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**ARENTO
COST OF SERVICE/RATE STUDY**

FINAL REPORT

**Performed for the Arab Republic of Egypt
National Telecommunications Organization**

and the

**U.S. Agency for International Development
Under Contract No. 236-0177-C-00-340**

by

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EXECUTIVE SUMMARY

Introduction and Relevant Background

This Final Report contains the findings and recommendations from K & M Engineering and Consulting Corporation's review of ARENTO's financial and accounting records, current billing and collection practices, overall network planning and operations, and cost of providing various telecommunications services to ARENTO subscribers, as well as a description of the computer-based tariff model that was tailored and developed specifically for use by ARENTO top management in evaluating alternative pricing and tariff structure options as ARENTO continues to expand its network and enhance both the diversity and quality of telecommunications services that it offers to its customers.

Context of the Current Study Effort

Three previous studies of ARENTO financial planning and tariff design have been performed under contract to USAID. These include the following reports:

- *"Projected Revenue Requirements and Recommended Rates for 1981/1982"*, Arthur D. Little International, Inc. April 1981.
- *"Long Range Financial Planning"*, Arthur D. Little International, Inc., February 1986.
- *"A Financial and Administrative Review of the Arab Republic of Egypt National Telecommunications Organization: Definitional Mission Final Report"*, Teleconsult, Inc., May 1992.

As a result of the recommendations contained in the third report cited above, USAID and ARENTO have agreed to sponsor three additional follow-up study efforts intended to serve as important inputs to the overall planning process for the ARENTO Telecommunications Sector Support (TSS) Project. These three prerequisite follow-up reports included:

- (1) The ARENTO Operations and Maintenance Study effort performed by Teleconsult, Inc. and Harza Engineering, Inc.;
- (2) The ARENTO Cost of Service/Rate Study performed by K & M Engineering and Consulting Corporation which is the basis of the current study effort;
- (3) The ARENTO Policy Reform and Institutional Development Assessment which will evaluate the potential for institutional, regulatory, and policy reform in the Egyptian telecommunications sector, and hopefully, complement and build upon the findings and recommendations of the Cost of Service/Rate Study.

Study Objective

The principal objective of this study was to provide ARENTO with a basis for both designing and implementing an effective strategy for future telecommunications pricing in Egypt. In this regard, K & M has endeavored to develop a highly sophisticated PC-based computer model that will

provide a "user friendly" tool for testing a variety of alternative pricing strategies and structural options for consideration by appropriate governmental decision makers and political authorities.

Importance of Counterparts and Egyptian Nationals

In achieving this study objective, K & M worked closely with ARENTO counterpart personnel assigned by the ARENTO Chairman to insure access to critical technical and financial data as well as validate the practicality of policy recommendations and alternative tariff strategies and service enhancements to be evaluated during the course of the overall study effort.

In K & M's view, two important ingredients contributed toward the overall success of this study effort. These include:

- (1) Effective participation by designated ARENTO counterparts; and
- (2) The exceptionally high quality of the Egyptian nationals that served as consultants to K & M.

Overall Approach

In undertaking this critical technical assistance effort, K & M initially prepared a work plan including specific performance milestones as well as a comprehensive listing of data requirements, for joint approval by both USAID and ARENTO. As cited above, the formal nomination of ARENTO study counterparts was a major contributing factor in the ultimate success of this study effort. In addition, from the very outset, K & M was able to obtain ARENTO's approval and support for use of a common measuring rod against which all proposed changes could be evaluated. Finally, K & M formed specialty teams for performing each specific tasking assignment. In this regard, each team included a mix of highly qualified technical experts from the U.S. telecommunications industry, as well as former senior technical and financial managers from ARENTO.

Suggested Criteria to be Maximized

During the implementation phase of this study effort, the K & M study team consistently evaluated all proposed policy changes, service improvements, capital expenditure revisions, pricing adjustments, and structural pricing changes against a common objective function which sought to:

- (1) Increase anticipated revenue per line;
- (2) Decrease the long-run marginal costs of providing telecommunications services;
- (3) Increase network utilization and overall efficiency;
- (4) Enhance the overall value of the network over time; and
- (5) Improve the perceived quality of services provided to ARENTO customers.

Tasking Assignments and Interconnections

Consistent with the issues raised and recommendations made in the earlier Teleconsult report, K & M was directed to focus its technical assistance efforts on the following broadly related activities:

- Review of ARENTO accounting records, including required exchange rate adjustments to financial statements and operating plans (Task 2).
- Review of ARENTO current billing and collection practices (Task 4).
- Assessment of ARENTO network operations in an effort to identify potential service improvements (Task 3).
- Analysis of the cost of service for various types of customers and service categories (Task 5).
- Development of a computerized tariff model for evaluating alternating pricing and tariff structure options (Task 6).

The flow of data input requirements and derived outputs among each of these major tasking assignments, as well as the interconnected nature of the various tasks, is illustrated in Exhibit ES-1 on the following page.

Review of ARENTO's Financial and Accounting Records

K & M was asked to review ARENTO's financial and accounting records, including an assessment of historical and projected exchange rate changes, existing and anticipated future foreign debt service, and projected cash flow requirements, to determine local currency as well as foreign currency requirements for each type of service in each year of the current five year plan. The objective of this review was to determine the effect that exchange rate changes may have had in the past or are likely to have in the future on individual cost categories, and how these changes affect the overall cost of services provided by ARENTO. This information was used to recast ARENTO income statements for each year, distributing the effects of exchange rate changes to the appropriate cost accounts.

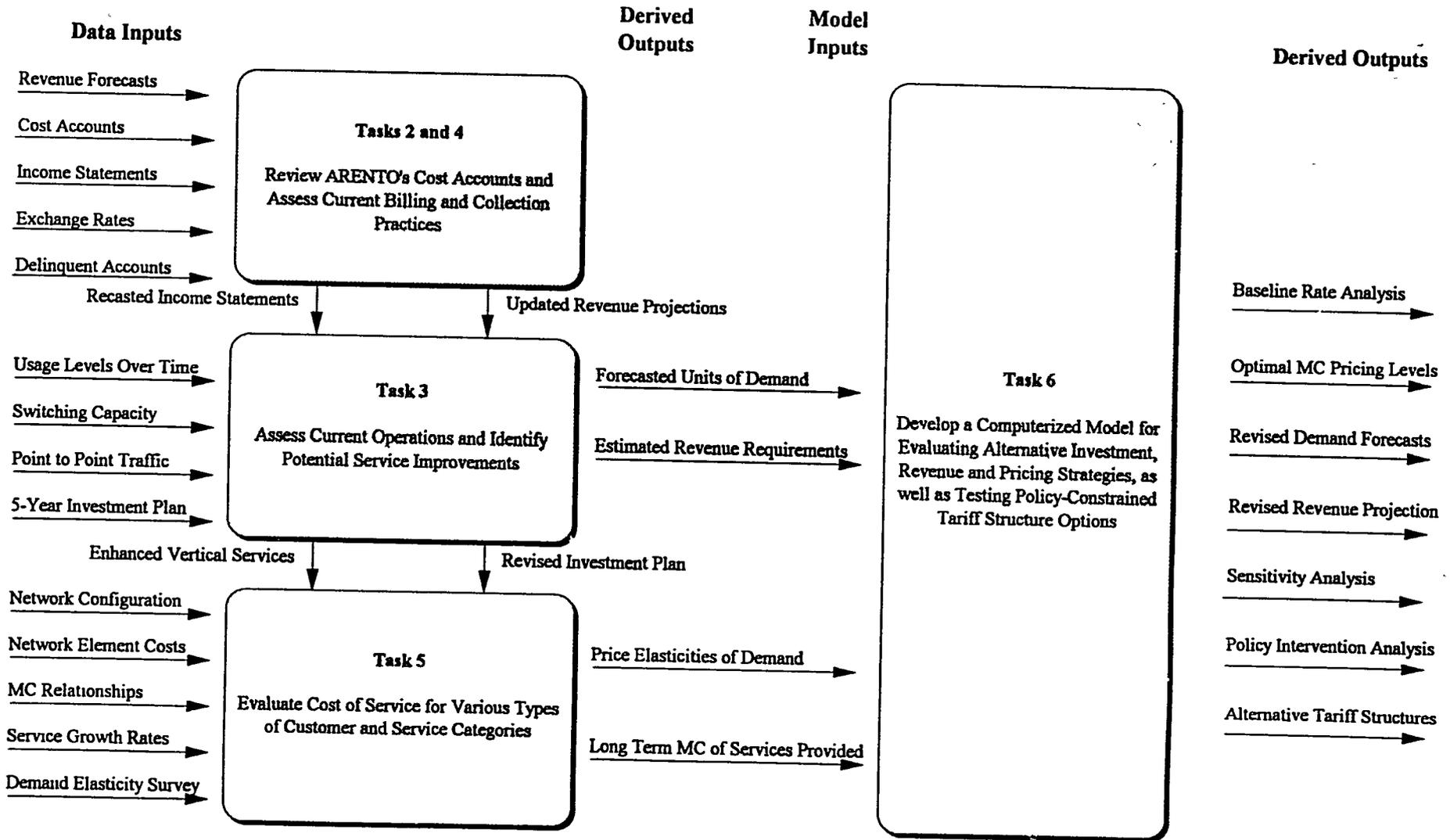
Major Findings

Highlights of major findings from this extensive review of ARENTO's financial and accounting records are summarized below:

- (1) The adverse effect of exchange rate changes over time on ARENTO income statements is limited primarily to interest payments and repayment of foreign-held debt.
- (2) At present, changes in exchange rates are not included in ARENTO projected income statements, and as a result, ARENTO has an unrecorded increase in foreign debt liability of approximately LE 1.4 billion.

EXHIBIT ES-1

FLOW OF INPUT REQUIREMENTS AND DERIVED OUTPUTS
FOR THE ARENTO COST OF SERVICE/RATE STUDY



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- (3) Similarly, ARENTO's long term debt and reserves are substantially understated by the amount of exchange rate changes from inception of foreign held debt until repayment.
- (4) ARENTO projected income statements for the current five year plan are based upon the unrealistic assumption that no change in exchange rates is likely to occur over the next five years.
- (5) Finally, ARENTO does not presently prepare detailed source and use of funds statements, nor does it utilize balance sheets, income statements, or source and use of funds statements in preparing five year financial plans.

Conclusions and Recommendations

Key conclusions and recommendations in the area of financial and accounting records include:

- (1) Recasting of income statements for the five-year period 1993-1997 is required for both the Changes in Prices of Hard Currency and Increases in Foreign Interest Expense accounts.
- (2) Based on World Bank projections of changes in LE/\$ exchange rates, ARENTO should recast these accounts utilizing a rate of 6.2 percent.
- (3) Utilizing such a rate, Changes in Prices of Hard Currency account should be increased by LE 55 million and the Foreign Interest Expense should be increased by LE 54 million.
- (4) While the LE 1.4 billion unrecorded increase in foreign debt has no impact on income statements, it should be included as an adjustment to the balance sheet for developing long-run marginal cost estimates for the various types of services offered by ARENTO.
- (5) ARENTO needs to include the affect of currency exchange rate changes as an expense against operating revenues in establishing total revenue requirements on a going forward basis.
- (6) Moreover, ARENTO should begin to prepare the annual source and use of funds statement, as well as prepare projected balance sheets for each year of the proposed five year plan for use in future planning cycles.

Assessment of Current Billing and Collection Practices

K & M was asked to determine the effect that billing and collection lags have had in the past, or may have in the future with respect to negative impact on cash flows, and how possible changes in ARENTO billing and collection practices may improve cash flows while at the same time meet customer satisfaction and convenience expectations. USAID also requested that K & M thoroughly review ARENTO's delinquent accounts policy, including records of overdue accounts. In addition, USAID asked K & M to review ARENTO's plans for a computer-based paying system, as well as evaluate the potential administrative costs that would likely be incurred by moving to a quarterly or monthly billing system.

Major Findings

Highlights of major findings from this assessment are summarized below:

- (1) ARENTO currently maintains two separate billing processes; one associated with billing international calls, and the other for all other telecommunications services.
- (2) Only the billing for international telecommunications services is presently fully computerized and billed monthly in arrears.
- (3) Residential, business, and governmental customers are currently billed semi-annually in arrears for national toll calls and any calls made above their respective free allowances, and semi-annually in advance for exchange services.
- (4) Bill preparation for all customers in Cairo and Alexandria is computerized, while bill preparation for all other exchanges is performed manually.
- (5) Government customers represent the only noteworthy problem associated with collection delinquencies; moreover, ARENTO neither requires a deposit from government customers nor applies existing disconnection/late payment penalties to enforce collection of past due government balances.
- (6) No separation of responsibility currently exists for ARENTO employees involved in billing, cash collection, posting of receivables, and issuance of billing adjustments for a particular account.
- (7) ARENTO does not currently possess the administrative or data processing capability to shorten cut-off time lags, or to bill more frequently than semi-annually.

Conclusions and Recommendations

Key conclusions and recommendations in the area of billing and collections include:

- (1) Expand ARENTO's data processing capabilities to permit moving to more frequent billing periods over time, as well as to facilitate better management control over both revenues and accounts receivable.
- (2) Issue more timely and easily payable telecommunications bills to all ARENTO customers throughout Egypt from a single integrated billing and collection system that includes an accounting for all telecommunications utilized by any given subscriber.
- (3) Place a higher priority on shortening time lags between the billing cut-off periods and the date bills are available for distribution.
- (4) Increase the frequency of billing over time from semi-annual to quarterly and eventually monthly for services normally billed in arrears to improve cash flow management and reduce the overall size and amount of each bill to a level more affordable by the majority of ARENTO's customers; however, it should be noted that moving to such a payment plan will entail an added cost to ARENTO which

will either have to be absorbed or shifted to the customer in the form of slightly higher prices.

- (5) Existing policies for international telecommunications services seem to be the most reasonable policies to adopt for all ARNETO telecommunications services as billing is converted to a monthly basis over time.
- (6) Development of a phased implementation plan is preferable to a flash cut to a new billing system.
- (7) With respect to the current semi-annual prepayment for local access, this payment frequency should be retained since movement to a quarterly or monthly local access billing will reduce ARENETO's real revenue generation capability, and may even require future offsets.
- (8) Move to one standardized account treatment policy that is consistently and uniformly applied to all subscribers, including government accounts.
- (9) The best solution for distributing customer bills is a mix of delivery systems.
- (10) Implement procedures which assign the various account management functional responsibilities to different groups or individuals since no single department or person should be solely responsible for billing, cash collection, bank reconciliation's, cash management and account adjustments, and write-offs.

Analysis of Network Planning and Service Improvements

K & M was also asked to undertake an analysis of factors behind ARENETO's recent revenue growth to establish actual rates of subscription growth, as well as understand how usage levels have changed for each class of user, location of user, and type of service category. In addition, K & M was asked to review point-to-point traffic data in an attempt to determine where future expansion or addition of telecommunications facilities is warranted. Furthermore, K & M was directed to review ARENETO's five-year investment strategy as well as existing planning process, and to provide revised revenue projections and recommendations as required. Finally, K & M was asked to identify possible areas where either expanded features or adjustments to ARENETO's existing investment strategy will result in further improvements in both service and value of the overall network. In fulfilling these requirements, K & M concentrated on the following activities: an assessment of recent demand for telecommunications services; a review of ARENETO's junction, switching, and outside plant capacity requirements; a review of current service operations; a review of ARENETO's present investment strategy; and validation of current revenue projections.

Major Findings

Highlights of K & M's analytical findings of the various service improvement-related assessments, reviews, and evaluations undertaken during the performance of this wide-ranging tasking assignment are summarized below:

- (1) The present lack of switching capacity is the primary reason for the current waiting list.

- (2) Demand for local telephone service continues to exceed ARENTO's capability to finance and construct the related switching and distribution facilities required to meet this demand.
- (3) Local call volume above the free call allowance has increased dramatically over the past six years increasing at over 32 percent annually.
- (4) Local usage consumes fully 91 percent of network utilization, but generates only 21 percent of all revenues.
- (5) Insufficient data is available on a timely basis to enable ARENTO to better coordinate switching and outside plant investment.
- (6) An analysis of the Cairo tandem to tandem circuit reveals that fully 60 percent of the groups have busy hour blockage.
- (7) The current fault report rate is excessive, and defective pairs are not currently being reported by the Facility Control Center.
- (8) ARENTO is presently foregoing significant additional revenue by not marketing and installing additional vertical service features.
- (9) The existing trunking configuration is severely mismatched to present calling patterns, thereby negatively impacting both service and revenue per line.
- (10) Call completion rates are consistently low, and call routing is still inefficient resulting in additional lost revenue per line.

Key Recommendations

Key recommendations from this extensive analysis of overall network planning and potential service improvements are presented below:

- (1) ARENTO should market telephone services to both increase revenue per line and reduce long run marginal costs.
- (2) ARENTO should implement expanded custom calling features (i.e. vertical services) in an effort to increase revenue per line, reduce junction and overall network costs, and improve quality of service provided.
- (3) ARENTO should commission a trunk administration and call completion study.
- (4) ARENTO should implement longer term planning for switching expansions.
- (5) ARENTO should attempt to better integrate switch planning with junction and outside plant planning.
- (6) ARENTO should immediately undertake the development of formal outside plant plans.
- (7) ARENTO should replace X-Bar offices earlier than currently planned.

- (8) ARENTO should immediately implement an integrated resources planning system through creation of a dedicated strategic planning group reporting directly to the Chairman with responsibilities including overall strategic planning, marketing, and pricing of ARENTO's telecommunications services, as well as coordination of existing planning departments.

Analysis of Service Costs

K & M was also asked to undertake an analysis designed to establish ARENTO's long run incremental (i.e., marginal) costs of providing specific telecommunications services, as well as determine to the extent possible the price elasticities of demand for each of these services.

In undertaking this crucial tasking assignment, K & M initially reviewed alternative costing methodologies, as well as underlying cost assumptions, utilized by others in estimating long run incremental costs in the telecommunications industry. K & M finally selected and adapted a network cost model similar in structure to the Service Cost Information System developed for use by local exchange carriers in the United States by Bellcore. Using relevant cost data developed during K & M's assessment of ARENTO current operations as major inputs to this model, K & M was able to calculate the marginal cost of providing each particular type of service offered to ARENTO subscribers. The results of these model runs are summarized in Exhibit ES-2.

In addition, K & M undertook an exhaustive survey of existing literature regarding price elasticities of demand in the telecommunications industry, since ARENTO does not presently collect or save historical price change and quantity response data. By tempering the results of this review with previous experience in countries similar to Egypt, the K & M Study Team was able to derive price elasticity of demand ranges for each type of telecommunications service. These estimated elasticities were then vetted with ARENTO staff. The results of this iterative process are presented in Exhibit ES-3.

EXHIBIT ES - 2

LONG-RUN MARGINAL COST ANALYSIS RESULTS

<u>TELECOMMUNICATIONS SERVICE CATEGORY</u>	<u>ARENTO LONG-RUN MARGINAL COSTS (LE)</u>
<u>Features:</u>	
Abbreviated	8.00
Follow-Me	4.00
Hotline	4.00
Wake-Up	3.00
Call Waiting	3.00
Conference	13.00
No Noise	4.00
Hunt Group	2.00
Fax	20.00
Touch Tone	1.00
<u>Long Distance:</u>	
Access	10.00
Usage: Day	0.04 to 0.23
Usage: Night	0.01 to 0.02
<u>Local Access:</u>	
** Flat Rate **	
Domestic	9.00
Public	9.00
Non-Domestic	9.00
Government	9.00
** Usage **	
<u>International</u>	
** Access **	250.00
** Usage **	2.30
<u>Coin Telephone:</u>	
Day Mou	0.01 to 0.08
Night Mou	0.01 to 0.01
<u>Leased Trunks</u>	540.00 - 2808.00
<u>Local Telex</u>	1000.00
<u>Local Teleg</u>	0.53
<u>Intl Telex</u>	0.10
<u>Intl Teleg</u>	3.37
<u>Cellular</u>	1200.00
<u>Telephone Sets</u>	63.00

EXHIBIT ES-3
PRICE ELASTICITY OF DEMAND
ESTIMATES FOR EACH SERVICE CATEGORY

<u>TELECOMMUNICATIONS SERVICE CATEGORY</u>	<u>DERIVED PRICE ELASTICITIES</u>	<u>WORLDWIDE SURVEY ELASTICITY ESTIMATES</u>
<u>Features:</u>		
Abbreviated	-0.20	-0.70 to -0.99
Follow-Me	-0.12	-0.70 to -0.99
Hotline	-0.12	-0.70 to -0.99
Wake-Up	-0.12	-0.70 to -0.99
Call Waiting	-0.12	-0.70 to -0.99
Conference	-0.12	-0.70 to -0.99
No Noise	-0.12	-0.70 to -0.99
Hunt Group	-0.80	-0.70 to -0.99
Fax	-0.12	-0.70 to -0.99
Touch Tone	-0.12	-0.70 to -0.99
<u>Long Distance:</u>		
Access	-0.01	NA
Usage: Day	-0.13 to -0.14	-0.05 to -0.59
Usage: Night	-0.14	-0.05 to -0.59
<u>Local Access:</u>		
** Flat Rate **		
Domestic	-0.14	-0.10 to -0.19
Public	-0.12	-0.10 to -0.19
Non-Domestic	-0.12	-0.10 to -0.19
Government	-0.12	-0.10 to -0.19
** Usage **	-0.11	-0.10 to -0.19
<u>International</u>		
** Access **	-0.99	-0.23 to -1.02
** Usage **	-0.80	-0.60 to -1.20
<u>Coin Telephone:</u>		
Day Mou	-0.13	-0.19 to -0.78
Night Mou	-0.13	-0.19 to -0.78
<u>Leased Trunks</u>		
	-0.12	-0.07 to -0.99
<u>Local Telex</u>		
	-0.99	-0.07 to -0.99
<u>Local Teleg</u>		
	-0.99	-0.07 to -0.99
<u>Intl Telex</u>		
	-0.99	-0.07 to -0.99
<u>Intl Teleg</u>		
	-0.99	-0.07 to -0.99
<u>Cellular</u>		
	-0.20	-0.07 to -0.99
<u>Telephone Sets</u>		
	-0.12	-0.07 to -0.99

Price Elasticity = $\frac{\% \text{Change in Units}}{\% \text{Change in Price}}$ and is always negative

Analysis of Service Prices in the Egyptian Telecommunications Sector

The purpose of this particular tasking assignment was to utilize the results from previous tasks to examine the current ARENTO rate structure and associated price levels for each service offered, and recommend changes within an acceptable range that would optimize return to the organization.

In addition, K & M was asked to develop a personal computer-based telecommunications pricing model that ARENTO top management could utilize to develop and refine optimal prices and rate structures for both current and planned telecommunications services. In this regards K & M endeavored to develop a model that was not only user friendly, but also capable of evaluating alternative investment, revenue, and pricing strategies, as well as testing policy-constrained tariff structure and pricing options.

In carrying out this tasking assignment, K & M focused on the following activities: developing a pricing analysis framework and methodology that incorporates the marginal costs and price elasticities of services; reviewing service prices and definitions to assure accurate application of derived marginal costs and price elasticities of demand; producing a user friendly PC-based pricing model that utilizes available information and can be easily understood by ARENTO staff; estimating revised revenue requirements for use in the pricing model; developing alternative pricing scenarios; performing sensitivity analyses; and recommending price level and structural changes that balance pure marginal cost approaches with the realities of the ARENTO business environment.

After the K & M "PRICEMOD" program was developed and refined, it was utilized to evaluate four different model scenarios including:

- a current 1993 unconstrained pricing structure without regard to possible policy related sensitivities;
- a suggested 1993 short term pricing structure addressing many of the political sensitivity issues ARENTO in obtaining approval for pricing reform;
- a planned 1997 long term policy-constrained pricing structure; and
- a suggested 1997 long term pricing structure that moves in the direction of providing usage sensitive pricing for local service.

Moreover, in an effort to test the sensitivity of prices to changes in service demand, two additional pricing scenarios were developed based upon:

- a 20 percent increase in forecasted demand; and
- a 10 percent decrease in forecasted demand.

Major Findings

Highlights from a detailed analysis of ARENTO's current service prices and overall tariff structure, as well as evaluation of these different model scenarios and levels of forecasted demand, are summarized below:

- (1) ARENTO currently prices many of its telecommunications services close to optimal marginal cost based prices.

- (2) However, critical local usage services are not optimally priced, and tend to shift a significant revenue burden of approximately LE 400 million a year to other services.
- (3) In this regard, ARENTO currently subsidizes, and will continue to subsidize, local access service through other telecommunications services enabled by the local access subscription; this subsidy is increased as the length of loop is increased.
- (4) Moreover, the average annual recurring revenues from these access lines do not presently cover the incremental or marginal cost associated with loop repair and related maintenance to keep such local loops in service.
- (5) ARENTO is presently covering approximately 42 percent of the marginal cost for calls that fall within the free call allowance category from revenues generated by calls that fall outside of the free call allowance.
- (6) Peak period calls can provide from 88 to 91 percent excess revenues over long run marginal costs, and off-peak toll service can generate around 99 percent in excess of revenues over long run marginal costs.
- (7) Coin service long run marginal cost is well below the current coin tariff rate.
- (8) Although ARENTO generally has low service rates, it can achieve relatively low long run marginal costs if service improvement actions are taken to more fully utilize plant investment.
- (9) In addition, vertical and enhanced features currently being provided by ARENTO have relatively low marginal costs, and thus are capable of sustaining prices that exceed long run marginal costs from 60 to 90 percent.
- (10) Finally, based upon a 14 percent return on investment as well as planned funding for continued network expansion and new call completion features,
K & M projects a significant estimated revenue shortfall for ARENTO on the order of LE 293.8 million in 1993, which is expected to continue at declining levels through 1995; this situation can only be remedied by either accepting lower rates of return on capital, curtailing future investment, or raising tariff levels and/or pricing structures.

Near Term Recommendations

A summary of near term recommendations relative to ARENTO telecommunications pricing and tariff structure are presented below:

- (1) Lower the local usage free call allowance in 1994 for all subscriber classes to capture at least 20 percent of the free local call units, generate greater revenues, and move closer to marginal cost pricing.
- (2) Calculate the usage of subscriber allowed calls on a quarterly basis of 300 calls each by 1994 to increase the probability that heavy users of local service will pay for using the network.

- (3) Move to a monthly allowance of 100 calls by 1995 to capture additional revenues from every local service user.
- (4) Actively promote and market call completion features such as Hunt Group, Touch Tone, Call Waiting, Call Forwarding, and Voice Messaging to stimulate local and national toll service minutes of use and messages while reducing high cost failed call attempts.
- (5) Increase feature, coin, and national toll rates by 1994 to provide adequate financial performance to fund new network investment.
- (6) Review the impact of leakages on ARENTO's ability to generate sufficient internal funds for future network investment.
- (7) Establish a formal marketing unit in ARENTO that is responsible for developing pricing strategies, producing service forecasts, and actively marketing targeted services.
- (8) Formally link the marketing function to the strategic planning function; in this regard, the marketing unit should be an integral part of a strategic planning group reporting directly to the ARENTO Chairman.
- (9) Develop long-term pricing objectives and evaluate various pricing options using the K & M pricing model as a key tool; this will involve formal price analysis training for selected members of the ARENTO staff.
- (10) Immediately collect and retain information relative to subscriber responses to changes in ARENTO prices, and continue internal cost analysis to estimate and monitor the marginal costs of each service; this recommendation will require training on both elasticity of demand and on marginal cost estimation techniques specifically for the telecommunications sector.

Long Term Recommendations

A summary of long term recommendations based upon the analytical results obtained from the K & M pricing model are presented below:

- (1) Move all prices toward optimal marginal cost/price elasticity determined levels to optimize revenue streams to ARENTO while providing customer satisfaction with appropriately value-priced services.
- (2) Focus price reform on local usage pricing to eventually eliminate free call allowances, and migrate to total usage sensitive priced local service.
- (3) Significantly lower local and national network access fees to provide low cost accessibility to communications in Egypt and optimize the financial performance of ARENTO.
- (4) Encourage strategic marketing unit participation in key management and business decisions.

I. BACKGROUND AND INTRODUCTION

The U.S. Agency for International Development (USAID) has made a major commitment to assist the Arab Republic of Egypt in the development of its telecommunications sector, which is regarded as having a key role in the country's further economic reform and development. In anticipation of a continuing commitment from USAID to the Arab Republic of Egypt National Telecommunications Organization (ARENTO) in the future, the Government of Egypt, ARENTO, and USAID have agreed that a Cost of Services/Rate Study is required. This chapter contains an introduction to such a study effort for ARENTO, as well as overall study objective and criteria to be maximized.

A. Context of the Current Study Effort

Three previous studies of ARENTO financial planning and tariff design have been performed under contract to USAID. These include the following reports:

- *"Projected Revenue Requirements and Recommended Rates for 1981/1982"*, Arthur D. Little International, Inc., April 1981.
- *"Long Range Financial Planning"*, Arthur D. Little International, Inc., February 1986.
- *"A Financial and Administrative Review of the Arab Republic of Egypt National Telecommunications Organization: Definitional Mission Final Report"*, Teleconsult, Inc., May 1992.

Of these three previous study efforts, only the Teleconsult Definitional Mission Final Report raised specific key issues which are still relevant today. In any event, as a result of the recommendations of this third report, USAID and ARENTO have agreed to sponsor three follow-up study efforts intended to serve as important inputs to the overall planning process for the proposed ARENTO V Telecommunications Project (recently renamed the ARENTO Telecommunications Sector Support Project), including the preparation of project implementation documents for the out-years. These three prerequisite follow-up reports include:

- (1) The ARENTO Operations and Maintenance Study to review the current operations and maintenance policies and procedures of ARENTO;
- (2) The ARENTO Cost of Service/Rate Study to assess ARENTO's current cost of providing specific telecommunications services in Egypt and estimate the performance of current and proposed prices on revenues over time; and
- (3) The ARENTO Sector Study to undertake an institutional, regulatory, and policy reform analysis of the Egyptian telecommunications sector.

K&M Engineering and Consulting Corporation (K&M) was selected by the USAID to perform the Cost of Service/Rate Study for ARENTO in the Arab Republic of Egypt. Consistent with the issues raised and recommendations made in the earlier Teleconsult report,

K&M was directed to focus its technical assistance efforts for this tasking assignment on the following broadly related activities:

- Review of ARENTO accounting records including required exchange rate adjustments to financial statements and operating plans;
- Review of current billing and collection practices;
- Assessment of ARENTO network operations in an effort to identify potential service improvements;
- Analysis of the cost of service for various types of customers and service categories; and
- Development of a computerized tariff model for evaluating alternative pricing and tariff structure options.

B. Overall Study Objective and Importance of Counterparts

The principal objective of this study was to provide ARENTO with a basis for both designing and implementing an effective strategy for future telecommunications pricing in Egypt. In achieving this objective, K&M worked closely with ARENTO counterpart personnel assigned by the ARENTO Chairman to insure the practicality of alternative tariff strategies and service enhancements to be evaluated during the course of the overall study effort. In addition, K&M endeavored to develop a highly sophisticated PC-based computer model that would provide user-friendly tool for alternative and testing alternative pricing and rate structure options for future consideration by appropriate governmental decision makers and political authorities.

Two important factors contributing to the overall success of this study effort were: (1) effective participation by designated ARENTO counterparts; and (2) the exceptionally high quality of the Egyptian nationals that served as expert consultants to the K&M team. Exhibit I-1 illustrates the working arrangement that existed between the various members of the K&M team and their designated ARENTO counterparts throughout the study period.

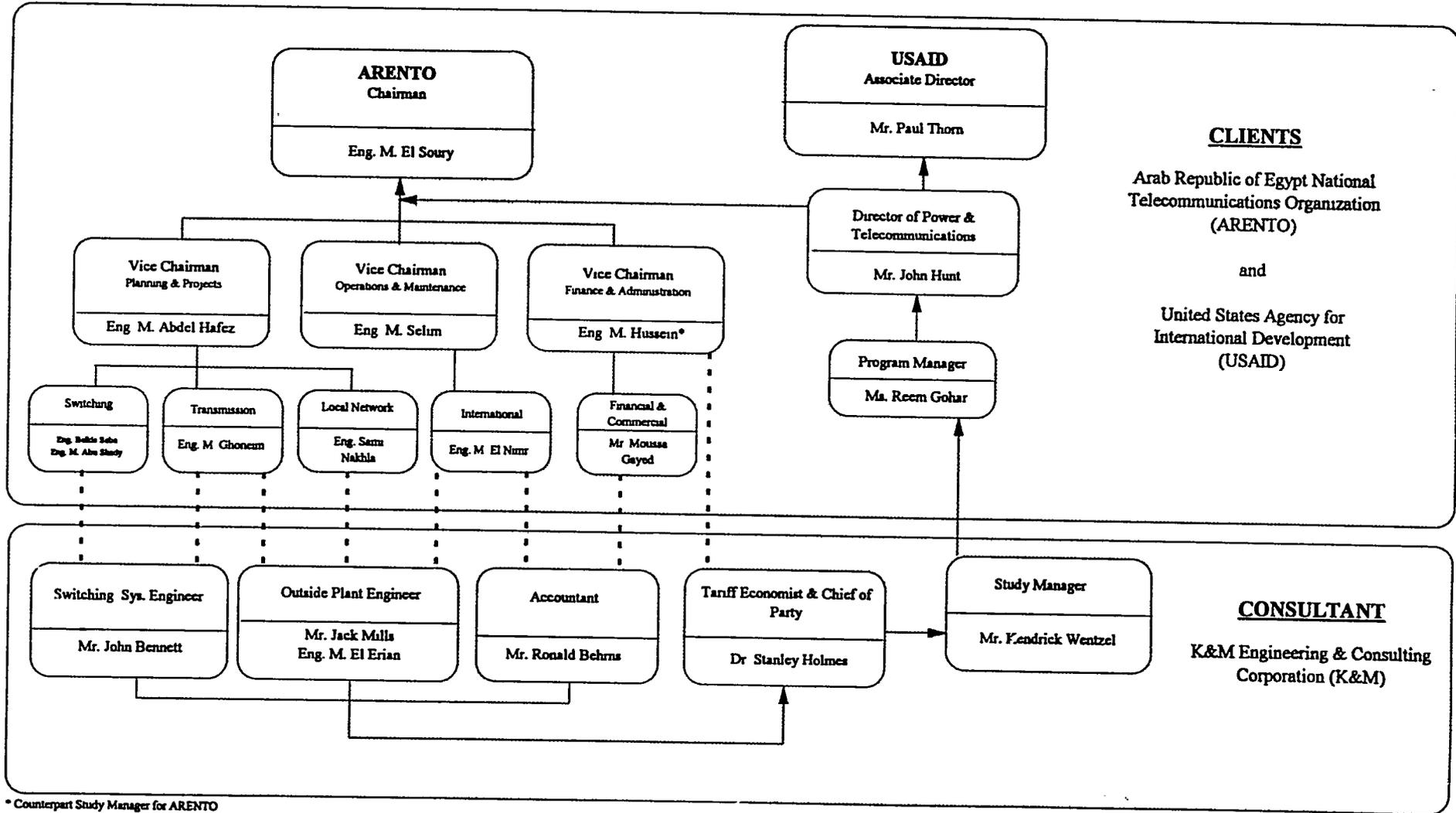
C. Suggested Criteria to be Maximized

During the performance of this study effort, the K&M team consistently evaluated all proposed policy changes, service improvements, capital expenditures revisions, pricing adjustments, and structural pricing changes against an objective function which seeks to:

- 1) Increase anticipated revenue per line;
- 2) Decrease the long run marginal costs of providing telecommunications services;
- 3) Increase network utilization and overall efficiency;
- 4) Enhance the overall value of the network over time; and
- 5) Improve the perceived quality of services provided to ARENTO customers.

EXHIBIT I-1

DESIGNATED COUNTERPARTS AND REPORTING RELATIONSHIPS



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II. OVERVIEW OF CONTRACTOR TASKS

This chapter is intended to provide an overview of the specific tasks that the K&M team was asked to perform under this study effort, as well as illustrate the data input /output flows and interconnections among the various tasking assignments.

A. Highlights of Specific Tasking Assignments

In carrying out the approved scope of work for this study effort, K&M was asked to perform the following tasking assignments:

Task 1: Work Plan

Prior to initiating any substantive field work under this contract, the K&M team was required to prepare a work plan for USAID and ARENTO review and approval.

Task 2: Account Records

K&M was also asked to review ARENTO's financial and accounting records (especially cost accounts) to determine local currency as well as foreign currency requirements for each type of service in each year of the current five year plan. The objective of this review was to determine the effect that exchange rate changes may have had in the past or are likely to have in the future on individual cost categories, and how these changes affect the overall cost of services. This information was used to recast ARENTO income statements for each year, distributing the effects of exchange rate changes to the appropriate cost accounts.

Task 3: Service Improvements

The K&M team was asked to analyze factors behind ARENTO's recent revenue growth to establish actual rates of subscription growth, as well as understand how usage levels have changed for each class of user, location of user, and type of service category. In addition, the K&M team was asked to review point-to-point traffic data in an attempt to determine where future expansion or addition of telecommunications facilities are warranted. Furthermore, the K&M team was directed to review ARENTO's five-year investment strategy, and provide revised projections if required. Finally, the K&M team was asked to identify possible areas where adjustments to ARENTO's existing investment strategy will result in further improvements in both service and value of the overall network.

Task 4: Billing and Collection Practices

The K&M team was asked to determine the effect that billing and collection lags have had in the past, or may have in the future with respect to negative impact on cash flows, and how possible changes in ARENTO billing and collection practices may improve cash flows while at the same time meet customer satisfaction and convenience expectations.

Task 5: Cost of Service

The K&M was asked to undertake an analysis designed to establish long run incremental (i.e., marginal) costs of providing specific telecommunications services, as well as determine to the extent possible the price elasticities of demand for each of these services.

Task 6: Tariff Design

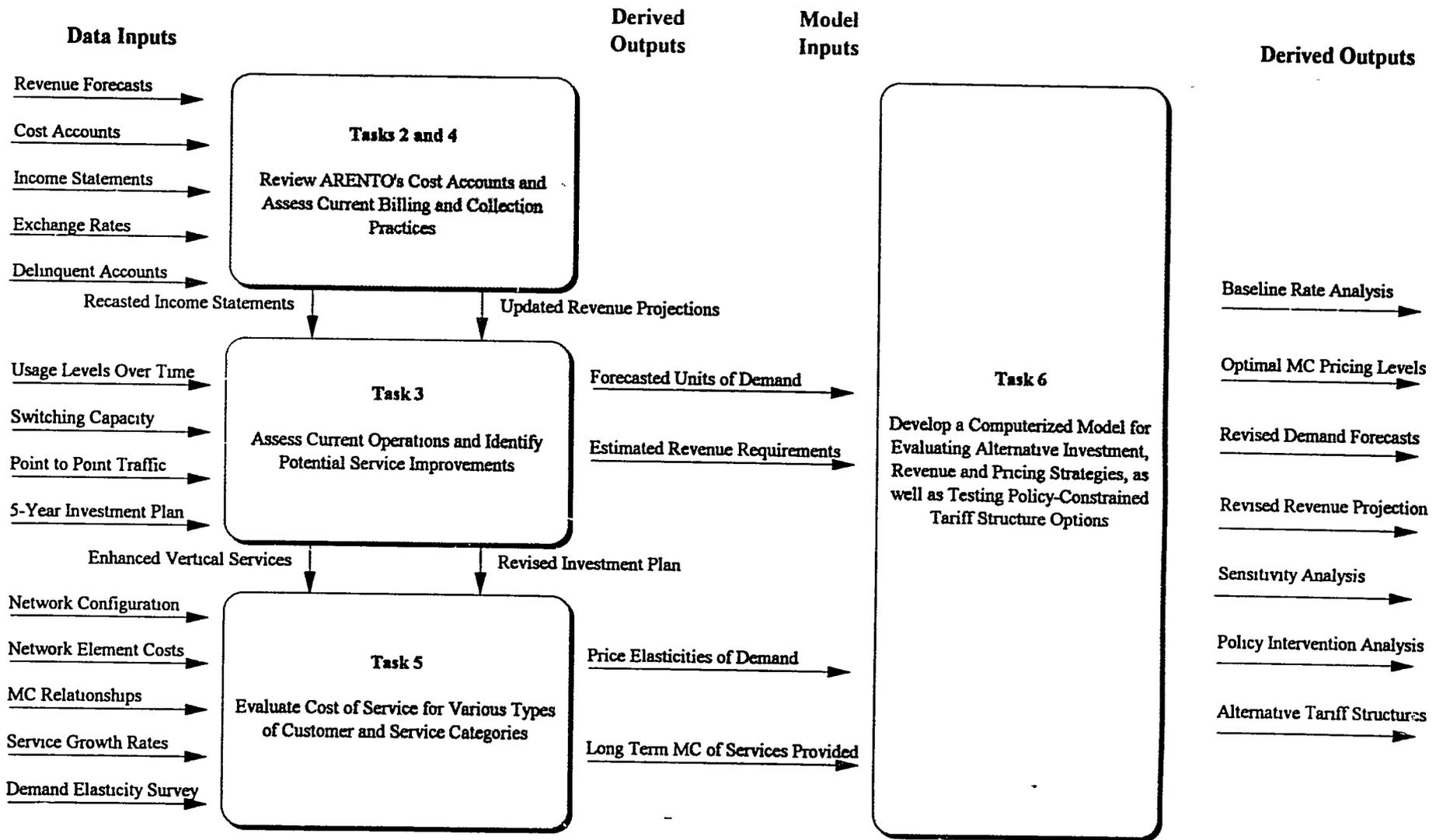
The K&M team was asked to develop a personal computer-based telecommunications pricing model that ARENTO top management can utilize to develop and refine optional prices and rate structures for current as well as planned telecommunications services. In this regard, K&M endeavored to develop a model that was not only user friendly, but also capable of evaluating alternative investment, revenue, and pricing strategies and testing policy-constrained tariff structure and pricing options.

B. Flow of Required Inputs and Outputs

The flow of data input requirements and derived outputs among each of the major tasking assignments described above, as well as the interconnected nature of the various tasks, is illustrated in Exhibit II-1 below.

EXHIBIT II-1

**FLOW OF INPUT REQUIREMENTS AND DERIVED OUTPUTS
FOR THE ARENTO COST OF SERVICE/RATE STUDY**



III. REVIEW OF ARENTO'S FINANCIAL AND ACCOUNTING RECORDS

This chapter presents the results from K&M's review of ARENTO's financial and accounting records including income statements, balance sheets, and the source and use of funds.

A. Task Background and Scope

The previous studies have been conducted under contract to USAID regarding ARENTO's financial planning. These include:

- *"Project Revenue Requirements and Recommended Rates for 1981/1982"*, Arthur D. Little, International, Inc. April 1981.
- *"Long Range Financial Planning"*, Arthur D. Little, International, Inc. February 1986.

In addition, in May 1992, Teleconsult, Inc. under contract to USAID performed a financial and administrative review of ARENTO operations. The Definitional Mission Report Final Report resulting from this review served as a basis for developing the Work Statement for the ARENTO Cost of Service/Rate Study.

In the specific area of accounting records, Teleconsult felt that the most important questions or issues to be addressed in any subsequent review were:

- (1) What effect have the exchange rate adjustments of 1987 had on individual cost categories?
- (2) How will these adjustments affect ARENTO's cost of services?

With respect to specific activities to be performed under Task 2: Accounting Records, K&M was asked by USAID to review ARENTO's cost accounts in detail to determine the local as well as the foreign currency exchange requirements for each type of service in each year of the current five-year plan. In addition, K&M was asked to utilize this information to recast income statements for each year distributing the effect of exchange rate changes to the appropriate accounts. Since these results will alter the distribution of costs to individual accounts, they are an essential preliminary step in testing the sensitivity of revenue requirement projections to possible future exchange rate shocks.

Accordingly, the objective of this review of ARENTO's financial and accounting records is to determine the effect that exchange rate changes may have had in the past or are likely to have in the future on individual cost categories, and how these changes are likely to affect the overall cost of telecommunications services provided by ARENTO.

B. Discussion of Review Results

This section presents the results of K&M's review of all financial and accounting records, including an assessment of historical and projected exchange rate changes as well as analysis of foreign debt and projected cash flows.

1. Overview of Major Findings and Recommendations

a. Account Analyses - Historical

K&M reviewed all ARENTO's Income Statement Accounts (see exhibit III-1 for complete listing of income statements reviewed), Balance Sheet Accounts (see exhibit III-2 for a complete listing of balance sheet accounts reviewed), and Source and Use of Funds Statements (see Exhibit III-3 for a complete listing of source and use of funds statements reviewed) for the fiscal years ending 1987-1992. It was learned from reviewing the income statement accounts, that the effects of exchange rate changes are related to two factors. These include: (1) interest payments and (2) the repayment of foreign held debt. Amounts for the effect of exchange rate changes associated with interest payments are recorded as interest expense in Account 357-Difference In Calculated Interests and classified as an operating expense (above-the-line). Amounts for the effect of exchange rate changes associated with the repayment of foreign held debt are classified as a non-operating expense (below-the-line) in accordance with established Egyptian accounting policy and are recorded in Account 362-Changes In Prices of Hard Currency.

Exhibit III-1 Income Statement Accounts

Code No.	Operating Revenues
417	Sold Services :
	Telegraph Revenues
	Telephone Revenues
	International Revenues
416	Receipts of Work Done for Others
418	Goods for Sale
	Operating Expenses
311	Cash Salaries
312	Salaries In Kind
314	Social Insurance
	Less Salaries Assigned To Chapter 3
	General Expenses
32	Commodities
33	Services
34	Goods for Sale

Current Transfer Expenses:

3514 Taxes And Duties

Depreciations:

3522 Building & Constructions
3523 Machinery & Equipment
3524 Transportation
3525 Tools & Machinery
3526 Furniture & Office Equipment
3528 Deferred Revenue Expenditures

Rent:

353 Actual Rent
354 Difference of Calculated Rent
Total Operating Expenses (Except Interest)
Total Revenues (Before Expenses)

Interest:

355 Local
356 Foreign
357 Difference In Calculated Interests
Income From Deferrals (Surplus)

Non-Operations Income:

Current Earmarked Revenues

43 Receipts From Securities
441 Credit Interest
442 Credit Rent
443 Capital Gains
444 Revenues of Previous Years
445 Compensations And Fines
446 Miscellaneous Revenues
447 Difference In Calculated Rent
448 Difference In Calculated Interests

Current Earmarked Expenses

361 Donations
362 Changes In Prices of Hard Currency
363 Compensations And Fines
364 Capital Losses
365 Previous Years Expenses
367 Provisions Except Depreciation
- Ministry of Finance
- National Subways Organization (Metro)
Carried Over Surplus

Exhibit III-2
Balance Sheet Accounts

Code No. I	Assets
11	Fixed Assets
111	Lands
112	Building & Constructions
113	Machines & Equipment
114	Transportation
115	Tools & Gears
116	Furniture & Desks Equipment
118	Deferred Revenues Expenditures
-	Assets Damaged By War
12	Projects Under Constructions
121	Commodities Formation
122	Investment Expenditures
13	Inventories
131	Commodity Requirement
1311	Raw Materials
1312	Fuel
1313	Spare Parts
1315	Scrap
132	Unfinished Work
135	Goods for Sale
136	Letter of Credit Machines
15	Investment
16	Debtors
161	Account Receivables
1611	Public Sector
1612	Private Sector
1613	Foreign
163	Miscellaneous
17	Various Debtors Accounts
172	Other Debtors
173	Deferred Earmarked

- 18 **Cash On Hand & In Bank**
- 181 Cash On Hand
- 1821 Investment Account Current
- 1822 Investment Account
- 183 Bank Deposit
 - Bank Hard Currency
 - Bank Service Improvements

Code No. 2 Liabilities

- 21 **Capital**

- 22 **Reserves & Carried Over Surplus**
- 224 General Reserves
- 226 Reserves for Increase In Assets Prices
- 227 Other Reserves
- 228 Carried Over Surplus

- 23 **Provisions**
- 231 Depreciations
- 2312 Building & Constructions
- 2313 Machinery And Equipment
- 2314 Transportation
- 2315 Tools & Gears
- 2316 Furniture & Office Equipment
- 2318 Deferred Revenues Expenditures
- 232 Provisions for Taxes (Contested)
- 233 Doubtful Accounts
- 234 Others
 - Provision or Assets Damaged By War
 - Litigation & Damages

- 24 **Long Term Debts**
- 241 Domestic
- 242 Foreign

- 251 **Bank Overdraft**

- 26 **Creditors**
- 261 Suppliers
- 263 Miscellaneous

- 27 **Various Creditor Accounts**
- 2721 Creditors of Purchasing Fixed Assets
- 273 Others
- 274 Accrued Current Expenses
 - Service Improvement Funnel

Exhibit III-3

**ARENTO
Statement of Sources and Use of Funds**

CODE	SELF FINANCE	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92
21	CAPITAL					0	4000000
224	GENERAL PROVISIONS					110753562	42611994
226	RESERVES FOR REPLACEMENT VALUES OF ASSETS	3868094	3370856	2089911	4990100	4596008	4674989
227	OTHER RESERVES	75226994	63190925	35116817	93356241	12477440	88658589
228	CARRIED OVER SURPLUS	108686844	159045225	229889086	441055402	412448333	461339365
231	DEPRECIATION	135488782	136438456	164780516	186109265	60582049	157148611
233	PROVISIONS FOR DOUBTFUL ACCOUNTS	0	290167	21504822	709404	0	0
234	OTHER PROVISIONS			5716392	0	0	0
	SUB-TOTAL	323270714	362335629	459097544	726220412	600857392	758433548
LIQUIDITY							
11	COSTS OF RETIRED ASSETS	0	6501665	0	2957688	137963747	108023098
INVENTORY DECREASE							
131	COMMODITY NECESSITIES	197154	5548515	0	760851	2513632	21043
132	UNFINISHED WORK IN PROGRESS	84503	0	181258	0	0	0
135	GOODS FOR SALE			0	769676	1633034	0
136	LETTERS OF CREDIT	0	0	0	0	3590745	0
	SUB-TOTAL	281657	5548515	181258	1530527	7737411	21043
DECREASE IN SECURITIES & OTHER INVESTMENTS							
161	SUBSCRIBERS	11684052	0	5593754		3433292	67276010
163	MISCELLANEOUS RECEIVABLE	378769	46577	0	405946	130130	35673
171	VARIOUS RECEIVABLE	0	0	0		0	0
172	OTHER RECEIVABLE	0	33323452	0	29624	10770140	23793457
173	DUE REVENUES		216			29368766	3255067
18	CASH ON HAND & IN BANK	1204952	112053977	0	43223964	0	98686659
	SUB-TOTAL	13267773	145424222	5593754	43659534	43702328	193046866
LONG TERM LOANS							
2241	LOCAL	0	0	31840000		0	0
242	FOREIGN	458334347	252046163	288877606	256167857	85462726	333892398
242	CORRECTION OF FOREIGN LOANS					5855316	11270635
	SUB-TOTAL	458334347	252046163	320717606	256167857	91318042	345163033
PAYABLE & BANK							
261	SUPPLIERS	1427068	672276	9162385	11153592	0	2727457
262	MISCELLANEOUS	6202093	10130214	9414540	11808748	9982888	26531102
272	VARIOUS	16526605	10130214	0		1983068	14148831
273	OTHERS	52013477	300278	76293735	105844599	64124347	12369990
274	CURRENT EARMARKED EXPENDITURES	421350	339188	4723101	323318	17131	9361517
	SUB-TOTAL	76590593	21572170	99593761	129130257	76107434	65138897
	TOTAL SOURCES	871745084	793428364	885183923	1159666275	957686354	1469826485

(Exhibit III-3 Continued)

		1986/87	1987/88	1988/89	1989/90	1990/91	1991/92
	CAPITAL FORMATIONS						
112	BUILDINGS & CONSTRUCTIONS	293521943	240716699	230546253	232328186	166027032	319873407
113	MACHINERY & EQUIPMENT	242365133	231349893	174914327	265575271	263019558	478138731
114	TRANSPORTATION	9721482	1462579	340959	0	234403	2709423
115	TOOLS & IMPLEMENTS	411402	147274	367895	2941333	1135977	2081202
116	FURNITURE & OFFICE EQUIPMENT	4296953	3064618	3015041	2566762	1932347	2646081
118	DEFERRED REVENUES EXPENDITURES	39756870	31791961	7935717	239601	6308037	0
	SUB-TOTAL	590073783	508533024	417120192	503651153	438657354	805448844
	INVENTORIES						
131	COMMODITIES	1718355	0	5518728	9519888	14115	11731708
132	UNFINISHED PRODUCTION & WORK IN PROGRESS	0	55795	0	0	0	0
135	GOODS FOR RESALE	0	9181271	767429	0	0	18550
136	LETTERS OF CREDIT	5190162	11349268	4908861	10325546	933781	5472999
	SUB-TOTAL	6908517	20586334	11195018	19845434	947896	17223257
12	PROJECTS UNDER CONSTRUCTION	40424400	45728622	146034122	15956531	16135943	174502145
	CAPITAL TRANSFERS						
111	LANDS (FIXED ASSETS)	210984	31773	352654	2583030	246490	134838
	LAND (PROJECTS)	325351	0	0	0	0	0
	SUB-TOTAL	536335	31773	352654	2583030	246490	134838
15	FINANCIAL INVESTMENT RECEIVABLE	0	0	0	4002023	8597977	46611994
161	ACCOUNTS RECEIVABLE	16223649	49349628	0	82721891	184131935	16752251
163	MISCELLANEOUS RECEIVABLE	431629	2838918	256955	271042	341205	1583155
171	MISCELLANEOUS DEBTORS	6432612	0	0	0	0	0
172	OTHER RECEIVABLE BALANCES	0	0	9742012	52318582	12016015	10194368
173	ACCRUED CURRENT RECEIPTS	0	0	1282191	32050273	44656	115134781
	SUB-TOTAL	23087890	52188546	11281158	167361788	196533811	143664555
	PAYMENT OF LONG TERM LOANS						
241	LOCAL INSTALLMENTS	25094658	29063373	33145000	36327000	36357000	33213000
242	FOREIGN INSTALLMENTS	116273348	87247544	141234937	112106477	118405853	120827043
	ADJUSTMENT OF FOREIGN LOANS	0	0	0	122386659	14872617	0
	SUB-TOTAL	141368006	116310917	174379937	270820136	169635470	154040043
18	CASH ON HAND AND IN BANK	69098660	8196664	107021816	48970785	7529108	63411327
	DECREASE IN PAYABLES						
261	SUPPLIERS	0	131783	0	253469	15122181	0
263	MISCELLANEOUS	20135	51236	369582	31589	326042	12720
272	VARIOUS PAYABLES	0	0	17193518	692207	0	0
273	OTHERS	195005	26781800	11234	122392296	100411426	39280021
274	CURRENT EARMARKED EXPENSES PAYABLE	25491	65	224692	2098998	2631965	567
12	DECREASE IN CAPITAL	0	14888400	0	0	0	0
22 & 23	DECREASE IN PROVISIONS & SERVICES	6862	0	0	1006836	910691	30496174
	SUB-TOTAL	247493	41853284	17799026	126475395	119402305	69789482
	TOTAL USES	831320684	747700542	739149801	1139707721	932952434	1253712346

Findings and Recommendations

- *While no Egyptian accounting changes are required, amounts in Account 362 - Changes in Prices of Hard Currency should be considered an operating expense (above-the-line) when developing revenue requirements, cost of services (Task 5) and in developing rates and tariffs (Task 6). In this regard, care should be taken to ensure that such costs are sensitized into rates and tariffs to avoid possible future rate shocks. These amounts should also be included in recasted operating projected Income Statements as an operating expense entitled Exchange Rate Changes.*
- *Based on the information from interviews regarding ARENTO's accounting policies, it appears that no additional accounts require recasting for hard currency related transactions that are included in operating expense accounts.*
- *There does not appear to be any hard currency transactions related to expenses that are not adjusted for exchange rate changes.*

Utilizing these suggestions, K&M has recast ARENTO's operating projected income statements. These recasted income statements for the current five year plan are presented in Exhibit III-4.

Exhibit III-4
Operating ARENTO Projected Income Statements
(Recasted to Include Effects of Exchange Rate Changes in Operating Expenses)
Five Year Plan

(million LE)	YR 1 '92/'93	YR 2 '93/'94	YR 3 '94/'95	YR 4 '95/'96	YR 5 '96/'97
OPERATING REVENUES					
Telegraph	15	16	17	18	19
Telephone	583	640	704	775	852
International	878	922	1014	1116	1227
Other	<u>61</u>	<u>86</u>	<u>91</u>	<u>94</u>	<u>98</u>
Total Revenues	1537	1664	1826	2003	2196
OPERATING EXPENSES					
Salaries & Soc. Ins.	195	234	280	337	404
Commodities	55	63	73	84	97
Services	33	36	40	44	48
Cost of Goods Sold	28	54	59	65	72
Depreciation	260	276	292	310	329
Interest	173	180	187	194	201
Other	103	3	3	3	3
Exchange Rate Change (*)	<u>166</u>	<u>172</u>	<u>178</u>	<u>184</u>	<u>190</u>
Total Expenses	1013	1018	1112	1221	1344
OPERATING INCOME	524	646	714	782	852

(*) Represents amounts for exchange rate changes related to the repayment of foreign held debt that was incurred to finance the purchase of switching, transmission & outside plant construction.

b. Balance Sheet - Foreign Held Debt Analysis - Historical

K&M requested and was provided a detailed list of outstanding foreign held debt. This information included the amount of debt stated in terms of the applicable foreign currency and the related amount stated in LE as reported on ARENTO's balance sheet for the period ending June 30, 1992. The repayment schedule for this debt was requested but not provided. When the repayment schedule for this debt was needed, estimates were calculated by K&M from other available data. This derived information was utilized to assess any possible income statement impact related to hard currency transactions.

Findings and Recommendations

- *The debt amounts provided were used to calculate the unrecorded increase in foreign debt which amounted to LE 1.4 billion arising from changes in exchange rates since inception of all loans of record.*
- *Such amounts have no impact on the income statements and should not be included in the Recasted Income Statements.*
- *However, when developing long-run marginal costs (TASK 5), such amounts should be included as adjustments to the balance sheet.*

K&M utilized this calculation to recast ARENTO's accounting summary of foreign held debt. The results of this effort are presented in Exhibit III-5. For a further discussion of this item, see section B(4) below entitled Analysis of Foreign Held Debt.

Exhibit III-5

ARENTO Recasted Foreign Held Debt as of June 30, 1992			
Country	Foreign Held Debt per Books	Recasted Foreign Held Debt	Unreported Liability Foreign Loan Payment Reserve
(Thousand LE)	(1)	(2)	(2)-(1)
France	342,474	723,970	381,496
Japan (per 100 Yen)	57,456	239,018	181,562
Germany	491,058	995,375	504,317
Austria	190,851	384,467	193,616
Saudi Arabia	1,468	3,615	2,147
USA	207,760	369,085	161,325
Sweden	11,610	22,998	11,388
Local	32,228	32,228	-
Total	1,334,905	2,770,756	1,435,851

c. Balance Sheet - Construction Purchases Analysis

Purchase and/or imports of equipment and services broken down by account (balance sheet accounts and income statement accounts) for each type of service for '87-'92 and for each year of the Five Year Plan '93-'97 were requested but not available. In lieu of requested information, foreign purchases for construction projects for the period, '87-'92 were provided by ARENTO (see Exhibit III-6) along with the funding sources of local currency, foreign currency and foreign debt. For the five-year planning period, a summary of "needed"

construction expenditures and "approved" construction expenditures for the five-year period were also provided by ARENTO along with the planned funding sources of local currency, foreign currency and foreign debt (see Exhibit III-7). In addition, ARENTO provided a five-year summary of construction projects approved by the Ministry of Planning for the period 1992/1993-1996/1997 (see Exhibit III-8).

Exhibit III-6
Foreign Purchases for Construction Projects with Funding Sources
FY 1987 - FY 1992
Projects under Execution

Foreign Purchases				
Year	Funding Sources (LE in Millions)			Total Foreign Purchases
	Local Currency	Foreign Currency	Facilities *	
86/87	117.057	63.358	177.655	358.070
87/88	159.546	155.529	214.536	529.611
88/89	162.990	185.233	198.261	546.484
89/90	150.301	181.605	132.793	464.699
90/91	184.765	185.176	82.792	452.733
91/92	310.900	325.597	343.588	980.085

* Foreign loans used to finance purchases related to construction

Exhibit III-7
Construction Expenditures Approved & Needed with Financing Sources
FY 1993 - FY 1997
(amounts in LE)

<u>CONSTRUCTION EXPENDITURES - NEEDED</u>	
ARENTO want Projects (92/93 - 96/97)	4825 000 000
<u>Financing Sources</u>	
Self Finance	
Local Currency	1 866 000 000
Foreign Currency	1 495 000 000
Total Self Finance	3 361 000 000
Foreign Loans	1 464 000 000
Total Funding Required	4 825 000 000

(Exhibit III-7 continued)

CONSTRUCTION EXPENDITURES - APPROVED

(92/93-96/97) 1 464 000 000

Financing Source

Self Finance

Local Currency 630 800 000

Foreign Currency 552 700 000

Total Self Finance 1183 700 000

Foreign Loans 281 000 000

Total Funding Required 1464 500 000

Exhibit III-8

Five Year Summary of Approved Construction Projects 92/93 - 96/97

Approved by the Ministry of Planning

(Million LE)	NEW, EXPANSION	COMPLETION	REPLACEMENT	TOTAL
Lands	1,500	-	-	1,500
Building, Constructions	111,470	151,775	176,500	439,745
Machines, Equipment	372,380	242,490	248,010	862,880
Transportation	4,030	1,450	6,650	12,130
Tanks, Gears	22,705	9,700	15,150	47,555
Furniture, Desks Equipment	2,050	2,465	6,490	11,005
Deferred Revenues Expenditures	7,845	4,160	3,840	15,845
Customs Charges	27,320	17,760	28,760	73,840
Total	549,300	429,800	485,400	1464,500

Funding Sources

Self Finance

Local Currency 630,800

Foreign Currency 552,700

Total Self Finance 1183,500

Foreign Loans

Loans (Foreign) 281,000

Total Construction Funding 1464,500

It was intended that this information would be used to redistribute the effects of exchange rate changes to appropriate accounts. However, since there were no hard currency transactions affecting any expense accounts, the use of this information for redistributing the effects of exchange rate changes was not needed. Accordingly, the amounts of hard currency required for construction projects will be used to distribute exchange rate changes to the appropriate switching, transmission and outside plant Balance Sheet accounts when developing the cost of services in Task 5.

d. **Five Year Plan Analysis**

In performing its review of ARENTO's current Five Year Plan (1993-1997), K&M analyzed Projected Income Statements - Summarized (see Exhibit III-9) as well as a Five Year Summary of Internally Generated Funds (see Exhibit III-10) and a Five Year Summary of Approved Construction Projects (see Exhibit III-8 above).

Exhibit III-9
ARENTO
Projected Income Statements
(Without Effects of Exchange Rate Changes Included in Operating Income - As
Produced and Recorded by ARENTO)
FIVE YEAR PLAN
92/93 through 96/97

(million LE)	YR 1 92/93	YR 2 93/94	YR 3 94/95	YR 4 95/96	YR 5 96/97
Operating Revenues					
Telegraph	15	16	17	18	19
Telephone	583	640	704	775	852
International	878	922	1014	1116	1227
Other	61	86	91	94	98
Total Revenues	1537	1664	1826	2003	2196
Operating Expenses					
Salaries & Soc. Ins.	195	234	280	337	404
Commodities	55	63	73	84	97
Services	33	36	40	44	48
Cost of Goods Sold	28	54	59	65	72
Depreciation	260	267	292	310	329
Interest	173	180	187	194	201
Other	103	3	3	3	3
Total Expenses	847	846	934	1037	1154
Operating Income	690	818	892	966	1042
Non-Operating					
Changes in Prices of Hard Currency	166	172	178	184	190
Carried over Surplus	524	646	714	782	852

Exhibit III-10
Five Year Summary
Internally Generated Funds

(THOUSAND LE)

Year	NET Income	Depreciation	Total	Installments of loans(*)	Net For Projects	Other Sources	Total
92/93	524,364	260,000	784,364	163,800	620,564	50,000	670,064
93/94	645,800	276,000	921,800	159,600	762,200	50,000	812,200
94/95	714,000	292,000	1006,000	165,900	840,100	50,000	890,100
95/96	782,000	310,000	1092,000	166,000	926,000	50,000	976,000
96/97	851,800	329,000	1180,800	137,000	1043,800	50,000	1093,800

F.Y.	Local	Foreigners	Total
92/93	28,80	135,00	163,80
93/94	28,60	131,00	159,60
94/95	28,90	137,00	165,90
95/96	29,00	137,00	166,00
96/97	<u>00,00</u>	<u>137,00</u>	<u>137,00</u>
	115,30	677,00	792,30

Findings and Recommendations

- *K&M was advised by the ARENTO Controller, that no balance sheets, no income statement account detail and no detailed or annual source and use of funds statements were either available, prepared or required for the current approved five-year financial plan at ARENTO.*
 - *As a result, it is extremely difficult to recast expenses related to hard currency transactions.*
 - *It is recommended that ARENTO begin to record the annual source and use of funds.*
- e. Five Year Plan - Income Statement Analysis**

This income statement information was requested by K&M to facilitate a review of ARENTO's cost accounts in detail to determine hard currency requirements in each expense account for each year of the five year plan. The information was going to be used to recast income statements for each year, distributing the effects of exchange rate changes to the appropriate expense accounts.

However, since account level detail was not available in the ARENTO Projected Income Statements as provided, this review consisted of extensive interviews and discussions with ARENTO's Controller in an effort to determine if any exchange rate changes were not accounted for, or if any recorded hard currency transactions (expenses) needed to be re-distributed. K&M learned that, "no foreign debt was planned to be incurred to cover operating expenses". However, the Controller confirmed that all planned foreign debt to be incurred in future years was solely for funding construction projects over the five year planning period. A summary of approved/needed construction expenditures showing the amount of planned foreign borrowing over the current five year period to finance construction activity is presented in Exhibit III-7.

Finally, no balance sheet was available for review by K&M for any year of the five year plan to verify such intentions.

Findings and Recommendations

- *It was learned that all hard currency-related transactions were already accounted for, therefore no re-distribution (recasting) is required.*
- *While exchange rate changes will impact interest expense and exchange rate change expense, both of these effects have already been accommodated in the Projected Income Statement provided by K&M for the period 1993-1997.*
- *It is recommended that in future planning cycles, ARENTO prepare projected balance sheets for each year of a proposed five-year plan.*

f. Five Year Plan-Budget Assumptions Related To Changes In Exchange Rates Analysis

Budget assumptions as they relate to expected exchange rate changes over the five year planning period were requested by K&M to determine the reasonableness of projected interest expense and exchange rate change expenses as projected by ARENTO over the five year planning period.

For planning purposes, ARENTO's Controller indicated that no change in exchange rates were incorporated into the ARENTO Projected Income Statements for the period 1993-1997 as previously illustrated in Exhibit III-9. These statements include projected expenses of LE 890 million for Changes In Prices of Hard Currency (Account 362) and LE 935 million for Interest Expense (Account 357) over the next five years at exchange rates as of 6/30/92. As confirmed by ARENTO, these amounts assume a "no change" market basket of foreign exchange rates over the five year plan.

Findings and Recommendations

- *ARENTO Projected Income Statements for the current five-year plan are based upon an unrealistic assumption that no change in exchange rates is likely to occur over the next five years.*
- *Utilizing an independent assessment of projected exchange rate changes prepared by the World Bank, K&M recommends an increase in the expenses related to changes in prices of hard currency (Account 362) of LE 55 million as well as an increase in interest expense (Account 357) of LE 54 million.*

Such amounts were calculated by K&M based upon the most likely scenario for projected exchange rate changes as described in section B(3) below. Additionally, for a detailed discussion of how alternative exchange rate changes are likely to impact ARENTO Income Statements, see sections C(1) and C(3) below.

2. Historical Exchange Rate Changes

Changes in exchange rates through June 30, 1992, have created an additional LE 1.4 billion of debt as previously illustrated in Exhibit III-5 above for ARENTO that should be included in developing the cost of services in Task 5. Such amounts should be recognized as an expense on all subsequent income statements as the debt is paid back over approximately the next 10 years. In this regard, ARENTO has included LE 890 million in the five year Projected Income Statements to expense these costs.

3. Projected Exchange Rate Changes

There appears to be a range of possibilities for changes to occur in exchange rates over the next five years. For the consultant's analysis the following scenarios were considered:

- a. "Low Scenario" - no change in exchange rates over time and based on ARENTO's 1993-1997 projection
- b. "Most Likely Scenario" - 6.2% average increase in foreign exchange rates relative to the LE and based on World Bank annual projections over the next five years
- c. "High Scenario" - 8.8% average increase in foreign exchange rates relative to the LE and based upon K & M's annual projections over the next five years

The "Most Likely" scenario was selected for recasting Interest Expense and Change In Hard Currency Expense for the income statements over the period of the current five year plan.

4. Analysis of Existing Foreign Held Debt

As of June 30, 1992, outstanding foreign held debt totaled LE 1.3 billion as reported on ARENTO's balance sheet. After adjusting the debt for changes in exchange rates since the inception of a particular debt, outstanding foreign liabilities are approximately LE 2.8 billion representing a 208% increase over stated or reported liabilities.

Moreover long term debt and assets (reserves) are substantially understated by the amount of exchange rate changes from inception of foreign held debt until repayment. This occurs because under Egyptian accounting policy, reserves are not set-up to recognize the effects of exchange rate changes on outstanding debt. In determining cost of service, it may be desirable to include such costs in Telephone Plant-in-Service or, as an alternative, include such costs as interest or depreciation expense when recognized to facilitate subsequent distribution to cost of service categories

5. Analysis of Anticipated Future Foreign Held Debt

Based upon ARENTO's construction plans over the next five years, additional foreign debt of LE 281 million has been approved by the Minister of Finance to meet "needed" construction programs as illustrated previously in Exhibit III-7. In this regard, ARENTO has estimated that an additional foreign debt of LE 1.2 billion will be required to finance the "desired" construction projects implicit in this exhibit.

6. Analysis of Projected Cash Flows - Local and Foreign Currency

ARENTO has projected net construction funding available from operations over the current five-year plan of LE 4.4 billion as illustrated previously in Exhibit III-10 above while having a need for LE 6.4 billion over the planning period. This shortfall would be partially met with foreign loans of LE 1.5 billion. This leaves a remaining short fall of LE .5 billion that could either be met by cutting back on "desired" construction projects or changing the rate structure in such a way as to generate additional revenues sufficient to meet this shortfall in projected cash flows.

C. Summary of Projected Impacts and Benefits

This section is intended to provide a summary of the ramifications of exchange rate changes, as well as present two alternative sets of recasted income statements for ARENTO's current five-year plan. In addition, this section contains a brief discussion of the potential benefits to ARENTO of incorporating projected exchange rate changes into its financial and accounting records.

1. Ramifications of Exchange Rate Changes

Recasting of Income Statements for the five-year period from '93-'97 are required for two items - neither of which represent, nor do both combined, result in a material change in net income for ARENTO.

The first item in recasting the income statements is to move "Changes In Prices of Hard Currency" (account 362) into the "Operating Expense" category from the "Non-Operations Income" category in the income statement. This is desirable for cost clarification purposes when conducting cost of service studies such as those required under Task 5 of this study effort. No formal accounting change is required as a result of these proposed reallocations, and there is no change in overall net income as determined by ARENTO in the five-year plan. This change merely facilitates cost of service/rate studies.

The second item in recasting the income statements is to increase ARENTO's "Foreign Interest Expense" (Account 356) estimate for the five-year period by LE 54 million and to increase ARENTO's "Changes In Prices of Hard Currency" (Account 362) estimate for the five-year period by LE 55 million. In developing the five-year plan, ARENTO assumed no change in a market basket of foreign exchange over the next five years. K&M has reviewed foreign exchange rates and has developed three possible scenarios:

- (a) No Change (as assembled by ARENTO)
- (b) Change (most likely)
- (c) Change (high)

The most likely scenario of a 6.2% change in exchange rates was selected for recasting increasing interest expense and changes in prices of hard currency based primarily on the World Bank projections of changes in LE/\$ exchange rates. Other factors taken into consideration in this analysis were long-run historical trends tempered by recent stability of all currencies in relation to the LE.

2. Recasted Income Statements

ARENTO's Projected Income Statements for 1993-97 in Exhibit III-4 do not adequately reflect exchange rate changes. It is K&M's view that for planning purposes an assumption of some change in the exchange rate is more likely than no change at all.

Accordingly, two sets of recasted income statements have been provided see Exhibits III-11 and III-12. Each set reflects a modest change in the exchange rate assumptions over the next five years. The effect of these changes on ARENTO's operating net income projections are shown in Exhibit III-13.

Exhibit III-11
"MOST LIKELY" Scenario
ARENTO Projected Income statements
(Recasted to Include Effects of Exchange Rate Changes)
FIVE YEAR PLAN - 92/93 through 96/97

(million LE)	YR 1 92/93	YR 2 93/94	YR 3 94/95	YR 4 95/96	YR 5 96/97
Operating Revenues					
Telegraph	15	16	17	18	19
Telephone	583	640	704	775	852
International	878	922	1014	1116	1227
Other	61	86	91	94	98
Total Revenues	1537	1664	1826	2003	2196
Operating Expenses					
Salaries & Soc. Ins.	195	234	280	337	404
Commodities	55	63	73	84	97
Services	33	36	40	44	48
Cost of Goods Sold	28	54	59	65	72
Depreciation	260	276	292	310	329
Interest	182	191	198	205	213
Other	103	3	3	3	3
Exchange Rate Exp. (Note 1)	176	183	189	195	202
Total Expenses	1032	1040	1134	1243	1364
Operating Income	505	624	692	760	828
Exchange Rate Change Exp.	5 years	LE 55		6.2%	
Interest Expense	5 years	LE 54		5.8%	
Total		LE 109			

Note (1): Represents amounts for exchange rate changes related to the repayment of foreign held debt that was incurred to finance the purchase of switching, transmission & outside plant construction

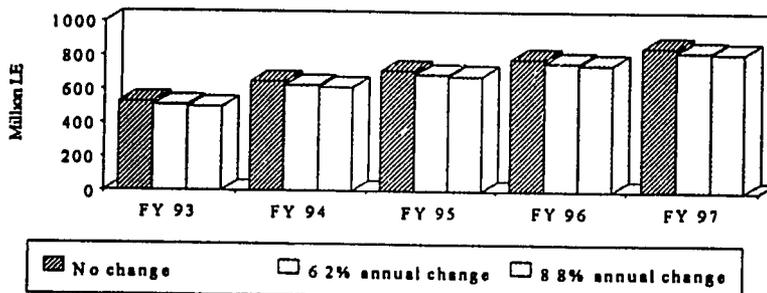
Exhibit III-12
"HIGH" Scenario
ARENTO Projected Income Statements
(Recasted to Include the Effects of Exchange Rate Changes)
FIVE YEAR PLAN - 92/93 through 96/97

(million LE)	YR 1 92/93	YR 2 93/94	YR 3 94/95	YR 4 95/96	YR 5 96/97
Operating Revenues					
Telegraph	15	16	17	18	19
Telephone	583	640	704	775	852
International	878	922	1014	1116	1227
Other	61	86	91	94	98
Total Revenues	1537	1664	1826	2003	2196
Operating Expenses					
Salaries & Soc. Ins.	195	234	280	337	404
Commodities	55	63	73	84	97
Services	33	36	40	44	48
Cost of Goods Sold	28	54	59	65	72
Depreciation	260	276	292	310	329
Interest	182	191	198	205	213
Other	103	3	3	3	3
Exchange Rate Exp. (Note 1)	180	188	194	200	206
Total Expenses	1041	1050	1144	1252	1376
Operating Income	496	614	682	751	820
Exchange Rate Change Exp.	5 years	LE 78		8.8%	
Interest Expense	5 years	LE 77		8.2%	
Total		LE 155			

Note (1): Represents amounts for exchange rate changes related to the repayment of foreign held debt that was incurred to finance the purchase of switching, transmission & outside plant construction

Exhibit III-13
ARENTO Operating Income
Effects of Exchange Rate Changes

(LE in Millions)	FY 93	FY 94	FY 95	FY 96	FY 97
No change	524	646	714	782	852
6.2% annual change	505	624	692	760	828
8.8% annual change	496	614	682	751	820



The most likely scenario of a 6.2% change in exchange rates results in an increase in interest expense of LE 54 million or 5.8% annualized as illustrated in Exhibit III-14. The high end of the change in exchange rates would increase interest expense by LE 77 million or 8.2% annualized over the five year planning period as illustrated in Exhibit III-15. Likewise, exchange rate change expense would also increase. In the most likely scenario, these expenses would increase LE 55 million or 6.2% annualized (as shown in Exhibit III-16), and on the high side they would increase LE 78 million or 8.8% annualized (as illustrated in Exhibit III-17).

Exhibit III-14
"MOST LIKELY" Scenario
Recasted Interest Expense
Recast Based on World Bank Projections of Exchange Rate Changes
Five Year Planning Period 92/93 - 96/97

(Million LE)	As Reported by ARENTO	Recast Adjustment	Recasted Interest	% change
FY 1993	173	9	182	5.4%
FY 1994	180	11	191	6.0%
FY 1995	187	11	198	5.9%
FY 1996	194	11	205	5.7%
FY 1997	201	12	213	5.8%
TOTAL	935	54	989	5.8%

Exhibit III-15
"HIGH" Scenario
Recasted Interest Expense
Recast based on K&M Projections of Exchange Rate Changes
Five Year Planning Period 92/93 - 96/97

(Million LE)	As Reported by ARENTO	Recast Adjustment	Recasted Interest	% change
FY 1993	173	14	187	8.1%
FY 1994	180	16	196	8.8%
FY 1995	187	16	203	8.4%
FY 1996	194	15	209	7.9%
FY 1997	201	16	217	7.8%
TOTAL	935	77	1012	8.2%

Exhibit III-16
"MOST LIKELY" Scenario
Recasted Exchange Rate Change Expense
Recast Based on World Bank Projections of Exchange Rate Changes
Five Year Planning Period 92/93 - 96/97

(Million LE)	As Reported by ARENTO	Recast Adjustment	Recasted Exchange Rate Change Expense	% change
FY 1993	166	10	176	5.8%
FY 1994	172	11	183	6.5%
FY 1995	178	11	189	6.3%
FY 1996	184	11	195	6.1%
FY 1997	190	12	202	6.2%
TOTAL	890	55	945	6.2%

Exhibit III-17
"HIGH" Scenario
Recasted Exchange Rate Change Expense
Recast Based on K&M projections of Exchange Rate Changes
Five Year Planning Period 92/93 - 96/97

(Million LE)	As Reported by ARENTO	Recast Adjustment	Recasted Exchange Rate Change Expense	% change
FY 1993	166	14	180	8.7%
FY 1994	172	16	188	9.5%
FY 1995	178	16	194	9.0%
FY 1996	184	16	200	8.5%
FY 1997	190	16	206	8.4%
TOTAL	890	78	968	8.8%

In conclusion the "Most Likely" Restated Income Statement (as presented in Exhibit III-11) reflects a decrease of LE 109 million in net income to reflect a modest change in exchange rates. On the high end with exchange rate changes of 8.8%, income would decrease LE 155 million (as illustrated in Exhibit III-12).

3. Potential Benefits to ARENTO

a. Cost of Service Rate Design

Including realistically projected increases for exchange rate changes in the current and projected budget plan, it will assist ARENTO in fully distributing these costs across each class of service. With each class of service fully costed, ARENTO will be in a stronger

position to develop a rate structure that will reflect long term incremental costs by service type and will allow ARENTO to recover the capital and operating costs associated with each type of service.

b. Foreign Currency and Local Currency Requirements

Recasting the Five Year Budget Plan to include the affect of exchange rate changes will provide ARENTO with a method for anticipating future currency requirements for both foreign and local currency. Anticipated exchange rate changes may require ARENTO to direct more of its internally generated revenues to fund the construction program as opposed to transfers in support of transportation/metro funding.

c. Revenue Requirement

ARENTO needs to include as an expense against operating revenues the affect of currency exchange rate changes in order to establish a total revenue requirement on a going forward basis. This will enable ARENTO to develop a range of service offerings and associated tariffs to meet the increased expenses generated by the exchange rate changes. When considering "no change" in exchange rates, and when making no provision or reserve on the balance sheet for the additional debt, the revenue requirement is understated.

d. Sensitivity of Earnings to Changes in Exchange Rates

The foregoing analysis clearly indicates how sensitive earnings are to changes in exchange rates. With each percentage point change in exchange rates, net income will change by approximately one-half a percentage point as confirmed by calculations performed by K&M.

IV. ASSESSMENT OF CURRENT BILLING AND COLLECTION PRACTICES

This chapter presents an assessment of ARENTO's current billing and collection practices. In addition, it explores the feasibility and practicality of selected billing, collection, data processing, and policy changes.

A. Task Background and Scope

As indicated in the previous chapter, in May 1992, Teleconsult, Inc. under contract to USAID performed a preliminary financial and administrative review of ARENTO operations. In the specific area of billing and collection practices, Teleconsult felt that it was important for ARENTO to assess the potential improvement in long term cash flows to be achieved from adjusting its billing and collection practices.

In this regard, Teleconsult identified the following key issues to be addressed with respect to billing and collection practices:

- (1) Is it practical, both in terms of customer acceptance and administrative capabilities, to shorten the billing periods for ARENTO in the foreseeable future?
- (2) Can the delinquent accounts policy be adjusted to reduce ARENTO's collection lag?

With respect to specific activities to be performed under Task 4: Billing and Collection Practices, K&M was asked by USAID to assess the long term value to ARENTO of changes in present billing and collection practices in an effort to improve overall cash flows. USAID also requested that K&M thoroughly review ARENTO's delinquent accounts policy, including records of overdue accounts. Finally, USAID asked K&M to review ARENTO's plans for a computer-based paying system, as well as evaluate the potential administrative costs that would likely be incurred by moving to a quarterly or monthly billing system.

Accordingly, the objective of this assessment is to determine the effect that billing and collection lags have had in the past or may have in the future on cash flows, and how possible changes in billing and collection practices may improve overall cash flows while at the same time meeting customer satisfaction and convenience expectations.

B. Review of Current Practices

This section presents the findings from K&M's detailed assessment of ARENTO's current billing and collection practices, policies, and data processing capabilities.

1. Assessment of Current Billing and Collection Practices

The results of K&M's assessment of current practices for exchange services (including residential, business and governmental customers), national toll network services and international telecommunications services are presented below:

a. Exchange Services for Residential Customers

Ordering Service

Residential customers order telecommunications services by entering into a "contract" with ARENTO. Customers order and ARENTO agrees to provide any or all of the following:

- Local access and usage of up to 1500 calls annually
- Any selected vertical services
- Access to the national toll network
- Access to the international toll network

This contract stipulates the recurring and non-recurring charges, and may also include a requirement for a non-interest bearing deposit to protect ARENTO against possible payment defaults on usage billed in arrears. The contract is normally for a period of not less than one year. *Only one residence line is permitted with the same name and address. The customer cannot move or transfer his service outside his local exchange area for one year, but may retain his service if he moves within his local exchange during the year. Service can be transferred after one year to a family member (up to cousin) or the service can be transferred when the entire apartment or building is sold (not rented) including furniture.* Telecommunications services are available for a shorter period of time at substantially higher rates that are payable in advance along with a deposit for any usage that may exceed the maximum usage provided under the tariff and a deposit equal to one-half of estimated national and international toll that may be used.

All recurring charges for local and vertical services; all non-recurring charges such as installation and instant fees (priority); and any deposits required (for local calls above the maximum and for one-half of the estimated national and international toll charges) are paid in advance upon the signing of the contract. After these fees and recurring charges (prorated when appropriate) are paid, service is installed and activated.

Beginning in July 1993, exchange and vertical service billing, calls in excess of call allowance billing and national toll billing for residential customers were changed from annual to semi-annual and the recurring charges to be paid in advance to activate service were reduced from an annual amount to a semi-annual amount. No tariff changes were required to effect this change in billing. ARENTO does not plan to change current billing periods for international toll. The remaining situation assessment is based upon the billing status of July 1, 1993, after the change to semi-annual billing had been implemented.

Beginning in July 1993, the contract became renewable upon payment of:

- The local and vertical service charges for the next successive six month period (in advance),

- Charges for any local calls made above the maximum covered under the tariff for the preceding six month period (in arrears),
- charges for any national toll calls for the preceding six month period (in arrears), and
- Charges for any international toll calls for the preceding month (in arrears)

Most residential customers were billed in January 1993, when billing was generally calculated and payable for one year in advance for exchange services and one year in arrears for calls in excess of the call allowance and national toll. *The change to semi-annual billing for residential customers effective as of July 1993, will accelerate billing and cash collection for six months of local calls in excess of the call allowance and national toll. This one-time increase in cash flows will be off-set in January 1994, when only half the normal annual recurring charge will be billed and collected. Cash flows will increase in 1993 and decrease in 1994. From information available to K&M, this cash flow impact has not been included or considered in developing the current Five Year Plan.* For income statement purposes there would be no change in reported net income for the fiscal year ending June 30, 1994. (Conceptually, when using the cash accounting method as ARENTO does, one would expect a decrease in reported net income due to the decrease in cash receipts for the period ending June 30. However, the Controller of ARENTO indicated that the books are held open at the June 30 fiscal year end until August 7 when all billed amounts are due so that cash collected can be included in fiscal year ending revenue and income.) International toll billing has always been billed one month in arrears for residential customers and this is not expected to change in 1993.

Monthly Billing

Residential customers receive monthly bills for international toll calls that are billed separately at the end of each month except in December and June when they are billed with the semi-annual billing of exchange services and national toll .

Semi-Annual Billing

All subsequent residential customer billing for recurring charges associated with local access and call usage allowance (local service) and vertical services as covered under the contract are billed semi-annually in advance. *Under existing local service tariffs, the residential customer is entitled to a call usage allowance of a maximum of fifteen hundred (1500) local calls annually of up to six (6) minutes each in duration. Billing for any calls made over the fifteen hundred (1500) call maximum are billed semi-annually in arrears. Billing for any national toll calls are billed semi-annually in arrears.*

Computerized Billing

Residential customer bills are prepared semi-annually in June and December from a computerized billing system for the Cairo and Alexander serving areas only. (The new billing schedule for the current five year plan is presented in Exhibit IV-1, and a comparison of billing summaries for various classes of customers as of July 1992 are illustrated in Exhibits IV-2

through IV-6). These bills include recurring charges for exchange and vertical services for the next succeeding six month period, charges for any local calls made above the local call allowance for the prior six month period, charges for any national toll calls made in the prior six month period and charges for any international toll calls made in the prior month.

**Exhibit IV-1
Five Year Change Proposal Summary Billing
Five Year Plan - Fiscal Years Ends 1993 - 1997**

Start Date	Completion Date	Exchange & Vertical Service	Calls Above Allowance	National Toll	International Toll	Paying System	Billing System
RESIDENTIAL, BUSINESS and GOVERNMENT							
2/28/93	6/30/92 6/30/93	Annual Semi	Annual Semi	Annual Semi	Monthly n/c	Manual n/c	Mech. n/c
4/1/93	6/30/94	Annual n/c	Annual n/c	Annual n/c	n/c	new	new
Add manually billed lines to the new system & convert Cairo and Alexandria to the new system							
7/1/94	6/30/95	cyc/qrtly	cyc/qrtly	cyc/qrtly	n/c	n/c	n/c
Convert to cycle quarterly billing							
7/1/95	6/30/96	cyc/mnthly	cyc/mnthly	cyc/mnthly	cyc/mnthly	n/c	new
Convert to cycle monthly billing							
7/1/96	6/30/97	n/c	n/c	n/c	n/c	n/c	n/c

n/c = No change cyc/qrtly = Cycle quarterly
SEM/ANN = Semi Annual cyc/mnthly = Cycle monthly
QRTLY = Quarterly
MNTHLY = Monthly

**Exhibit IV-2
Billing Summary - Residential, Business, Government and Fax
Cairo July 92**

(in LE.)

Category	Res.	Bus. & Gov.	Fax.	G. Total
# of Bills/Ln	278,211	136,497	6,622	421,330
Local Calls - Amt of LE	488,904,415	1,276,666,255	58,172,635	1,823,743,305
Flat Rate	657,312,488	730,813,213	200,238,690	1,588,364,391
Taxes Customs Duties	8,284,170	4,092,480	198,600	12,575,250
Insurance		1,433,230		1,433,230
Adm. Fee	71,193,599	96,903,359	35,735,230	203,832,188
National Calls - DD	458,223,985	734,968,006	87,313,905	1,280,505,896
National OPTR HDLE		1,789,243		1,789,243
Total	1,683,919,657	3,165,690,613	381,659,060	5,231,269,330

**Exhibit IV-3
Billing Summary - Government
Cairo - Amounts July 1992**

Category	Local Calls Amount	National Calls Amount	Number of Lines	Projected Flat Rate Amount @ 75 LE per line
Gov. (East Cairo Zone Total)	193,004,345	112,922,764		
Gov. (West Cairo Zone Total)	25,727,474	129,673,641		
G. Total	218,731,819	242,596,405	102,806	7,710,450

**Exhibit IV-4
Billing Summary - Residence, Business, Government & Fax
Cairo - January 1993**

Category	Res.	Bus. & Gov.	Fax	G. Total
# of Bills/Ln	762,837	146,532	7,766	917,135
Local Calls Amt of LE	4,156,063,870	1,709,874,620	85,745,760	5,951,684,250
Flat Rate	2,854,029,059	825,034,183	243,569,716	3,922,632,958
Taxes Customs Duties	36,114,590	64,616,350	3,466,700	104,197,640
Insurance		1,826,613		1,826,613
Adm. Fee	3,784,307,017	1,896,072,406	135,309,738	5,815,689,161
National Calls DD	2,333,315,082	990,325,619	125,691,356	3,449,332,057
National OPTR HDLE		1,314,063		1,314,063
Total	13,164,592,455	5,489,210,386	593,791,036	19,247,593,877

**Exhibit IV-5
Billing Summary - Government
Cairo - January 1993**

Category	Local Calls Amount	National Calls Amount
Gov. (East Cairo Zone Total)	187,699,010	149,697,724
Gov. (West Cairo Zone Total)	227,012,415	154,382,364
G. Total	414,711,425	304,080,088

Exhibit IV-6
Billing Summary - Residence, Business, Government & Fax
Alexandria - July 1992

Category	Res.	Bus. & Gov.	Fax	G. Total
# of Bills/Ln	2,560	36,390	1,115	40,065
Local Calls Amt of LE	7,241,750	281,680,265	8,015,175	296,937,190
Flat Rate	5,412,753	181,018,557	24,944,336	211,375,646
Taxes Customs Duties	76,800	1,091,700	33,450	1,201,950
Insurance		149,073		149,073
Adm. Fee	750,420	26,889,570	7,526,674	35,166,664
National Calls DD	9,034,217	358,475,367	34,515,040	402,024,624
National OPTR HDLE		388,709		388,709
Total	22,518,500	849,729,631	075,035,790	0947,134,997

In the computerized bill preparation process for Cairo and Alexandria all services are rated and calculated in accordance with existing tariff rates. All local calls made above the local call allowance are mechanically accumulated and rated and all national and international toll calls are mechanically accumulated and rated. These amounts are all combined for each line and a bill is mechanically prepared for each line. No billing is done on an account or customer basis, but rather a bill is prepared for each line. Residential customers receive a bill for each residential line contracted for. Under existing tariffs, only one line per name and address is permitted for each residence.

In the computerized billing process, all national and international toll calls are accumulated and rated for all of Egypt. The national toll calls that are to be billed to residential customers outside of Cairo and Alexandria are forwarded to the zones to be included with manually prepared bills. The international toll calls that are to be billed to residential customers outside of Cairo and Alexandria are forwarded to the Sector Chief for International Telecommunications Services for distribution and collection.

After the bills are mechanically rated, calculated and prepared for Cairo and Alexandria, they are sent (on every first week of January and July) to the exchanges where the residential customers are registered. Customers queue-up (stand in line) to pick-up their bill for the six month period then queue-up again in a bill "paying line" to pay their bill.

Monthly billing for international telecommunications services is combined only with semi-annual billing in June and December. For details on regular monthly billing for international telecommunications services, see section B(1)(e) below entitled International Telecommunications Services.

Manual Billing

Bill preparation for all other exchanges throughout Egypt, except Cairo and Alexandria, are manually prepared which represents approximately 38% of billable revenue/lines in service as derived from data presented in Exhibit IV-7 regarding Number of Lines/Subscribers for various types of customers. Mechanically rated national toll call charges are received from the Sector Chief for Information Systems and are combined with manually calculated charges for

exchange and vertical services. Tariffed rates are applied in rating these services except in the area of rating local calls made in excess of the local call allowance.

In exchanges outside of Cairo and Alexandria served with a manual central office switch, information about the number of and the duration of local calls is not available. Therefore, no charges are calculated or billed for any calls made in excess of the call allowance. This means that residential customers in these serving areas receive unlimited local calling

In exchanges outside of Cairo and Alexandria served with semi-automatic and automatic central office switches, information about the number of calls is available, retained, accumulated and used to charge for calls above the call allowance. Information on local call duration is not available from semi-automatic central office switches and is therefore not considered when billing for local calls in excess of the call allowance. Information on local call duration is available from automatic central office switches but is not retained, accumulated or used to charge for calls above the call allowance. Since the average holding time for a local call throughout Egypt is about two and half minutes, it is relatively safe to assume that little, if any, revenue is lost because of a lack of information to bill or because of not retaining and using the duration times available.

Exhibit IV-7
Number of Lines per Subscriber - Residence, Business & Government
as of December 31, 1992

Zone	Auto				Semi Auto				Central Battery				Magnito				Total
	Res.	Bus	Gov.	Total	Res.	Bus	Gov.	Total	Res.	Bus	Gov.	Total	Res.	Bus	Gov.	Total	
Cairo East																	
Zone No. 1 East	79556	39779	4352	123687													
Zone No. 2 East	66370	33140	1946	101456													123687
Zone No. 3 East	92410	46231	2726	141367													101456
Zone No. 4 East	67180	33934	2251	103371													141367
Total Cairo East	305516	153084	11275	469881													103371
Cairo West																	469881
Zone No 1 West	71233	44252	13629	129114													
Zone No. 2 West	106786	40492	4018	151296	348	19	53	420			200	200					129314
Zone No. 3 West	79548	30094	3405	113047					209	1	22	232	208	2	15	225	151941
Zone No. 4 West	53367	14183	5242	72792													113279
Zone No. 5 West	63325	22394	2231	87950													72792
Total Cairo West	374259	151415	28525	554199	348	19	53	420	209	1	222	432	208	2	15	225	87950
Alexandria																	555276
Alex.1.	75462	37401	5735	118598	482	207	45	734	65	35	176	276					119608
Alex.2.	79524	39762	5915	125201													125201
Alex.3.	43951	22778	3624	70353													70353
Alex.4.	3424	1712	360	5496	136	61	82	279	450	225	88	763	43	23	26	92	6630
Total Alex.	202361	101653	15634	319648	618	268	127	1013	515	260	264	1039	43	23	26	92	321792
Delta West																	
Kafr El Dawar	15623	3706	658	19987	112		30	142	549	33	28	610	253	31	41	333	21072
Damanhour	17473	3105	1355	21933	1454	153	231	1838	1878	43	36	1957	701	32	38	816	26544
Total Delta West	33096	6811	2013	41920	1566	153	261	1980	2427	76	64	2567	954	63	79	1149	47616
Middle Delta																	
Tanta	50191	8496	2817	61504	7472	301	993	8766	3655	118	210	3983	604	10	48	662	74915
Shebin El Kom	26240	2431	5171	33842	17820	317	983	19120	6494	104	72	6670	667	16	17	710	60342
Kafr El Sheikh	24134	3183	2756	29974	5262	536	528	6326	3983	83	93	4159	2467	15	75	2557	43016
Benha	17855	1945	2024	21824	2903	380	305	3588	2186	44	37	2267	581	21	23	624	28304
Total Middle Delta	118420	16055	12768	147144	33457	1534	2809	37800	16318	349	412	17079	4319	62	163	4553	206577

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Zone	Auto				Semi Auto				Central Battery				Magnito				Total
	Res.	Bus	Gov.	Total	Res.	Bus	Gov.	Total	Res.	Bus	Gov.	Total	Res.	Bus	Gov.	Total	
Delta East																	
El Mansoura	42262	15597	3761	61620	13615	497	932	15044	4339	137	118	4594	3000	133	75	3208	84466
El Zaqaziq	63933	8793	4786	77512	3439	318	481	4238	6390	140	160	6690	3047	203	80	3330	91770
Damietta	25728	2026	2975	30729	3298	152	193	3643	831	14	3	848	92	1	3	96	35316
Total Delta East	131923	26416	11522	169861	20352	967	1606	22925	11560	291	281	12132	6139	337	158	6634	211552
Canal Area																	
Port Said	24029	5141	2300	31470													
El Suez	7153	3984	4163	15300	158	22	19	199	273	10	7	354	44	12	3	59	31470
Ismailia	17185	2906	2618	22709	86	16	10	112	62	23	30	115	264	73	33	370	15812
North Sinai	11967	1189	1014	14170	357	6	24	387	43			43	310			310	23306
South Sinai	1569	446	491	2506	100	40	139	279	127	34	54	215	186	53	54	293	14910
Hurgada	4010	804	1054	5868					47	3		50	24			293	3293
Total Canal Area	65913	14470	11640	92023	701	84	192	977	552	70	91	777	828	138	96	1062	94739
Upper Egypt #1																	
B.Suef	15579	3340	2941	21860	1779	204	144	2127	145	7	15	167	3524	159	223	3906	28060
Fayoum	12350	2377	1259	15986	2163	280	251	2694	463	9	10	428	1902	43	81	2026	21188
Minia	29624	3792	1643	35059	2167	208	268	2643	508	48	22	578	2703	195	195	3093	41373
Total Upper Egypt #1	57553	9509	5843	72905	6109	692	663	7464	1116	64	47	1173	8129	397	499	9025	90621
Sohag	25171	3127	3135	31433	5501	147	287	5935	5734	89	113	5936	2407	39	49	2492	45796
Assuit	25700	1412	1031	28143	5929	322	304	6555	3885	49	78	4012	1962	71	76	2109	40819
Aswan	14075	2069	2694	18838	1250	78	125	1453	2023	114	96	2233	686	53	50	789	23313
Wadi Gadid	5784	142	364	6290	316	10	15	341	1268	5	65	1338	1120	8	87	1215	9184
Quena	24101	3224	2170	29495	2692	103	95	2890	2948	52	67	3067	3474	25	120	3619	39071
Total	94831	9974	9394	114199	15688	660	826	17174	15858	309	419	16586	9649	196	382	10224	158183

Zone	Auto				Semi Auto				Central Battery				Magnito				Total
	Res.	Bus	Gov.	Total	Res.	Bus	Gov.	Total	Res.	Bus	Gov.	Total	Res.	Bus	Gov.	Total	
Gd Total	1383872	489387	108614	1981780	78839	4377	6537	89753	48555	1420	1800	51785	30269	1218	1418	32964	2156237

Lines Subscribers	No. of Lines/Subscribers	%
Manually Billed	809,288	37.50%
Computer Billed	1,346,949	62.50%
Total	2,156,237	100.00%

Assessment of Current Billing & Collection Practices

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Customer Payments and Collection

Receiving payments and posting the payments for each line in service is entirely a manual process throughout Egypt. It appears from the information available about the billing system that there is no computerized accounts receivable file or bill "paying system". The receipt of payments and any posting that might be done to update customer accounts receivable records, is all manually handled. The Definitional Mission/Scope of Work study issued in May 1992, indicated that ARENTO planned to have a bill "paying system" operational in 1993. For a further discussion on the status of systems see Section B(3) below entitled Data Processing Situation Assessment of Current Data Processing Situation.

Residential customers have the following options for paying their bill for each line after the bill has been picked-up at their serving exchange:

- Residential customers may pay in cash at the same time the bill is picked-up. ARENTO prefers that all residential customers use this option. It is the most direct and least complicated method and requires the least amount of manual handling. ARENTO has or uses approximately five hundred service establishments where customers can pay their bills as illustrated in Exhibit IV-8.
- Payment at five (5) selected banks is permitted but discouraged because generally these banks have neither been timely in notifying ARENTO about the payments that have been received nor timely in forwarding payments to ARENTO.
- Mail-in payments (cash or checks) are permitted, but discouraged because residential customer's payments often reach ARENTO after the payment deadline, which, according to ARENTO, creates confusion about service disconnection and reconnection penalties.

All payments must be received by ARENTO no later than February 7, for bills issued during the first week in January and no later than August 7, for bills issued during the first week in July, to avoid disconnection of service and the assessment of reconnection/late payment penalties. This applies to all payment options. Payments must be in the hands of ARENTO by these dates to avoid disconnection and subsequent reconnection/late payment penalties.

**Exhibit IV-8
ARENTO Customer Service Establishments**

	Pick-up bill and Pay		Pay Only	TOTAL
	CASHIER	OFFICE	POST	
EAST CAIRO			23	23
ZONE 1	4	11	-	15
ZONE 2	10	8	-	18
ZONE 3	5	13	-	18
ZONE 4	4	13	-	17
TOTAL	23	45	23	91
WEST CAIRO			11	11
ZONE 1	3	12	-	15
ZONE 2	4	10	-	14
ZONE 3	5	11	-	16
ZONE 4	2	10	-	12
ZONE 5	2	6	-	8
TOTAL	16	49	11	76
ALEXANDRIA			7	7
ZONE 1	5	13	-	18
ZONE 2	2	5	-	7
ZONE 3	3	3	-	6
ZONE 4	-	7	-	7
TOTAL	10	28	7	45
CAIRO & ALEX	49	122	41	212
OTHER (est.)				300
TOTAL LOCATIONS				512

ARENTO attempts to minimize collection lags and collection problems by applying progressively higher reconnection/late payment penalties based upon elapsed time from date of disconnection. These penalties are illustrated below:

<u>Date by Which Bills Has Not Been Received</u>	<u>Reconnection/Late Payment Penalty</u>
Payment not received on or before Feb. 7	Service is disconnected
Level 1 - if payment is received by February 28	LE. 10 penalty is assessed; after it is paid, service is reconnected
Level 2 - if payment is received by May 31	LE. 100 penalty is assessed; after it is paid, service is reconnected
Level 3 - if payment is received by September 30	LE. 200 penalty is assessed; after it is paid, service is reconnected

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After service is initially disconnected on February 7, the line is held for delinquent residential customers until September 30, after which, if payment is not received, the access line is made available to meet waiting list demand and any deposits held are forfeited

With semi-annual billing, these collection policies appear to extend too far into the future and overlap billing periods rendering them less effective than what they might otherwise be.

According to ARENTO's Controller, probably not more than 1% of all of ARENTO's customers are delinquent at September 30. *No data is available to evaluate delinquencies, uncollectible or write-offs because only cash collected is generally recorded in ARENTO's books of account. No amounts are recorded for differences between amounts that are billed and amounts that are actually collected.* For a further discussion of this topic, see section B(2) below entitled Assessment of Current Policy Situation.

There are twenty four zones within Egypt for collecting cash from residential customers for their telecommunications bills. As noted earlier, within all zones there are approximately five hundred separate locations where customers can pay their bills. This collection process is under the responsibility of the Controller of ARENTO who is also responsible for distributing bills, updating customer accounts, depositing cash collections and issuing billing adjustments and write-offs. The Controller is assisted by personnel from the Traffic Department in July and January when the heaviest work load is experienced.

Customer Billing Inquiries

Customers may inquire about amounts billed for local calls billed above the maximum call allowance, national toll calls and international toll calls. The customer is provided a list of calls at no cost. It normally requires seven to ten days to provide this information and if incorrect billing is found no re-billing is done and adjustments to the customer's account balance does not appear to be recorded in ARENTO's books of account. ARENTO follows the Egyptian Unified Accounting System which, the consultant has been told, requires that the cash method of accounting be followed. Under this method of accounting, revenues are recognized based upon the amount of cash collected. Therefore, no accounting entries are made to record billing adjustments and uncollectibles. For a further discussion of this accounting method see Section B(2) below entitled Assessment of Current Policy Situation.

b. Exchange Services for Business Customers

Ordering Service

Business customers order telecommunications services by entering into a "contract" with ARENTO. Customers order and ARENTO agrees to provide any or all of the following:

- Local access and usage of up to 300 calls annually
- Any selected vertical services
- Access to the national toll network
- Access to the international toll network

The contract will stipulate the recurring and non-recurring charges, and may also include a requirement for a non-interest bearing deposit to protect ARENTO against possible payment

defaults on usage billed in arrears. The contract is normally for a period of not less than one year. If the business is sold the contract can be transferred to the new buyer. *Only two business lines are permitted. If more lines are required, express written permission is required from the Chairman of ARENTO.* Telecommunications services are available for a shorter period of time at substantially higher rates that are payable in advance along with a deposit for any usage that may exceed the maximum usage provided under the tariff and a deposit equal to one-half of estimated national and international toll that may be used.

All recurring semi-annual charges for local and vertical services; all non-recurring charges such as installation and instant fees (priority); and any deposits required (for local calls above the maximum and for one-half of the estimated national and international toll charges) are paid in advance upon the signing of the contract. After these fees and the semi-annual charges (prorated when appropriate) are paid, service is installed and activated.

The contract is renewable upon payment of:

- The local and vertical service charges for the next successive six month period (in advance),
- Charges for any local calls made above the maximum covered under the tariff for the preceding six month period (in arrears),
- Charges for any national toll calls for the preceding six month period (in arrears), and
- Charges for any international toll calls for the preceding month (in arrears).

Monthly Billing

Business customers receive monthly bills for international toll calls that are billed separately at the end of each month except in December and June when they are billed with the semi-annual billing of exchange services and national toll .

Semi-Annual Billing

All subsequent business customer billing for recurring charges associated with local access and call usage allowance (local service) and vertical services as covered under the contract are billed semi-annually in advance. *Under existing local service tariffs the business customer is entitled to a call usage allowance of a maximum of three hundred (300) local calls annually of up to six (6) minutes each in duration. Billing for any calls made over the three hundred (300) call maximum are billed semi-annually in arrears. Billing for any national toll calls are billed semi-annually in arrears.*

Computerized Billing

Business customer bills are prepared semi-annually in June and December from a computerized billing system for the Cairo and Alexander serving areas only (see Exhibits IV-2

to IV-6 cited previously). These bills include recurring charges for exchange and vertical services for the succeeding six month period, charges for any local calls made above the local call allowance for the prior six month period, charges for any national toll calls made in the prior six month period and charges for any international toll calls made in the prior month.

In the computerized bill preparation process for Cairo and Alexandria all services are rated and calculated in accordance with existing tariff rates. All local calls made above the local call allowance are mechanically accumulated and rated and all national and international toll calls are mechanically accumulated and rated. These amounts are all combined for each line and a bill is mechanically prepared for each line. No billing is done on an account or customer basis, but rather a bill is prepared for each line. Business customers receive a bill for each business line contracted for. Under existing tariffs, businesses are permitted to have two lines. Provisioning for more than two lines require the express written permission of the ARENTO Chairman.

In the computerized billing process, all national and international toll calls are accumulated and rated for all of Egypt. The national toll calls that are to be billed to business customers outside of Cairo and Alexandria are forwarded to the zones to be included with manually prepared bills. The international toll calls that are to be billed to business customers outside of Cairo and Alexandria are forwarded to the Sector Chief for International Telecommunications Services for distribution and collection.

After the bills are mechanically rated, calculated and prepared for Cairo and Alexandria they are sent to the exchanges where the business customers are registered on every first week of January and July. Customers queue-up (stand in line) to pick-up their bill for the six month period then queue-up again in a bill "paying line" to pay their bill.

Monthly billing for international telecommunications services is combined only with semi-annual billing in June and December. For details on regular monthly billing for international telecommunications services, see section B(1)(e) below entitled International Telecommunications Services.

Manual Billing

Bill preparation for all other exchanges throughout Egypt, except Cairo and Alexandria, are manually prepared which represents approximately 38% of billable revenue/lines in service as cited earlier. Mechanically rated national toll call charges are received from the Sector Chief for Information Systems and are combined with manually calculated charges for exchange and vertical services. Tariffed rates are applied in rating these services except in the area of rating local calls made in excess of the local call allowance.

In exchanges outside of Cairo and Alexandria served with a manual central office switch, information about the number of and the duration of local calls is not available. Therefore, no charges are calculated or billed for any calls made in excess of the call allowance. This means that business customers in these serving areas receive unlimited local calling.

In exchanges outside of Cairo and Alexandria served with semi-automatic and automatic central office switches, information about the number of calls is available, retained, accumulated and used to charge for calls above the call allowance. Information on local call

duration is not available from semi-automatic central office switches and is therefore not considered when billing for local calls in excess of the call allowance. Information on local call duration is available from automatic central office switches but is not retained, accumulated or used to charge for calls above the call allowance. Since the average holding time for a local call throughout Egypt is about two and one-half minutes, it is relatively safe to assume that little, if any, revenue is lost because of a lack of information to bill or because of not retaining and using the duration times available.

Customer Payments and Collection

Receiving payments and posting the payments for each line in service is entirely a manual process throughout Egypt. It appears from the information available about the billing system that there is no computerized accounts receivable file or bill "paying system". The receipt of payments and any posting that might be done to update customer accounts receivable records, is all manually handled. The Definitional Mission/Scope of Work study issued in May 1992, indicated that ARENTO planned to have a bill "paying system" operational in 1993. For a further discussion on the status of systems, see section B(3) below entitled Assessment of Current Data Processing Situation:

Business customers have the following options for paying their bill for each line after the bill has been picked-up at their serving exchange:

- Business customers may pay in cash at the same time the bill is picked-up. ARENTO prefers that all business customers use this option. It is the most direct and least complicated method and requires the least amount of manual handling. ARENTO has or uses approximately five hundred service establishments where customers can pay their bills as cited earlier.
- Payment at five (5) selected banks is permitted, but discouraged because the banks have neither been timely in notifying ARENTO about the payments that have been received nor timely in forwarding payments to ARENTO.
- Mail-in payments (cash or checks) are permitted, but discouraged because business customer's payments often reach ARENTO after the payment deadline, which, according to ARENTO, creates confusion about service disconnection and reconnection penalties.

All payments must be received by ARENTO no later than February 7, for bills issued during the first week in January and no later than August 7, for bills issued during the first week in July, to avoid disconnection of service and the assessment of reconnection/late payment penalties. This applies to all payment options. Payments must be in the hands of ARENTO by these dates to avoid disconnection and subsequent reconnection/late payment penalties.

ARENTO attempts to minimize collection lags and collection problems by applying progressively higher reconnection/late payment penalties based upon elapsed time from date of disconnection. Under existing tariffs these penalties are as follows:

<u>Date by Which Bills Has Not Been Received</u>	<u>Reconnection/Late Payment Penalty</u>
Payment not received on or before Feb. 7	Service is disconnected
Level 1 - if payment is received by February 28	LE 10 penalty is assessed; after it is paid, service is reconnected
Level 2 - if payment is received by May 31	LE 100 penalty is assessed; after it is paid, service is reconnected
Level 3 - if payment is received by September 30	LE 200 penalty is assessed; after it is paid, service is reconnected

After service is initially disconnected on February 7, the line is held for delinquent business customers until September 30, after which, if payment is not received, the access line is made available to meet waiting list demand and any deposits held are forfeited

With semi-annual billing, these collection policies appear to extend too far into the future and overlap billing periods rendering them less effective than what they might otherwise be.

According to ARENTO's Controller probably not more than 1% of all of ARENTO's customers are delinquent at September 30. No data is available to evaluate delinquencies, uncollectibles, or write-offs because only cash collected is generally recorded in ARENTO's books of account. Moreover, no amounts are recorded for differences between amounts that are billed and amounts that are actually collected. For a further discussion of this topic, see section B(2) below entitled Assessment of Current Billing Situation.

There are twenty-four zones within with approximately five hundred establishments within Egypt for collecting cash from business customers for their telecommunications bills. This collection process is under the responsibility of the Controller of ARENTO who is also responsible for distributing bills, updating customer accounts, depositing cash collections and issuing billing adjustments and write-offs. The Controller is assisted by personnel from the Traffic Department in July and January when the heaviest work load is experienced.

Customer Billing Inquiries

Customers may inquire about amounts billed for local calls billed above the maximum call allowance, national toll calls and international toll calls. The customer is provided at no cost a list of calls billed. It normally requires seven to ten days to provide this information and if incorrect billing is found no re-billing is done and adjustments to the customer's account balance does not appear to be recorded in ARENTO's books of account. ARENTO follows the Egyptian Unified Accounting System which, the consultant has been told, requires that the "cash method" of accounting be followed. Under this method of accounting revenues are recognized based upon the amount of cash collected. Therefore, no accounting entries are made to record billing adjustments and uncollectibles. For a further discussion of this accounting method see Section B(2) below entitled Assessment of Current Policy Situation.

c. Exchange Services for Government Customers

Ordering Service

Governmental customers order telecommunications services by entering into a "contract" with ARENTO. Customers order and ARENTO agrees to provide any or all of the following:

- Local access and usage of up to 1000 calls annually
- Any selected vertical services
- Access to the national toll network
- Access to the international toll network

The contract will stipulate the recurring and non-recurring charges, *Government customers are not normally required to provide a non-interest bearing deposit to protect ARENTO against possible payment defaults on usage billed in arrears.* The contract is normally for a period of not less than one year. Telecommunications services are available for a shorter period of time at substantially higher rates that are payable in advance. Deposits for any usage that may exceed the maximum usage provided under the tariff and a deposit equal to one-half of estimated national and international toll are not normally required from governmental customers.

All recurring charges for local and vertical services and all non-recurring charges such as installation and instant fees (priority) are paid in advance upon the signing of the contract. After these fees and the semi-annual charges (prorated when appropriate) are paid, service is installed and activated.

Beginning in July 1993, exchange and vertical service billing, calls in excess of call allowance billing and national toll billing for governmental customers changed from annual to semi-annual and the recurring charges to be paid in advance to activate service have been reduced from an annual amount to a semi-annual amount. No tariff changes are required to effect this change in billing. ARENTO does not plan to change billing periods for international toll. The situation assessment is based upon the billing status as of July 1, 1993, after the change has been implemented.

The contract is renewable upon payment of:

- The local and vertical service charges for the next successive six month period (in advance),
- Charges for any local calls made above the maximum covered under the tariff for the preceding six month period (in arrears), and
- Charges for any national toll calls for the preceding six month period (in arrears).
- Charges for any international toll calls for the preceding month (in arrears)

Most governmental customers were billed in January 1993, when billing was generally calculated and payable for one year in advance for exchange services and one year in arrears

for calls in excess of the call allowance and national toll. The change to semi-annual billing for governmental customers which became effective in July 1993, will accelerate billing and cash collection for six months of local calls in excess of the call allowance and national toll. This one-time increase in cash flows will be off-set in January 1994, when only half the normal annual recurring charge will be billed and collected. Cash flows will increase in 1993 and decrease in 1994. From information available to K&M, this cash flow impact has not been included or considered in developing the current Five Year Plan. For income statement purposes there would be no change in reported net income for the fiscal year ending June 30, 1994. (Conceptually, when using the cash accounting method as ARENTO does, one would expect a decrease in reported net income due to the decrease in cash receipts for the period ending June 30. However, the Controller of ARENTO indicated that the books are held open at the June 30 fiscal year end until August 7 when all billed amounts are due so that cash collected can be included in fiscal year ending revenue and income). International toll billing has always been billed one month in arrears for residential customers and this is not expected to change in 1993.

Monthly Billing

Government customers receive monthly bills for international toll calls that are billed separately at the end of each month except in December and June when they are billed with the semi-annual billing of exchange services and national toll.

Semi-Annual Billing

All subsequent governmental customer billing for recurring charges associated with local access and call usage allowance (local service) and vertical services as covered under the contract are billed semi-annually in advance. *Under existing local service tariffs the governmental customer is entitled to a call usage allowance of a maximum of one thousand (1000) local calls per line annually of up to six (6) minutes each in duration. Billing for any calls made over the one thousand (1000) call maximum are billed semi-annually in arrears. Billing for any national toll calls are billed semi-annually in arrears.*

Computerized Billing

Governmental customer bills are prepared semi-annually in June and December from a computerized billing system for the Cairo and Alexandria serving areas only (see Exhibits IV-2 through IV-6 cited previously). These bills include recurring charges for exchange and vertical services for the next succeeding six month period, charges for any local calls made above the local call allowance for the prior six month period, charges for any national toll calls made in the prior six month period and charges for any international toll calls made in the prior month.

In the computerized bill preparation process for Cairo and Alexandria all services are rated and calculated in accordance with existing tariff rates. All local calls made above the local call allowance are mechanically accumulated and rated and all national and international toll calls are mechanically accumulated and rated. These amounts are all combined for each line and a bill is mechanically prepared for each line. No billing is done on an account or customer basis, but rather a bill is prepared for each line. Governmental customers receive a bill for each exchange access line contracted for.

In the computerized billing process, all national and international toll calls are accumulated and rated for all of Egypt. The national toll calls that are to be billed to governmental customers outside of Cairo and Alexandria are forwarded to the zones to be included with manually prepared bills. The international toll calls that are to be billed to governmental customers outside of Cairo and Alexandria are forwarded to the Sector Chief for International Telecommunications Services for distribution and collection.

After the bills are mechanically rated, calculated and prepared for Cairo and Alexandria they are sent to the exchanges where the governmental customers are registered on every first week of January and July. Customers queue-up (stand in line) to pick-up their bill for the six month period then queue-up again in a bill "paying line" to pay their bill.

Monthly billing for international telecommunications services is combined only with semi-annual billing in June and December. For details on regular monthly billing for international telecommunications services, see section B(1)(e) below entitled International Telecommunications Services.

Manual Billing

Bill preparation for all other exchanges throughout Egypt, except Cairo and Alexandria, are manually prepared which represents approximately 38% of billable revenue/lines in service as cited earlier. Mechanically rated national toll call charges are received from the Sector Chief for Information Systems and are combined with manually calculated charges for exchange and vertical services. Tariffed rates are applied in rating these services except in the area of rating local calls made in excess of the local call allowance.

In exchanges outside of Cairo and Alexandria served with a manual central office switch, information about the number of and the duration of local calls is not available. Therefore, no charges are calculated or billed for any calls made in excess of the call allowance. This means that governmental customers in these serving areas receive unlimited local calling.

In exchanges outside of Cairo and Alexandria served with semi-automatic and automatic central office switches, information about the number of calls is available, retained, accumulated and used to charge for calls above the call allowance. Information on local call duration is not available from semi-automatic central office switches and is therefore not considered when billing for local calls in excess of the call allowance. Information on local call duration is available from automatic central office switches but is not retained, accumulated or used to charge for calls above the call allowance. Since the average holding time for a local call throughout Egypt is about two and half minutes, it is relatively safe to assume that little, if any, revenue is lost because of a lack of information to bill or because of not retaining and using the duration times available.

Customer Payments and Collection

Receiving payments and posting the payments for each line in service is entirely a manual process throughout Egypt. It appears from the information available about the billing system that there is no computerized accounts receivable file or bill "paying system". The receipt of payments and any posting that might be done to update customer accounts receivable records,

is all manually handled. The Definitional Mission/Scope of Work study issued in May 1992, indicated that ARENTO planned to have a bill "paying system" operational in 1993. For a further discussion on the status of systems see Section B(3) below entitled Assessment of Current Data Processing Situation.

Governmental customers have the following options for paying their bill for each line after the bill has been picked-up at their serving exchange:

- Governmental customers may pay in cash at the same time the bill is picked-up. ARENTO prefers that all business customers use this option. It is the most direct and least complicated method and requires the least amount of manual handling. ARENTO has or uses approximately five hundred service establishments where customers can pay their bills as cited earlier.
- Payment at five (5) selected banks is permitted, but discouraged because the banks neither have been timely in notifying ARENTO about the payments that have been received nor timely in forwarding payments to ARENTO.
- Mail-in payments (cash or checks) are permitted, but discouraged because governmental customer's payments often reach ARENTO after the payment deadline, which, according to ARENTO, creates confusion about service disconnection and reconnection penalties.

All payments must be received by ARENTO no later than February 7, for bills issued during the first week in January and no later than August 7, for bills issued during the first week in July, to avoid being considered delinquent. No government lines are disconnected or assessed reconnection/late payment penalties for late or non payment. *Governmental customers constitute the only apparent collection problem for ARENTO.* See Exhibit IV-9 for a detailed listing of governmental delinquencies. The collection policy used by ARENTO to encourage collection is to withhold provisioning for any requested additions or changes to service. In this regard, governmental requests for service changes are generally denied until past due balances are paid. After past due payments are received, the requested additions or changes are made to service levels. However this approach is generally ineffective in collecting past due amounts from governments owing to the priority status given to governmental customers.

ARENTO does not apply existing disconnection/late payment penalties to enforce collection of past due government balances. Normal tariffs that are automatically applied to all other customer accounts in attempting to minimize collection lags and collection problems by applying progressively higher reconnection/late payment penalties based upon elapsed time from date of disconnection, are not applied to governmental customers.

While governmental customers represent the only note-worthy problem associated with delinquencies and are extremely slow to pay amounts owed, ARENTO's Controller stated that all such amounts are ultimately collected. No data is available to evaluate delinquencies, uncollectibles or write-offs because only cash collected is generally recorded in ARENTO's books of account. Normally, no amounts are recorded for differences between amounts that are billed and amounts that are actually collected. However, ARENTO does record accounts receivable for the government for the amounts billed, but not collected, because ultimately

they feel the balance will be collected. For a further discussion of this see Section B(2) below entitled Assessment of Current Policy Situation.

**Exhibit IV-9
Debtors in the Public Sector
as of June 30, 1992**

NAME	AMOUNT (IN LE)	
MINISTRY OF INTERIOR (POLICE)	38,954,120	
MINISTRY OF DEFENSE	10,558,942	**
MINISTRY OF LOCAL JUDGMENT	6,474,504	
MINISTRY OF INFORMATION	2,512,468	
MINISTRY OF HEALTH	1,337,894	
MINISTRY OF JUSTICE	913,315	
MINISTRY OF TOURISM & AERONAUTICS	655,084	
MINISTRY OF CULTURE	468,737	
MINISTRY OF ECONOMY	461,501	
MINISTRY OF IRRIGATION	458,962	
MINISTRY OF AGRICULTURE	419,991	
MINISTRY OF ELECTRICITY	416,170	AGED PER ARENTO
MINISTRY OF FINANCE	330,573	CONTROLLER - AVERAGE
MINISTRY OF HOUSING	315,757	ABOUT 5 YEARS
MINISTRY OF SUPPLIES	226,854	
MINISTRY OF SOCIAL INSURANCE	139,241	
MINISTRY OF EDUCATION	137,132	
MINISTRY OF DEVOTATION, AZEHAR	122,124	
MINISTRY OF FOREIGN AFFAIRS	93,996	
MINISTRY OF INDUSTRY	72,859	
MINISTRY OF MILITARY	52,734	
MINISTRY OF REPUBLIC CABINET	1,407,984	
MINISTRY OF INTELLIGENCE AGENCY	1,402,305	
MINISTRY OF ADVISORY PARLIAMENT	1,012,112	
MINISTRY OF CABINET	407,610	
ADMINISTRATIVE DEVELOPMENT	157,687	
CONTROL & FOLLOW UP	92,292	
TOTAL	69,602,948	*

* Does not include Public Sector International Toll

** Balance was paid in 1993

BALANCE SHEET -ACCT. 1611	80,965,476
UNEXPLAINED DIFFERENCE (MAYBE INTERNATIONAL TOLL)	11,362,528
BALANCE SHEET SUPPORTING DETAIL	69,602,948

There are twenty-four zones with approximately five hundred establishments within Egypt for collecting cash from governmental customers for their telecommunications bills. This collection process is under the responsibility of the Controller of ARENTO who is also responsible for distributing bills, updating customer accounts, depositing cash collections and issuing billing adjustments and write-offs. The Controller is assisted by personnel from the Traffic Department in July and January when the heaviest work load is experienced.

Customer Billing Inquiries

Customers may inquire about amounts billed for local calls billed above the maximum call allowance, national toll calls and international toll calls. The customer is provided at no cost a list of calls billed. It normally requires seven to ten days to provide this information and if incorrect billing is found no re-billing is done and adjustments to the customer's account balance does not appear to be recorded in ARENTO's books of account. ARENTO follows the Egyptian Unified Accounting System which, the consultant has been told, requires that the cash method of accounting be followed. Under this method of accounting revenues are recognized based upon the amount of cash collected. Therefore, no accounting entries are made to record billing adjustments and uncollectibles. For a further discussion of this accounting method see section B(2) below entitled Assessment of Current Policy Situation.

d. National Toll Network Services

Ordering Service

Any category of customer, residential, business or government, may order access to the national toll network by entering into a "contract" with ARENTO. Customers order and ARENTO agrees to provide access to the national toll network which permits the customer to make national toll calls from their local exchange telephone line. While customers without access are blocked from originating national toll calls, they may receive incoming national toll calls.

The contract will stipulate the non-recurring charge (installation fee for activating access) and may also include a requirement for a non-interest bearing deposit or bond to protect ARENTO against possible payment defaults on usage billed in arrears. The contract is normally for a period of not less than one year. Access to the national toll network is available for a shorter period of time at substantially higher rates that are payable in advance along with a deposit equal to one-half of the estimated national toll that may be used. After these fees are paid, service is installed and activated.

The contract is provisionally renewable upon timely payment of all telecommunications charges billed by ARENTO.

Annual Billing

Prior to July 1993, national toll calls were billed annually in arrears in January of each year for residential, business and governmental customers. Beginning in July 1993, national toll billing was changed from annual to semi-annual. From now on national toll calls will be billed in July and January for the six month periods ending in June and December of each year. No

tariff changes are required to effect this change in billing. The change to semi-annual billing will accelerate billing and cash collection for six months of national toll calls. This represents a one-time increase in cash flows for the calendar year 1993. From information available to K&M, it does not appear that this cash flow impact has been included or considered in developing the five-year Plan. For income statement purposes there would be no change in reported net income for the fiscal year ending June 30, 1994. (Conceptually, when using the cash accounting method as ARENTO does, one would expect a decrease in reported net income due to the decrease in cash receipts for the period ending June 30. However, the Controller of ARENTO indicated that the books are held open at the June 30 fiscal year end until August 7 when all billed amounts are due so that cash collected can be included in fiscal year ending revenue and income.) The remaining situation assessment that is presented here is based upon the billing status as of July 1, 1993, after the change has been implemented.

Semi-Annual Billing

All subsequent billing for national toll calls as covered under the contract are billed semi-annually in arrears. *Under existing national toll tariffs, the customer will be charged for call usage based upon a three minute minimum for each segment of the call. The two semi-annual billing periods are January through June and July through December.*

Computerized Billing

Customer bills are prepared semi-annually in June and December from a computerized billing system for the Cairo and Alexander serving areas only (see Exhibits IV-2 through IV-6 for billings as of July 1992). These bills include recurring charges for exchange and vertical services for the succeeding six month period, charges for any local calls made above the local call allowance for the prior six month period, charges for any national toll calls made in the prior six month period and charges for any international toll calls made in the prior month.

In the computerized bill preparation process for Cairo and Alexandria all national toll calls are mechanically accumulated and rated. These amounts are then included with other items to be billed for each line and a bill is mechanically prepared for each line. No billing is done on an account or customer basis, but rather a bill is prepared for each line. Customers receive a bill for each contracted exchange access line that includes the national toll calls made on that line.

After the bills are mechanically rated, calculated and prepared for Cairo and Alexandria they are sent to the exchanges where the customers are registered on every first week of January and July. Customers queue-up (stand in line) to pick-up their bill for the six month period then queue-up again in a bill "paying line" to pay their bill.

In the computerized billing process, all national toll calls are accumulated and rated for all of Egypt. The national toll calls that are to be billed to customers outside of Cairo and Alexandria are forwarded to the zones to be included with manually prepared bills.

Manual Billing

Bill preparation for all other exchanges throughout Egypt, except Cairo and Alexandria, are manually prepared. Mechanically rated national toll call charges are received from the Sector

Chief for Information Systems and are combined with manually calculated charges for exchange and vertical services.

Customer Inquiries About Billing

Customers may inquire about amounts billed for national toll calls. The customer is provided at no cost a list of calls billed. It normally requires seven to ten days to provide this information and if incorrect billing is found no re-billing is done and adjustments to the customer's account balance does not appear to be recorded in ARENTO's books of account. ARENTO follows the Egyptian Unified Accounting System which, the consultant has been told, requires that the cash method of accounting be followed. Under this method of accounting revenues are recognized based upon the amount of cash collected. Therefore, no accounting entries are made to record billing adjustments and uncollectibles. For a further discussion of this accounting method see Section B(2) below entitled Assessment of Current Policy Situation.

e. International Telecommunications Services

Ordering Service

Any category of customer, residential, business or government, may order access to the international toll network by entering into a "contract" ARENTO. Customers order and ARENTO agrees to provide access to the international toll network which permits the customer to make international toll calls from their local exchange telephone line. Customers without access are blocked from originating international toll calls but may receive incoming international toll calls.

The contract will stipulate the non-recurring charge (installation fee for activating access) and may also include a requirement for a non-interest bearing deposit or bond to protect ARENTO against possible payment defaults on usage billed in arrears. The contract is normally for a period of not less than one year. Access to the international toll network is available for a shorter period of time at substantially higher rates that are payable in advance along with a deposit equal to one-half of the estimated international toll that may be used. After these fees are paid, service is installed and activated.

The contract is provisionally renewable upon timely payment of all telecommunications charges billed by ARENTO including the monthly billing for international toll usage.

All international billing and collection activity is separate and apart from all other billing and collection activity at ARENTO. In effect, there are two separate billing and collection processes, one for international telecommunications services and one for all other telecommunications service. These processes are merged twice during the year when international billing is included with semi-annual billing for billing periods ending in June and December of each year.

Monthly Billing

All subsequent billing for international toll calls as covered under the contract are billed monthly in arrears. Under existing international toll tariffs customers with access to

international toll calling will be charged for call usage based upon a one minute minimum for each segment of the call. Customers without access to international toll calling may place international toll calls from public telephones; and will be charged for call usage based upon a three minute minimum for each segment of the call. The monthly billing periods are from the beginning of the month through end of the month.

Computerized Billing

All customer billing for international telecommunications is computerized. The calls are accumulated for each one month period, are then rated (priced) and a bill is prepared by the Information Systems Sector. Bill preparation time is normally thirty (30) to sixty (60) days after the close of the billing period.

After the international bills are prepared they are forwarded to the International Sector Chief for distribution to customers and subsequent collection, except in June and December of each year when international toll billing is included with billing for other telecommunications services billed on a semi-annual basis. International toll bills are distributed by messenger or Egyptian mail which normally takes about ten (10) days.

International Payments and Collections

Receiving payments and posting the payments for each line equipped with international toll access is entirely a manual process. It appears from the information available about the billing system that there is no computerized accounts receivable file or bill "paying system". The receipt of payments and any posting that might be done to update customer accounts receivable records, is all manually handled. The Definitional Mission/Scope of Work study issued in May 1992, indicated that ARENTO planned to have a bill "paying system" operational in 1993. For a further discussion on the status of systems see Section B(3) below entitled Assessment of Current Data Processing Situation.

There is one zone within Egypt for collecting cash from customers for their international toll bills. This collection process is under the responsibility of the Sector Chief of International Telecommunications Services who is also responsible for updating customer accounts, depositing cash collections and issuing billing adjustments and write-offs.

The account treatment and delinquency payment policies are different for international toll than for all other telecommunication services. For international toll customers are required to pay the bill within twenty-one (21) days from the date of distribution. If not paid within twenty-one days a ten percent (10%) penalty is applied. The minimum penalty is LE 5 and the maximum penalty is LE 50. If not paid within twenty eight days, access to international communications services is disconnected and any bond or deposit is forfeited. If not paid within thirty five days, national and/or local service is disconnected. Any unrecovered uncollectible amounts are referred to local collection agencies for collection and if necessary, for legal action to enforce collection. Information about the number of accounts and amount referred for collection was not readily available. Further, such amounts are not recorded in ARENTO's books of account. The International Sector Chief indicated that uncollectibles are relatively minor and arise primarily from small business accounts that cease operations and disappear. Every effort is made by the collection agencies to locate the responsible parties

and enforce collection. The collection agency retains a percentage of the amounts collected and forwards the balance to the International Sector Chief for further processing.

Customer Billing Inquiries

Customers may inquire about amounts billed for international toll calls. The customer is provided at no cost a list of calls billed. It normally requires seven to ten days to provide this information and if incorrect billing is found no re-billing is done and adjustments to the customer's account balance does not appear to be recorded in ARENTO's books of account. ARENTO follows the Egyptian Unified Accounting System which, the consultant has been told, requires that the cash method of accounting be followed. Under this method of accounting revenues are recognized based upon the amount of cash collected. Therefore, no accounting entries are made to record billing adjustments and uncollectible. For a further discussion of this accounting method, see Section B(2) below entitled Assessment of Current Policy Situation.

f. International Settlements

ARENTO jointly and/or wholly owns facilities for direct access to fifty-two countries and has negotiated settlement agreements with one hundred and fifty one (151) countries.

Under international settlement rules, settlements are calculated and settled "net" each quarter and are based upon "accounting charges" that are separately negotiated between ARENTO and all other countries. The separately negotiated "accounting charge" rate is split 50/50 between originating and terminating country after payment (reduction) for any intermediate countries (companies) handling the call. The intermediate countries are considered "Gate Way-Carriers." For example, AT&T serves as an international gateway for calls originating in Latin America and terminating in Egypt.

International settlements are denominated in francs, and payments are all made in U.S. dollars under established international settlement rules. All settlement payments paid by ARENTO and all settlement payments received by ARENTO are consequently in U.S. dollars.

Based upon favorably negotiated "accounting charge rates", the International Sector Chief indicated that ARENTO is a net receiver of cash flows from other countries for this settlement process. Information was requested but not provided to assess the magnitude of settlement revenues. This means that ARENTO subscribers receive more sent paid messages than they send, and originate more sent collect messages than they receive *The implication from this finding is that subscribers may already be attempting to avoid ARENTO's international collection rates which may be higher than rates in other countries (ARENTO's international toll rate tariffs) or there are more calls originating outside of Egypt and terminating in Egypt than there are calls originating inside Egypt and terminating outside of Egypt.*

Under international settlement agreements, the billing country bills international toll calls at rates established in and by the billing country. Further, any of the difference between "collection rates" and the negotiated "accounting rates" is exclusively retained by the billing country.

2. Assessment of Current Policy Situation

The scope of the policy situation assessment is limited to policies related to bill preparation and distribution, receipt of payments, account treatment associated with the collection of amounts billed, and the accounting policies associated with recording adjustments to billed amounts as well as recording uncollectible amounts.

a. Two Separate Billing Processes

It is ARENTO's current policy to maintain two separate billing processes. One process associated with billing international telecommunications services and another different process for billing all other telecommunications services. Billing as used in this context is intended to include bill preparation (maintenance and updating of customer name and address files, maintenance and updating of services as provided under contract to each customer/line, maintenance and updating of rate schedules per the tariff, local and toll usage accumulation and rating and bill preparation for each customer/line), bill distribution, cash collection, account treatment and the related accounting entries to record this activity.

The Sector Chief of International Telecommunications Services is responsible for all billing processes associated with international telecommunications services while the Controller of ARENTO is responsible for the billing processes associated with all other telecommunications services.

Each separate process shares a common data processing system for toll accumulation, toll rating, and bill preparation. All other processes are different and essentially manual. These processes include bill distribution, cash collection and account treatment practices.

The policy to maintain two separate processes with their attendant differences in practices is assumed to be based on the relative significance of international toll revenue, which is 60-70% of ARENTO's total revenue and the related desire to bill for these services as quickly as possible.

The primary overriding difference between the two processes is in billing frequency. International telecommunications services are billed monthly in arrears. All other telecommunications services are billed semi-annually in arrears for local usage above the maximum call allowance and national toll, and semi-annually in advance for exchange services.

b. Cash Method of Accounting

ARENTO follows the Egyptian Unified Accounting System which, K&M has been told, requires that the cash method of accounting be followed. Under this method of accounting, though not required under this method of accounting, *ARENTO is recognizing and recording revenue only to the extent that cash is collected. When following this method, billed revenues are not recognized or recorded and no accounting entries are made to record billing adjustments and uncollectibles.* Billing adjustments and any amounts not collected (uncollectibles) represent the difference between what is billed and what is collected. Information about these differences was requested but not available.

ARENTO does make one exception to this policy when they recognize government billed revenue not yet collected and set up a receivable for government accounts. This exception is made on the premise that while governmental customers are normally late in paying they do eventually pay accordingly ARENTO wants to recognize the revenue in the appropriate accounting period to support net income.

c. Separation of Duties

Presently, each individual responsible for their respective billing function is also totally responsible for issuing and distributing bills, collecting the cash, manually posting, if any, of receivables, depositing all receipts and cash collections, issuing billing adjustments and authorizing uncollectible write-offs, if any. The Controller of ARENTO is further responsible for reconciling bank statements and managing all foreign and local currency.

3. Assessment of Current Data Processing Situation

The Definitional Mission Statement identified three systems that were under development and/or in an implementation stage on a computerized or automated basis. These systems were:

- Waiting List System
- Billing System
- Bill Paying System (implementation scheduled for July 1993)

a. Waiting List System

K&M did not review or assess the Waiting List System as it was not covered under the existing scope of work for the Cost of Service/Rate Study.

b. Billing System

K&M reviewed the existing billing system with the following major findings listed below:

- (1) The billing system supports billing for:
 - Bill preparation for exchange services in Cairo and Alexandria serving areas only (All other serving areas are manually billed),
 - National and international toll accumulation and rating for all of Egypt,
 - International toll bill preparation for all of Egypt.
- (2) There is no on-line access for inputting or retrieving data from the billing system. Order entry, rating and service item tables must be updated and maintained from manual input and keying. Customer inquiries must be manually handled from hard copy output.

- (3) Based on K&M's review of information requested and the lack of information provided or available, it appears that no accounts receivable balances are maintained in the billing system. However, unlikely that may be, if accounts receivable balances are maintained, they would be accessible from hard copy only and would be updated and maintained from manual input and keying (cash collection and adjustment posting) or, more likely, if accounts receivable balances are maintained, they are manually updated and posted in the twenty-five zone offices that receive and collect payments. (Hence the need for a "paying system"). Any accounting entries arising from this activity are based on actual cash received and no information is available regarding adjustments or uncollectibles. There has been no data available to the consultants that would indicate that accounts receivable balances are maintained or that any adjustment vouchers or cash receipts are received or processed through the billing system. There is no supporting detail available to support balance sheet accounts receivable balances of LE 337 million as of June 30, 1992. (See Exhibit IV-10 for a summary of accounts receivable balances for 1990-1992).
- (4) The billing system provides no account treatment support, either because the system maintains no accounts receivable balances or because the system is currently deficient in providing account treatment capability. Account treatment and collection activity is, therefore if handled at all, manually handled in the zone offices. It could not be determined if any attention is given to managing accounts receivable and any related collection efforts and activity.
- (5) The billing system is not accessible from or used by outlying areas in Egypt. There are no data links between input locations and the ARENTO data center in Cairo.
- (6) There appears to be no statistics files, history files or modeling capabilities that would support cost of service/rate studies or marketing and sales programs.
- (7) Internal controls appear weak in terms of accounting for amounts billed compared with cash receipts collected and in balancing lines billed with the number of lines reported as in-service.
- (8) The billing system bills all accounts at once and does not have a "billing cycle" capability that would be useful in smoothing out the work load for ARENTO personnel and most importantly in reducing the customer queuing lines in picking up and paying their bills.
- (9) Overall the existing billing system is inadequate to support the expanding role ARENTO plans to play in the expanding market oriented telecommunications development of Egypt.

Exhibit IV-10
ARENTO
Accounts Receivable Balances
1990 - 1992

(In million LE.)

	1990		1991		1992	
	Amt	Chg.	Amt	Chg.	Amt	Chg.
Government	67.6	2.1%	64.2	(5.0)%	81.0	26.2%
Residence & Business	55.5	72.4%	199.3	259.1%	180.9	(9.2)%
International Toll	<u>83.3</u>	229.2%	<u>123.6</u>	48.4%	<u>74.7</u>	(39.6)%
Total Accounts Rec. Revenue Change	206.4	66.9%	387.1	87.5%	336.6	(13.0)%
		24.7%		18.3%		26.3%

c. Bill Paying System

The Definitional Mission Statement issued in May 1992 indicated that a bill "paying system" would be installed by July 1993, to streamline the manual process where customers pick-up and pay their bills and which would provide the capability to accelerate billing from essentially an annual basis to semi-annual, quarterly, and eventually monthly billing for all services and usage. No cycle billing capability was anticipated or included in this system.

ARENTO has indicated that the original plans for this "paying system" have been scrapped and that it is unknown when a "paying system" will likely be available, but definitely not in July 1993.

A new Request for Proposal (RFP) or a tender has been prepared and issued. Responses to the tender are to be opened on March 28, 1993. ARENTO personnel indicated they have no specific plans they could provide to the consultants related to the who, what, when, where, why or how of the future "paying system". The consultants were told that information about the status and future of the "paying system" would not be available until after the tenders are opened, analyzed and a decision reached on which one to accept, which is too late for inclusion into this report. They did indicate that the system, with whatever unknown functionality it will have, would be implemented in 1993.

C. Analysis of Alternative Approaches

This section contains the results from feasibility assessments undertaken by K&M of proposed billing frequency changes, collection alternatives, data processing upgrades, and policy changes intended to improve ARENTO's overall cash flow situation and billing processes.

1. Feasibility of Suggested Billing Changes

Based on the situation assessment of billing and collections as described in section B(1) above, specific opportunities need to be identified for changing the billing process and related policies that are targeted at improving ARENTO's cash flow. Specific areas for consideration in terms of practicality, customer acceptance and administrative capabilities, is shortening the billing

periods for ARENTO in the foreseeable future. An objective for the feasibility analysis was developed, and specific goals identified along with critical success factors that must be overcome to reach the desired objective as described below.

a. Objective

Issue timely, easily payable, and affordable telecommunications bills to all ARENTO customers throughout Egypt from a single integrated billing process that includes billing for all telecommunications services.

With the above objective in mind, specific problems have been identified for resolution including::

- *Shorten the time lags between the billing cut-off periods and the date bills are available for distribution. ARENTO's current time lags are illustrated in Exhibit IV-11 below:*

**Exhibit IV-11
Summary of Current Billing Time Lags by Type of Service**

Billing Period	Cut-off Date for Each Billing Period	Date the Bill is Available for Distribution	Time Lag
<u>Exchange and Vertical Services</u> (Flat rate/recurring charge billing)			
7/1 - 12/31 (adv.)	11/15	6/30	6 weeks
7/1 - 6/30 (adv.)	11/15	12/31	6 weeks
<u>Local Calls Above The Maximum Call Allowance:</u>			
1/1 - 6/30 (arrear)	5/15	6/30	6 weeks
7/1 - 12/31 (arrear)	5/15	12/30	6 weeks
<u>National Toll Billing:</u>			
1/1 - 6/30 (arrear)	5/15	12/31	6 weeks
7/1 - 12/31 (arrear)	11/15	12/31	6 weeks
<u>International Toll Billing:</u>			
Monthly - 1st through last day of the month	through end of the month	60-90 days later	8-12 weeks

The above time lags represent the amount of time required to manually and mechanically prepare bills for distribution. There is an additional seven to ten days required to distribute the bills to customers or to "paying offices" Thereafter customers have thirty days to pay the balances due, except for international toll customers who have twenty-one days to pay the balances due except in those months when international toll billing is combined with all other billing (bills issued in July and December of each year). When combined with all other billing, international toll customers have thirty days in which to pay the balances due. Any balances not paid by the due date, will normally result in disconnection of service.

- *Increase the frequency of billing to reduce the overall size and amount of each bill to a level more affordable by ARENTO customers. Rather than issuing one (annual) or two (semi-annual) relatively large bills for the entire year, bill more frequently so the bills are smaller in amounts, thus making telecommunications services appear less expensive and more affordable by more customers. The billing periods for ARENTO telecommunications services currently are illustrated below in Exhibit IV-12:*

**Exhibit IV-12
Current Billing Periods for Selected Telecommunications Services**

<u>Service</u>	<u>Billing Period</u>	<u>Time</u>
Exchange and vertical Services	1/1 through 6/30	6 months
(Flat rate/recurring charge)	7/1 through 12/31	6 months
Local Calls Above the Maximum Call Allowance	1/1 through 6/30	6 months
	7/1 through 12/31	6 months
National Toll services	1/1 through 6/30	6 months
	7/1 through 12/31	6 months
International Toll Services	Calendar month	1 month

The six month billing periods used by ARENTO create the appearance of, and in fact often do result in, relatively large and costly bills for ARENTO customers. The average bill for each line in-service for the six month period is about LE 106 without international toll included. International Toll revenues average LE 1,687.50 per line per month. The extended billing periods make it difficult for customers to financially plan for and to pay the large bills all at one time.

b. Critical Success Factors

To effect a reduction in the time lag between the billing cut-off and the preparation of the bill for distribution and while at the same time increase the frequency of billing to reduce the size of individual bills, the following five critical success factors must be satisfied:

- (1) Currently, ARENTO does not have the administrative or mechanical capability (data processing capability) to shorten cut-off time lags or to bill more frequently. The "Definitional Mission and Scope of Work" issued in May 1992, indicated that ARENTO would have a new "paying system" installed by July 1993. The original contract for this work was canceled and new tenders were issued, which in all probability will delay the previously planned July 1993, implementation date. New bid proposals are scheduled to be received and opened on March 28, 1993, after which a decision will be made to proceed. Until then, K&M has been told, no specific plans are available regarding ARENTO's implementation plans. Based upon information available to K&M, only the acquisition of a "paying system" is under consideration.

Reaching the above objective is dependent upon ARENTO acquiring and implementing a fully integrated customer billing system throughout Egypt. This system, at a minimum, must include on-line order entry capability, maintain accounts receivable balances with on-line interactive access to the account status ("paying system"), provide account treatment capability and have the capacity to handle monthly cycle billing for an estimated four to five million lines by the end of the five year planning period in 1997. This is not intended to be a complete definition of systems requirements but rather is intended reflect the basic functional system requirements, which go well beyond a "paying system". Before acquiring a new billing system or before modifying the existing billing system, a thorough, in-depth Systems Analysis Requirements Study should be conducted.

An alternative to acquiring or modifying the existing billing system, would be to buy billing services from an outside supplier who would prepare and make distribution of the bills to customers. The contractor could also collect cash payments or any amounts due, if desired. Some Electric Utility companies in Egypt currently contract billing and collection services from newspaper publishers and other providers.

- (2) Training employees on the use of a new on-line billing system.
- (3) Development of a phased-in implementation plan as opposed to a flash cut to a new billing system.
- (4) Increasing flat rate tariff charges for exchange and vertical services to cover the increased costs associated with both a reduction of cash flows and billing and collection of each line twelve times per year verses the current two times per year.
- (5) Ultimately changing tariff for the local call maximum call allowance from an annual basis to a monthly basis, i.e. for residence customers the annual call allowance is 1500 calls. With a revised tariff the call allowance would be monthly for 125 calls. (Rate change analysis is covered in detail in Chapter VII).

2. Feasibility of Suggested Collection Changes

Based on the situation assessment of billing and collections as described in section B(1) above, specific opportunities need to be identified for changing ARENTO's current collections and delinquent account treatment policies.

The existing collection policies being applied for amounts billed on a semi-annual basis are the same policies that were used for billing on an annual basis. Therefore, the current collection policies appear to extend too far into the future and overlap billing periods rendering them less effective than what they might otherwise be. Additionally, two exceptions are made for government accounts. The first exception is that government services are not disconnected for non-payment. The second exception is that ARENTO does not require a deposit from the government.

There is an entirely different collection and delinquent account treatment policy for international toll which is billed on a monthly basis.

The basic objective should be to move to one standardized account treatment policy that is consistently and uniformly applied without exceptions for the government.

The existing policies for international toll seem to be the most reasonable policies to adopt for all telecommunications services as billing is converted to a monthly basis.

3. Feasibility of Suggested Data Processing Changes

Based on the situation assessment of data processing as described in section B(3) above, specific opportunities need to be identified for changing ARENTO's current data processing capabilities that are targeted at more frequent billing and cash collection for telecommunication services. An objective for the feasibility analysis was developed and specific requirements were identified along with critical success factors for reaching the desired objective.

a. Objective

Increase ARENTO's data processing capabilities to issue timely and accurate billing for all telecommunications services, and to provide sufficient management and statistical information to more effectively manage ARENTO's revenues and accounts receivable.

With the above objective in mind, the following specific requirements or features have been identified that would be desirable as an enhancement to ARENTO's data processing capabilities as an aid to improve cash flows and frequency of billing:

- On-line order entry.
- Aged accounts receivable balances and summaries.
- Computer generated account treatment.
- Toll accumulation and rating.
- Local call accumulation and rating.
- Account billing as opposed to billing for each line.
- On-line account status and posting of payments.
- Cycle-monthly billing.
- An estimated useful life of not less than seven years. System capacity to handle billing for four million lines initially and expandable to seven million lines over its estimated life. Capacity to accommodate not less than one thousand simultaneous inquiries.
- Management and statistical information for supporting future cost of service/rate studies, developing and monitoring marketing and sales programs,

managing accounts receivable, developing revenue requirement revenue projections and current year budget and five-year plans.

b. Critical Success Factors

To effect an increase in ARENTO's data processing capabilities in an effort to issue timely and accurate billing for all telecommunications services and provide management and statistical information for effectively managing ARENTO's revenues the following critical success factors have been identified:

- Funding sources. A review of the five year plan indicates that funding has not been provided to acquire a new integrated customer billing system.
- Well defined information requirements and system functionality need to be documented.
- Training requirements to update the skill level of affected employees needs to be identified.
- Motivation of staff members to adapt to computerized processes should be considered.
- System maintenance support requirements should be identified.

4. Feasibility of Suggested Policy Changes

Based on the policy situation assessment as described in section B(2) above, specific opportunities need to be identified where changing certain ARENTO policies will aid in improving ARENTO's cash flow and billing processes. Specific areas for consideration include collection policies, accounting policies, and organizational structure. An objective for the feasibility analysis was developed and specific goals identified along with critical success factors related to achieving the desired objective.

a. Objective

Establish policies that assist the management of ARENTO in managing a single integrated billing and collection process on a uniform and consistent basis while giving consideration to customer convenience and satisfaction in paying affordable and timely bills for telecommunications services throughout Egypt.

With the above objective in mind, the following existing policies have been identified that, if changed, would assist management in managing the billing and collection process to improve cash flows and frequency of billing.

- Revenue recognition policy. Recording revenues when earned as opposed to recording revenues as cash is collected.

- Policies related to maintaining accounts receivable balances and recording adjustments to customer accounts.
- Policies related to account treatment for delinquent balances.
- Policies related to the separation of duties and responsibilities.

b. Critical Success Factors

To effect changes in established policies that will assist the management of ARENTO in managing a single integrated billing and collection process on a uniform and consistent basis while giving consideration to customer convenience and satisfaction in paying affordable and timely bills for telecommunications services throughout Egypt the following critical success factors have been identified:

- (1) Organizational structures should be reviewed and perhaps redefined to ensure that each respective activity related to billing and collection receives adequate on-going attention and priority.
- (2) Ensure accounting policies conform to the Egyptian Unified Accounting System.
- (3) Ensure adequacy of internal controls associated with adjustments to outstanding accounts receivable balances.
- (4) Ensure adequacy of separation of duties related to cash collections, bank reconciliations, billing, distribution of bills and issuing adjustments.

D. Recommendations and Potential Benefits

1. Billing Changes

K&M has assessed the possible long term value to ARENTO of changes in billing targeted at improving the company's cash flow. The major changes that K&M has assessed are an increase in the frequency of billing from semi-annual to quarterly, and from quarterly to monthly. ARENTO's plans for a computer based paying system have been scrapped and were not reviewed by K&M. Administrative costs were calculated for quarterly and monthly billing costs under the assumption that a fully mechanized billing and collection system was in place. The consultant also calculated the cash flow impacts associated with reductions in advance billings and the increased frequency of billing for services billed in arrears.

a. Discussion of Phased Implementation

All billing changes are predicated upon the installation of a fully integrated billing and collection system. Without a new system, ARENTO lacks the administrative and data processing capability to change their current billing from semi-annual to quarterly or even monthly. Based on discussions with ARENTO personnel, there are undocumented plans to begin the implementation of a new billing system within the next two months, but no

information was made available to K&M that indicate the system functionality that will be implemented.

It is K&M's conclusion, assuming a new system is available and installed before year-end 1993, that a reasonable plan to proceed with changes in billing should begin with a phased conversion to cycle monthly billing. (See Exhibit IV-1 for a summary of this change proposal).

As currently envisioned, Phase 1, starting April 1, 1993, and scheduled for completion no later than June 30, 1994, would be carried out in two stages. The first stage would be to convert Cairo and Alexandria to the new billing system followed with a stage two conversion of all other manual billing to the new system. Upon the completion of Phase 1, all billing would be mechanized and all manual billing would be eliminated from outlying areas throughout Egypt. It is possible this could be accomplished by the end of June 1994.

Phase 2, starting July 1, 1994 and scheduled for completion no later than June 30, 1995, after all service areas are up and operating on the new system, would be to convert all semi-annual billing to cycle quarterly billing with completion targeted for no later than the end of June 1995.

Phase 3 starting July 1, 1995, would involve conversion from cycle quarterly billing to cycle monthly billing, which could be completed by the end of June 1996. Thereafter, all billing periods beginning on or after July 1, 1996 would be on a cycle monthly billing frequency.

b. Costs and Cash Flow Effects of Moving to Monthly Billing

The previous discussion of exchange service pricing indicates that ARENTO is currently billing residential, business and government customers on a semi-annual basis for the following six months of access to local exchange service. *ARENTO Customers are presently paying in advance for exchange service to be provided by ARENTO. This advance payment provides ARENTO with the needed revenues to fund operations and investment for subsequent periods, and has provided an expected level of cash flows.*

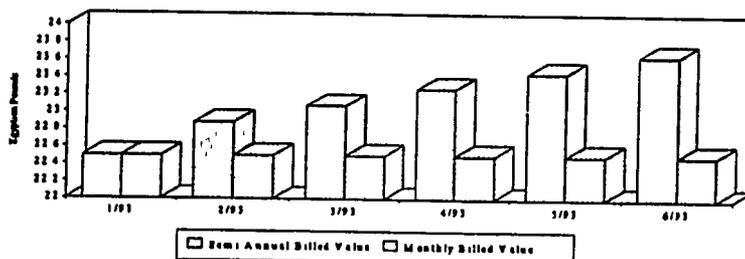
In this section, the effects of moving from the semi-annual prepayment billing plan in place today to a monthly billing payment plan alternative are explored. It will be demonstrated that *moving to a more frequent payment plan will constitute a cost to ARENTO that will either be absorbed by them or shifted back to the customer in the form of higher prices. It will be shown that the economic effects of moving to a more frequent (monthly or quarterly) billing process do not provide the logic for reducing customer rates as an inducement to customers to accept more frequent billing.* In this section, K&M examines the current semi-annual billing plan relative to local access, and compares it to the extreme case of monthly billing. Additionally, the impact of a quarterly local access billing plan is shown to be slightly less than the extreme case.

The additional processing costs associated with moving to more frequent billing of local access can be assumed to add to the loss in value calculated in this analysis. These additional costs may not be significant, however, if local, national and international usage is to be billed monthly.

Under the current semi-annual plan, each residential subscriber is expected to pay LE 22.50 per line for the next six months of local access. Exhibit VI-13 below shows the real value of LE 22.50 paid in January of 1993 for each of the six succeeding months. By the end of the six month period, the value per line of the initial LE 22.50 has grown to LE 23.65 or by LE 1.15 due to the effect of compounded interest. The same calculation for business and government customers shows the real value of the LE 37.50 semi-annual payment per line increases LE 1.91 to LE 39.41 by the end of six months. This difference in value can easily be realized by placing these prepaid funds in an interest bearing account or investing them in profitable business alternatives such as telecommunications for the six month period.

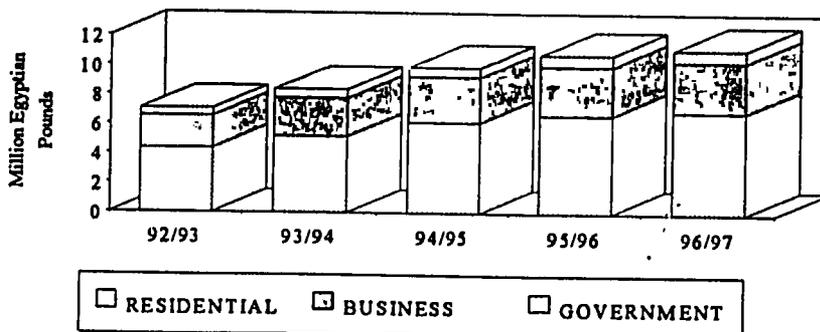
If bills are paid monthly, the same cash amount is received from customers and the compounded interest effect beyond one month on ARENTO revenues does not occur. As a result, the monthly payment for service will reduce the revenue generating value of each local access line. In the example above, the value could fall by up to LE 1.15 per line at the end of six months (LE 2.30 annually per line) for residential service. A similar LE 1.91 per line (LE 3.82 annually per line) decrease in value for business and government service would also occur assuming a 10 percent interest rate.

Exhibit IV-13
Future Value of Local Residential Access
10% Compounded Monthly



The magnitude of the current residence, business and government semi-annual billing value over monthly billing for the five year plan is significant and may be expected to grow to approximately LE 11.2 million per year by the end of the plan (as illustrated in Exhibit IV-14 below). The cumulative effect of semi-annual billing value over monthly billing is approximately LE 47.3 million over the entire five year plan.

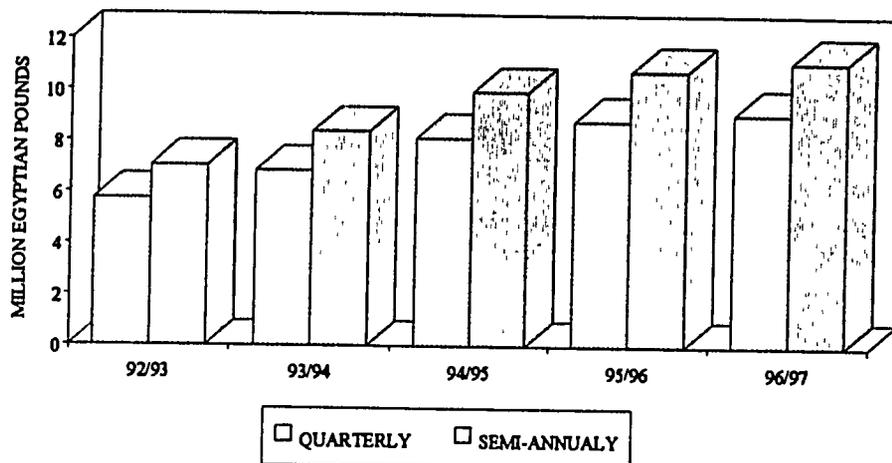
Exhibit IV-14
Impact of Billing Local Access Monthly
Over the Five-Year Plan



This growth in value per line has been factored into current and planned operations and investment decisions. Therefore, *movement to a monthly billing plan from the current plan will exact a cost on ARENTO*. In effect, internally generated funds will decrease in value over the plan by LE 47.3 million and ARENTO may need to offset this decrease by either reducing operating expenses and/or investment by this amount or increase prices by up to LE 2.30 per year for each residential line in service and LE 3.82 per year for each business and government line in service.

Moving to a quarterly local access billing plan will result in a slightly smaller impact over the plan period (as illustrated in Exhibit IV-15). The offsetting cost reduction/revenue increase per line is LE 1.88 for residential local access service and LE 3.12 for business and government local access service annually. The decrease in value over the plan from moving to a quarterly billed local access from the current semi-annual billing is approximately LE 3.7 million.

**Exhibit IV-15
Quarterly Vs Semi-Annual Billing Effects over the Five-Year Plan**



The recommendation of the K & M Team is to preserve the semi-annual prepayment of local access since movement to monthly or quarterly local access billing will reduce the real revenue generation capability of ARENTO and may require future offset. Further, the current relatively low flat rate semi-annual charge does not seem to represent a major burden to the Egyptian market segments that will take local access service. The price elasticity relative to local service will be discussed more thoroughly in chapters VI and VII.

The present value effect of advancing arrears billing over the five year period is estimated to be LE 32.5 million.

In summary, the net change in value from reducing advanced billing (LE 47.3 million) and from increasing the frequency of arrears billing (LE 32.5 million) is a net decrease in the value of cash flows of LE 14.8 million.

c. Projected Costs Associated with Converting to Monthly Billing

It is estimated that current billing costs for ARENTO to bill local access, usage, national and international toll is LE 7,035 thousand per year. These costs include bill preparation, manual distribution, and manual processing of payments received and data processing costs.

With improved bill distribution and conversion to a fully integrated computerized data processing system, it is estimated that billing costs per bill would be approximately LE .68 per bill, or LE 16,320 thousand per year, to bill on a monthly basis. International toll costs per bill are currently estimated to be LE .67 per line or LE 319 thousand per year. By consolidating the customer billing and collection power into a single operation it is estimated that billing costs could be reduced by approximately LE 320 thousand.

In summary, the net change in billing costs to move from semi-annual to monthly billing; integrating all billing and collection processes and to redefine the organizational roles and responsibilities would increase costs by LE 8,965 thousand in the first year of cycle monthly billing. It is estimated that acquisition costs for a new fully integrated customer billing system would be about six to ten million pounds.

2. Collection Changes

In this section, the current collection process, defined in two parts as account treatment and cash collection, is examined and alternative collection methods are explored. The objective of this section is to recommend the best method to improve ARENTO's collection efficiency and effectiveness. This, in turn, should have a direct impact on the revenue generation capability of ARENTO from the point of view of collection success as well as from the point of view of improved customer satisfaction with transacting business with ARENTO.

The current method of collection for local, national, and international service will be described along with specific observations relative to areas of improvement in bill delivery to the customer and bill payment by the customer. The current plan will then be discussed along with areas of uncertainty relative to the plan. Finally, alternatives for bill delivery and customer payment will be evaluated and a recommended approach will be described.

a. General Discussion of Delinquency and Account Treatment

The delinquent accounts relative to the residence and business market segments are viewed to be relatively insignificant but perhaps under managed due to a lack of available information. This is reinforced by the relatively high late payment penalties described earlier and eventual disconnection and reassignment of the customer's line. Since reconnection will then require the customer to subscribe to the waiting list, late payment past one month makes no economic sense from the customers' perspective if they desire telephone service.

The balance sheet for June 30, 1992, included an accounts receivable balance for residence and business accounts of LE 181 million. The international toll outstanding receivable for the same period more LE 75 million. The consultants were told that little if any of the LE 181 was delinquent and no information was available that identified delinquent accounts. No information was available regarding international toll receivables or delinquencies. Given ARENTO's policy to disconnect service if the account balance is not paid by the due date, it is

reasonable to presume that delinquencies are relatively minor. However, it is the K & M Team conclusion that the new billing system, should provide information that identifies delinquent accounts and that would age the outstanding receivables. When delinquency information was not available, information about the volume of write-offs and adjustments was requested, but again the consultants were told that such information is not available. It is the K & M Team conclusion that the new billing system along with redefining roles and responsibilities, should provide information that would enable the Controller to monitor write-offs as well as adjustments and which would enable the Controller to record such amounts in ARENTO's books of account to effectively manage accounts receivable. Regarding account treatment policies, they should be standardized based upon the treatment policies used for the monthly billing of international toll and consistently applied to all accounts. This policy more closely meets the need for a monthly billing collection policy versus the annual policy and will free-up lines currently held for seven months while customers decide if they will pay.

Finally, bill treatment policy on all accounts should be standardized and not left to local or sector ARENTO management interpretation.

b. Government as Current Exception

Delinquencies at ARENTO are significant in only one group of customers--government accounts. Information available to K&M was limited to a partial listing of accounts receivable balances for government accounts as described previously in section B(1) and illustrated in Exhibit IV-9 above. This Exhibit indicated that LE 69 million was delinquent with about LE 40 million of the total due from the Minister of Security (National Police Department). Given the current political and social environment, it appears that ARENTO attempts to barter with government ministries for partial payment, and insists that eventually account balances are paid. Most of the delinquencies included on the list were estimated by ARENTO to be about five years old.

Late payment by some Egyptian governmental agencies may be addressed by several alternatives some of which have been rejected by ARENTO and government officials for reasons not clearly understood. The alternatives discussed are not mutually exclusive and may be combined to create a sound position to ensure higher reliability in collecting delinquent governmental accounts.

It is the K&M Team conclusion that existing delinquent account policies should be equally applied to all classes of subscribers (i.e. disconnection for non-payment and posting of bond or the receipt of deposits). Additionally, efforts could be undertaken to enact legislation for taxing communication services with the resulting tax revenues retained by ARENTO to off-set government telecommunications services. In effect, when the government does not pay its telecommunications bill, the resulting costs are ultimately paid by the general public. An explicit tax to identify what the government is spending seems practical given the government's stated objective of moving towards a market based economy.

Another alternative for consideration is the centralization of telephone service payment by the Government of Egypt (GOE) for all agencies. This will enable ARENTO to deal with a single payment transaction, and apply concentrated political pressure if required to receive this payment.

A third alternative is a surcharge or tax placed on each non-governmental subscriber to pay for the telephone services used by the GOE. The revenue requirement in the form of a surcharge could then be spread to high margin vertical, national toll and international services.

Finally, bill treatment policy on all accounts should be standardized, and not left to local or sector ARENTO management interpretation.

c. Cash Collection

In general, the findings of this section support the use of the most expedient and cost effective methods to get the bill to the customer, and to get the payable funds to ARENTO. Given the wide range of ARENTO customer's income and location, the best solution may be a mix of delivery alternatives. The payment process will be shown to require another mix of alternatives to provide the most effective solution to collecting customer payments.

A few principles form the basis of K&M's analysis relative to the evaluation of alternatives. First, the concept of customer satisfaction is addressed from the standpoint of convenience. This may be measured in terms of our estimates of the relative time the customer takes in transacting business with ARENTO. Second, the concept that ARENTO will migrate to more frequent billing for services billed in arrears such as local usage above call ceilings, national toll usage, and international toll usage will aid in identification of the desired characteristics that a desired collection process should possess. Finally, the realization that a large majority of ARENTO customers will likely pay in cash rather than check must also be considered.

Currently, ARENTO bills approximately 2.1 million access lines across residence, business and government customers. The vast majority of customers fall in the first two categories. These customers currently converge on about 500 nationwide bill payment centers that range from full telephone service centers and special bill payment centers operated by ARENTO to authorized banks and post office bill payment locations.

In the full service offices, telephones are sold, lines and services are ordered, line changes are ordered and repair requests are made along with bill distribution to customers and payment collection from customers. These offices represent the main marketing arm of ARENTO. Currently, twice a year during the collection periods of January 7 to February 7 and July 7 to August 7, these Service Offices essentially become customer exposure points to ARENTO's transactions process. This process can become a several hour wait in line to pick up the bill, and then a similar wait in another line to pay the bill which creates an unfriendly product and service marketing environment. In many cases, the customers essentially devote the entire day to the payment of their phone bills.

Movement to a more competitive telecommunications environment through market reform will result in the need to make any transaction with the customer as convenient as possible, especially at service sale points. In some areas, one-stop telecommunications bill payment and service ordering may maximize customer convenience even with long waits when transportation to and from the Sales Office is limited. That is, long waiting lines may be tolerated more in rural and lower income areas than urban upscale areas in Egypt.

Temporary offices or Cashier Offices are also operated by ARENTO that are open only during the time of expected high bill payment activity. These offices are typically manned by two employees, with one serving waiting customers their bill and the other receiving payment for the service. A similarly long waiting line greets customers at these bill payment points as well.

Other, ARENTO authorized locations that include 41 post office locations and 5 banks also contribute to the points of bill payment for customers. However, the same relatively long wait is also characteristic of these locations as well. These points, unlike the ARENTO operated locations, do not have the ability to distribute the bill to the customer; rather they merely provide an alternative point of bill payment. The customer must still stand in line to pick-up his bill at ARENTO-operated locations.

Given approximately 2.1 million lines, and assuming that about 90 percent of the customers may need to access these payment centers, nearly 1.9 million ARENTO customers converge on some 500 payment locations every six months. This is an average of approximately 4000 customers per location assuming each location is equally used. Since the average daily wage in Egypt is approximately LE 7.7 a day (calculated from data provided by the Ministry of Information and Mobilization of Egypt), the loss in national productivity due to telephone bill paying is estimated to be LE 14.6 million for each six month bill cycle or LE 29.3 million annually. By the end of the five-year plan, the same six month cycle could result in a LE 56.9 million annual productivity loss to ARENTO's customers. This number could be higher due to multiple payment office visits made by some customers. The lost productivity to Egypt of monthly billing and payment with the same process could be LE 341.5 million annually by 1997.

The current ARENTO billing and collection plan includes placing on-line CRTs in approximately 400 payment centers across Egypt to reduce transaction time. Specifically how the transaction time will be reduced is unclear other than more rapid and mechanized account balance reference. The 41 authorized post offices and 5 banks are planned to be equipped with CRTs as well. In this plan, it is envisioned that the customers will receive the amount billed by ARENTO, and then pay the amount in a single line or single transaction. The customer will pay on the spot and receive a receipt for payment from an ARENTO representative. Additionally, if there are any questions about the bill, the customer will be referred to another queuing line to receive an answer to any inquiries. There may be a charge of LE 3 to LE 10, however, for customer inquiries. If the customer cannot pay immediately, they will likely repeat the process of standing in line.

The alternatives examined are aimed at reducing the lost time of the customer and improving convenience of the billing and paying transaction. Alternatives for distributing the bill must accommodate monthly billing cycles. As discussed above, the lost productivity and inconvenience to ARENTO customers is a significant consideration, especially if ARENTO wishes to attract foreign investors that demand not only state-of-the-art telecommunications infrastructure but also maximum ease in doing business with the telecommunications provider. The provision of service does not stop at the completed call as most telecommunications firms in Europe and the United States have found. The provision of service also includes the accurate and timely billing for service, as well as efficient and straightforward collection for services rendered.

d. Recommended Alternatives and Mixes

The best solution for distributing customer bills is a mix of delivery alternatives. First, if the customer subscribes to international toll service, Egyptian mail service is used as the first choice for bill delivery. When mail service is not practical, special couriers are currently employed to deliver the customer's international service bill. The K&M Team suggests that these same delivery methods should be used to deliver the entire ARENTO bill to the subscriber that includes charges for all local, national and international services. The incremental cost of mailing or using courier service when mailing is not possible, i.e. using the existing delivery methods, will be minimal.

The Egyptian Postal Service should be used to deliver ARENTO customer bills whenever possible. This method should be used for customers that have clear addresses and applies equally to residential, business and international customers. As billing records and addresses are computerized, a subscriber/address association should be made for all local, national and international service customers. Attention should be given to the bill mailing dates to ensure the customer has adequate time to remit payment before the due date.

The third level of bill delivery should consist of existing and planned payment center hard-copy bill delivery, accompanied by CRT verification and inquiry. The current plans for post office, bank, and ARENTO payment centers will likely be the bill distribution choice of customers with unclear addresses and lower incomes. These customers will appreciate one-stop transactions in which they pick up and pay the bill in one process without long waiting lines. The reduction in waiting time at the payment centers can be achieved through off loading much of the bill distribution to the other channels mentioned above. The primary point to be made is -- *customers will not accept monthly billing if they have to stand in line and customer selected options should be available to the customer to make monthly billing more appealing and acceptable.*

Payment of funds should also be a combination of alternatives that provide the customer with the maximum payment channel choice. For high income residential and large business customers, automatic funds transfer paying arrangements can be made with the customer's bank to speed payment. The customers that have checking accounts can also mail in their remittance. Others may pay in person at a nearby payment center in cash or check.

Another alternative that should be market tested is the concept of monthly payment of a bills or coupons based on past monthly average charges that are adjusted to actual levels every six months. In this case, at the beginning of the year, each customer will receive a booklet of six telephone bills each based on an average of actual monthly charges the customer incurred over the past six months. Each month the customer mails or personally delivers one of the bills along with either check or cash to ARENTO. At the beginning of the next six month period, the customer either receives or personally picks up a new booklet of six monthly bills based on the last six months of actual charges. The customer's new monthly bills are adjusted for either over or under payment that occurred over the past six months. This approach has the advantage of preserving monthly cash flow to ARENTO while giving the customer consistency in telephone expenditures over each of the six month intervals. This payment system applies to services such as national and local usage that are normally billed in arrears.

In addition to customer convenience and low cost, a fundamental requirement for an improved billing and collection system in ARENTO is an integrated billing and paying process. This process, whether computerized or not, must be capable of crediting or adjusting customer accounts in real time or "on the spot". Additionally, an effective billing and collection system should have centralized remittance capability for receiving and recording mailed, courier delivered and personally delivered payments from all points in Egypt. This centralized and integrated system requirement should also apply to all service types such as local, national and international services.

3. Data Processing Changes

a. Recommendations

It is the conclusion of the K & M Team that ARENTO should conduct a comprehensive information requirements survey to identify detailed system functionality needs for an integrated customer billing and collection system. Thereafter, they should proceed to acquire a new customer billing system to reduce the time lag between the billing cut-off period and the preparation of the bill and to increase the frequency of billing from semi-annually to quarterly and eventually monthly for services normally billed in arrears. Until local service rates are increased and the annual call allowance is reduced to a monthly call allowance no change should be made to the semi-annual billing for services billed in advance.

b. Benefits to ARENTO

The likely advantages to ARENTO from implementation of a new billing system include an increase in efficiency by eliminating manual billing, to :

- Improved accuracy and timely preparation of bills,
- Increased likelihood of customers accepting the billed amounts without requesting local call billing detail,
- Increased accuracy and efficiency in posting cash collections to customers accounts,
- The ability to bill "accounts" as opposed to billing each line,
- The feasibility of integrating all billing operations within one organizational structure, and
- The increased availability of information needed to manage accounts receivable and to record uncollectibles and adjustments.

4. Policy Changes

a. Recommendations

It is the conclusion of the K & M Team that certain policies should be changed to assist the management of ARENTO in managing a single integrated billing and collection process while

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giving increased consideration to customer convenience and satisfaction when paying their telecommunications bill.

The following existing policies, if changed, would assist management in managing the billing and collection process to improve cash flows and frequency of billing.

- *Policies should be established that enable revenues to be recognized and recorded when earned as opposed to recognizing revenues when cash is collected.*
- *Policies should be established to maintain and age accounts receivable balances and to record adjustments to customer accounts by charging adjustments to an expense account that facilitate, monitoring and internal control of write-offs.*
- *Policies related to account treatment for delinquent accounts should be standardized among all accounts. International toll presently follows a different policy than the policy applied to all other telecommunications services. Additionally, the same policies are not applied consistently and uniformly for all classes of customers.*
- *Policies should be established to maintain the separation of duties and responsibilities. To facilitate adequate internal controls, no single individual or department should be solely responsible for billing, cash collection, bank reconciliations, cash management and account adjustments, and write-offs.*
- *Organizational structures should be reviewed and perhaps redefined to ensure that each respective activity related to billing and collection receives adequate on-going attention and priority.*

b. Benefits to ARENTO

With the above policy changes in place ARENTO should enjoy the following benefits:

- Uniform delinquency treatment for all accounts.
- Improved internal controls and management information.
- Increased and a continuing level of attention given to billing, data processing systems, accounting functions of recording and classifying, and cash management.

V. ANALYSIS OF NETWORK PLANNING AND SERVICE IMPROVEMENTS

This chapter presents the analytical findings and results of K&M's assessment of current ARENTO operations in an effort to identify potential service improvements intended to maximize revenues per line, reduce long run marginal costs for services provided, enhance the value of the network, and improve the perceived quality of services in the eyes of ARENTO customers.

A. Background and Introduction to the Task

Highlights of activities to be performed under Task 3: Service Improvements are presented below, along with a summary of ARENTO's current service improvement goals and K&M's suggested measuring rod for evaluating proposed service improvements.

1. Highlights of Contractor Analytical Activities

In performing this task, K&M was asked to concentrate its initial analytical efforts on the following specific activities in accordance with both the Scope of Work and Work Plan:

- Analysis of factors behind ARENTO's recent revenue growth;
- Review of available point-to-point traffic data to determine future expansion needs for telecommunications equipment;
- Review of the current five-year investment plan along with associated revenue projections;
- Identification of potential adjustments to the five-year investment strategy if warranted;
- Identification of areas where the provision of improved or additional services would likely result in increased revenues; and
- Formulation of revised five-year revenue projections.

In undertaking this Task 3: Service Improvements study assignment, K&M has worked closely with ARENTO counterpart organizations and personnel to insure the validity of data and information that was provided, as well as the practicality of K&M's proposed recommendations for improving overall telecommunications service in the Arab Republic of Egypt. In addition, at the outset of the study effort associated with this particular task, K&M tried to get a mutually agreed upon criterion or measuring rod for just what constitutes a service improvement for telecommunications in the Arab Republic of Egypt. The following two sections provide insight into the overall objectives to be achieved in this important area. The first is an overview of ARENTO service improvement goals as contained in the current five-year investment plan, and the second is a suggested objective function to be optimized in the area of service improvements.

2. Overview of ARENTO Service Improvement Goals

Specific service improvement goals implicit in ARENTO's current five-year construction program (i.e. 1992/1993 through 1996/1997) are highlighted below :

- Increased telephone penetration in each Governorate of Egypt (taking into account a projected population growth rate of 2.3 percent) to achieve an overall penetration of 7.3 lines per 100 people by the end of the period;
- Replacement of all X-Bar exchanges to give a better level of service;
- Increased number of digital exchanges in the various Governorates to insure that the overall penetration goal can be met;
- Increased outside plant capacity sufficient to cover all of the exchanges;
- Implementation of digital remote switches where required to provide services for new communities and rural areas;
- Gradual replacement of all common battery and magneto equipment with new electronic equipment using Direct Inward Dialing whenever possible;
- Conversion of all main line coaxial cables to fiber optic transmission in anticipation of the planned transition to an integrated digital network;
- Increased number of coin boxes and card phone telephones to facilitate access to public communications; and
- Increased capacity of the international exchanges to meet growing international demand.

3. Objective Function Optimization

K&M agrees with ARENTO that these are worthy service improvement goals. However, these goals do not appear to have been either rationalized or developed as part of an integrated planning system intended to support the development of an over-arching service improvement strategy that optimizes planned investments over time. In this regard, given ARENTO's current stage of network development, it is K&M's opinion that such a piecemeal set of goals can only be achieved either through major increases in grant funding assistance or foreign indebtedness, increased tariffs for general telecommunications services, or some combination of the above. On the other hand, through a more systematic matching and phasing of planned investments to capacity requirements, plus greater emphasis on vertical marketing of additional services that have a capacity for both reducing congestion and/or blockage while at the same time increasing overall revenues, it may be possible to minimize or possibly even forego future general tariff increases over the next five years.

Accordingly, it is suggested that prior to formal acceptance, all planned capital expenditures and policy changes in the area of service improvements must first be able to show that they are consistent with optimizing an objective function which seeks to:

- (1) Increase anticipated revenue per line;
- (2) Decrease the long run marginal costs of providing telecommunications services;
- (3) Increase network utilization and overall efficiency;
- (4) Enhance the overall value of the network over time; and
- (5) Improve the perceived quality of services provided to the customer.

B. Task Requirements and Contractor Approach

In undertaking the Task 3: Service Improvements study assignment, K&M organized its work effort along the lines summarized below to meet specific requirements established in the Scope of Work.

1. Assessment of Demand Side Changes

In the area of understanding recent demand side changes and likely future trends, K&M was asked to perform the following activities in the Scope of Work:

- Attempt to analyze factors behind ARENTO's recent revenue growth from available data to establish actual rates of subscription growth; and
- Undertake an assessment of usage levels over time for: each class of user (business, residential and governmental); location of user (Cairo, Alexandria and all other if available); and type of service category (local, national and international).

In approaching these subtasking assignments, K&M undertook a thorough review of changes in revenue over the past several years with a special emphasis on data associated with local access lines in an effort to establish actual rates of subscription growth. In this regard, K&M was particularly interested in ascertaining the number of lines in service, as well as usage of these lines. In addition, K&M compared planned additions of lines of switching capacity to future demand as measured by the number of applications received to be placed on the waiting list. Finally, in the area of usage patterns over time, K&M undertook a detailed analysis of lines in service by customer class, location for Cairo and Alexandria only, and type of service category.

2. Review of Junction, Switching and Outside Plant Capacity Requirements

With respect to equipment capacity requirements, K&M was asked to perform the following activities:

- Review utilization of switching capacity in light of subscriber line growth; and
- Analyze available point-to-point traffic data to determine where future expansion or addition of switching facilities may be warranted.

In light of significant recent changes in overall demand as well as changes in patterns of usage among various types of users, K&M decided to also include reviews of utilization of both junctions and outside plant equipment along with its assessment of the utilization of switching capacity. For instance, in the area of junctions, K&M reviewed how trunks are presently being provided over the transport network. Similarly, for switching facilities, K&M undertook a thorough review of waiting lists for each automated wire center. In the area of outside plant, K&M compared outside plant pairs terminated with both existing and planned switch capacity. Finally, K&M undertook a detailed analysis of both point-to-point traffic data and COM Center data to determine specific blockages as well as lost revenues as a result of the current configuration.

3. Review of Service Operations

Regarding the current status of service operations and business practices, K&M was asked to perform the following activities:

- Assess the effectiveness of current maintenance for outside plant and central office equipment in an effort to determine existing operational efficiencies; and
- Review current business practices and procedures for delivering telecommunications services to ARENTO customers.

In addressing these subtasking assignments, K&M undertook a detailed review of maintenance data from the Facility Control Center to evaluate the overall reliability of the network. In addition, K&M reviewed both installation and turn-up procedures for switches. K&M also attempted to identify the projected impact of defective pairs on the outside plant network from the standpoint of increased costs per line, lost revenues, erosion of quality of service provided, and the inability to work the waiting list in a timely manner. Finally, in the area of business practices, K&M conducted an in-depth review of current business practices, including the likely linkages in Egypt between demand for customer calling features and the engineering of such additional services.

4. Review of Present Investment Strategy

In assessing ARENTO's present investment strategy related to service improvements, K&M was asked to perform the following activities:

- Assess ARENTO's present five-year investment plan for network development to determine its adequacy and ability to achieve planned service improvement goals; and
- To the extent possible, attempt to identify those areas where adjustments to the present five-year investment plan could result in further improvements in

ARENTO's ability to meet demand as well as an increase in overall value of the network.

In carrying out these subtasking activities, K&M reviewed four different five-year investment plans with a special focus on one of them - the "Switching Plan". This version contained the service improvement goals highlighted in Section V (B) (2) above. In evaluating this version, K&M undertook several supporting analyses, including a review of existing switch types at each exchange, an evaluation of planned switching additions and retirements implicit in this version of the five-year investment plan for network development, and an assessment of the current junction configuration. In addition, K&M also compared lines in service to both the outside plant terminated pairs and the waiting list in an effort to assess overall sufficiency and adequacy of this plan. In an effort to identify potential areas where adjustment to this plan may result in further improvements in ARENTO's ability to meet demand as well as an increase in the overall value of the network, K&M assessed this five-year investment plan from the standpoint of whether the funding allocation implicit in this plan correctly targets equipment components that are bottlenecks to improved service. In this regard, K&M evaluated the need for replacing X-Bar exchanges, analyzed the current uses of remote switching modules, reviewed the history of ARENTO's central office sizing efforts over time, and analyzed data on trunk circuit availability and traffic over the trunking network. Finally, K&M undertook an assessment of the current penetration of vertical services based on existing switching capacity in COM Center - administered wire centers.

5. Verification of Revenue Projections

With respect to verification of ARENTO's current revenue projections, K&M was asked to:

- Review the current revenue projections implicit in the present five-year investment plan and provide revised projections as required; and
- Assess the likely impact on revenue forecasts resulting from suggested modifications or revisions to the current five-year investment plan as well as enhanced revenues from the marketing of vertical service operations.

In undertaking these subtasking assignments, K&M reviewed historical growth rates for usage as well as planned additions to switching capacity included in the present five-year investment plan to develop a revised revenue forecast in an effort to establish an updated base case for comparison purposes. K&M next attempted to analyze the likely impact on these updated revenue forecasts resulting from suggested addition or deletions of planned equipment purchases in the present to five-year investment plan. In addition, K&M also attempted to assess the potential impact on future revenues of efforts designed to generate additional revenue per line such as increased marketing of vertical services.

C. Specific Issues Raised in Earlier Reports

Three previous studies of ARENTO financial planning and tariff design have been performed under contract to USAID. These include the following reports:

- *"Projected Revenue Requirements and Recommended Rates for 1981/1982"*, Arthur D. Little International, Inc., April 1981.
- *"Long Range Financial Planning"*, Arthur D. Little International, Inc., February 1986.
- *"A Financial and Administrative Review of the Arab Republic of Egypt National Telecommunications Organization: Definitional Mission Final Report"*, Teleconsult, Inc., May 1992.

Of these three previous study efforts, only the Teleconsult Definitional Mission Final Report raised specific key issues in the area of service improvements which are still relevant today. These issues or concerns were developed by Teleconsult in the form of questions to be addressed, and were utilized by USAID as one of the inputs in preparing the initial Contractor Terms of Reference and Scope of Work for the current study effort being performed by K&M. These questions are repeated below:

- (1) What are the primary underlying causes behind the current waiting lists for telephone service?
- (2) What actions would be most effective in relieving these demand constraints?
- (3) Are there other areas of ARENTO operations where demand is blocked, and if so, how can these other bottlenecks be relieved?
- (4) Is there any portion of ARENTO's current five-year plan for network development that needs to be modified or updated?
- (5) What aspects of the present five-year plan require further review?

The answers to these specific questions are presented in sections E(1) to E(5) below, immediately following the detailed discussion of K&M's analytical findings.

D. Discussion of Analytical Findings

This section is intended to present a detailed discussion of the analytical findings of the various service improvement-related assessments, reviews and evaluations undertaken by K&M in performing this task assignment. These findings have been grouped into four broad categories for greater clarity in presentation. They include discussions of:

- Demand side trends;
- Capacity and service operations;
- Overall investment strategy; and
- Revenue projections.

1. Demand Side Trends

Where information was available, changes in lines-in-service and usage levels were reviewed for each class of customer (residential, business and government), location of customer (Cairo, Alexandria and other) and for each service category (local, national and international). This information was used to assess the potential value of investment decisions based upon optimizing the suggested objective functions of increasing revenue per line, decreasing long term marginal costs, increasing the value of the network, and improving the quality of service.

a. Factors Behind Recent Revenue Growth

Major Findings

- *ARENTO has doubled the number of lines in service over the past five years; in this regard, about one million new customers have been added to the local exchange network.*
- *Customer access to the international toll network has more than doubled over the past five years; as a result, about 50,000 customers can now make international calls from their homes or businesses.*
- *Demand for local telephone service continues to exceed ARENTO's capability to finance and construct the related switching and distribution facilities required to meet this demand.*
- *Twenty percent of existing switch line capacity is reported as idle, while about ten percent of lines in service are unaccounted for.*

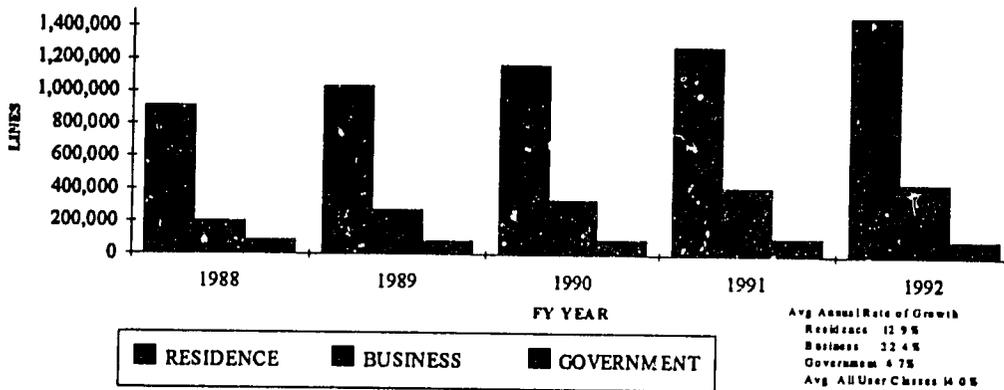
In the area of Local Access, ARENTO has nearly doubled the number of lines in service over the past five years from 1,040,000 to 2,027,680. Lines in service among all classes of customers have increased from 1,040,000 lines in 1987 to over 2,027,000 lines in 1992 as illustrated in Exhibit V-1 below. This represents a compounded annual growth rate of 14%. Local access revenues have increased from LE 78 million to LE 145 million representing an 86% increase in local access revenues.

Calculations based on this data show that lines in service by class of customer have experienced compounded annual growth rates as follows:

Residence	13%
Business	22%
Government	5%

**Exhibit V-1
Historical Local Access Data by Class of Customer**

Fiscal Year (FY) Ending	Residence	Business	Government	Total
June 30, 1987	-	-	-	1,040,000
June 30, 1988	908,872	204,106	87,645	1,200,623
June 30, 1989	1,034,553	276,067	83,656	1,394,276
June 30, 1990	1,167,634	340,026	96,234	1,603,894
June 30, 1991	1,285,804	421,107	109,619	1,816,530
June 30, 1992	1,473,659	451,215	102,806	2,027,680



In addition, international Toll Access has more than doubled over the past four years from 20,694 to 49,091 access lines as illustrated in Exhibit V-2 below. International toll access lines among all classes of customers have increased from 20,694 access lines in 1981 to 49,091 access lines in service in 1992. This represents a compounded annual growth rate of 24.1%.

**Exhibit V-2
Number of International Toll Access Subscribers**

Year	Accumulative Numbers			Annual Change	
	Direct	Thru. Operator	Total	Direct	Thru. Operator
1988	13,803	6,891	20,694		
1989	18,176	7,828	26,004	4,373	937
1990	23,869	8,471	32,340	5,693	643
1991	31,145	8,965	40,110	7,276	494
1992	39,684	9,407	49,091	8,539	442

Of the total lines in service of 2,027,680, 39,684 or approximately 2% have access to the international toll network. In 1988 only 1% of the lines in service had such access. There is no known waiting lists for customers wanting access to the international toll network. Funding has been allocated to adequately meet access demand.

Recent growth has been a function of the availability and allocation of supply rather than any significant increase in demand over the past five years. The market has been able to absorb all of the additional lines of local access capacity that ARENTO has been able to fund and build.

Currently the waiting list (demand) exceeds supply by 1.2 million lines. This demand level is primarily a function of the current artificially low price which is substantially below cost and perceived value.

Moreover, ARENTO has built and the market has absorbed about 1 million new local access lines over the five year period. There is proven demand now for at least an additional 1.2 million lines. An analysis of subscription growth implicit in such numbers is presented in Exhibits V-3 and V-4 below for all classes of subscribers.

**Exhibit V-3
Subscription Growth Year-To-Year Net Change**

in thousands	1988	1989	1990	1991	1992	TOTAL	ANNUAL AVERAGE
LOCAL ACCESS							
RES.	-	125.7	133.1	118.2	187.8	564.8	141.2
BUS	-	72.0	63.9	81.1	30.1	247.1	61.8
GOV.	-	-4.0	12.6	13.3	-6.8	15.1	3.8
TOTAL	160.1	193.7	209.6	212.6	211.1	987.1	206.8
NATIONAL TOLL ACCESS	NP						
INTERNATIONAL TOLL ACCESS	-	5.3	6.3	7.8	9.0	28.4	7.1

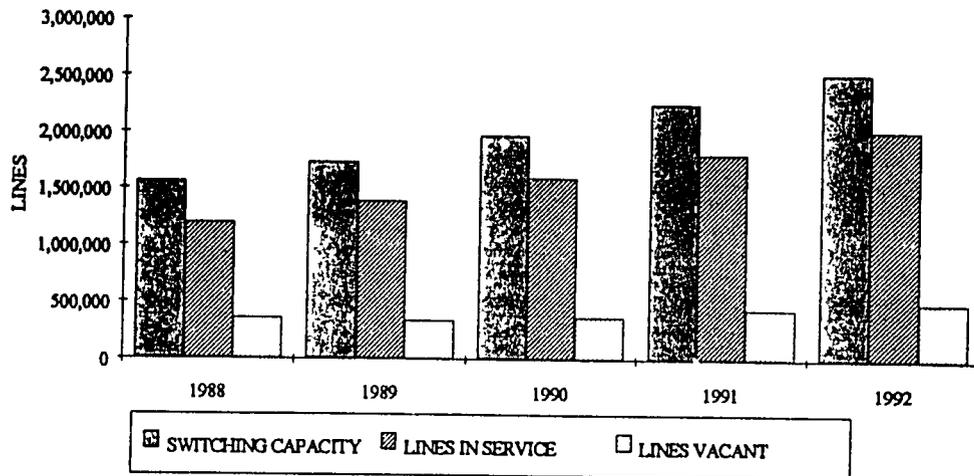
**Exhibit V-4
Subscription Growth
Year-To-Year Percentage Change**

	1988	1989	1990	1991	1992	TOTAL	ANNUAL AVERAGE
	%	%	%	%	%	%	%
LOCAL ACCESS							
RES.	-	13.8	12.9	10.1	14.6	62.1	12.9
BUS	-	35.3	23.2	23.8	7.1	121.1	22.4
GOV.	-	-4.6	15.0	14.4	-6.2	17.3	4.7
TOTAL	15.4	16.1	15.0	13.3	11.6	68.9	14.0
NATIONAL TOLL ACCESS	NP	NP	NP	NP	NP	NP	NP
INTERNATIONAL TOLL ACCESS	-	25.7	24.4	24.0	22.4	137.2	24.1
VERTICAL SERVICES	NA	NA	NA	NA	NA	NA	NA

Presently, approximately 20 percent of existing switched lines are reported as vacant as illustrated in Exhibit V-5 below. When comparing the number of lines of switching capacity to the lines in service, 19.9% of all lines are vacant. These vacant lines indicate a "fill rate" of 80.1%. The vacant or idle lines as reported, if correct, could be used to meet existing waiting list demand and thus become revenue producing.

**Exhibit V-5
Switch Capacity Utilization Lines**

Fiscal Year (FY) Ending	Lines of Switching Capacity	Lines In Service	Lines Vacant	Percentage Lines of Switching Capacity	
				In Service	Vacant
June 30, 1988	1,562,139	1,200,623	361,516	77.0%	23.0%
June 30, 1989	1,731,252	1,394,276	336,976	81.0%	19.0%
June 30, 1990	1,975,778	1,602,067	371,884	81.0%	19.0%
June 30, 1991	2,257,293	1,816,530	440,763	80.5%	19.5%
June 30, 1992	2,530,446	2,027,680	502,766	80.1%	19.9%



Network planning records indicate the 2,297.21 thousand lines are in service while the financial records (billing) indicate that only 2,027.7 thousand lines are in service, thus creating 269.6 thousand lines unaccounted for or 10.8% of total lines available as illustrated in Exhibit V-6 below. If the engineering record is correct the "fill rate" is 90.9% with 9.1% vacant; however there still remains 19.9% of the available lines that are non-revenue producing.

**Exhibit V-6
ARENTO
Lines In Service - Unaccounted For
Fiscal Year Ended June 30, 1992**

(Lines in thousands)	Switch Capacity Available	Lines In service	Fill %
Network Planning	2,350.7	2,120.3	
Adjustment for manual switches	177.0	177.0	
Total Network Planning	2,527.7	2,297.3	90.9
Financial Records	2,530.4	2,027.7	80.1
Unaccounted Difference	(2.7)	269.6	10.8

Causal considerations that may explain the 269.6 thousand unaccounted for lines include:

- Authorized Access not Recorded in the Financial Records

- Unauthorized Network Access
- Timeliness in Reporting New Service Connections

The implications of the 269.6 thousand unaccounted for lines include.

- **Oversizing Switch and Line Additions**
Timeliness in reporting new service connections would indicate that the Waiting List is overstated possibly by as much as 20+% (1,212,605/269.6); creating the possibility for oversizing switch and line additions.
- **Lost Revenue**
Authorized access not recorded, unauthorized access and delays in reporting new service connects results in Lost Revenue. During the billing process, reported usage on a line (local and national calls) cannot be matched with a billing record and is not billable in the current billing period. Further, ARENTO makes no attempts to re-bill the unmatched usage in the next subsequent billing period, resulting in Lost Revenue. Additionally, local service recurring (flat rate) and non-recurring (installation and connection fees) revenues are lost from unauthorized network access.
- **Increased Costs**
Increased billing costs are incurred when billing records are not timely updated.

b. Changes In Usage Levels

Major Findings

- *Local call volume above the call allowance has increased dramatically over the past six years; indeed call volume has been increasing at a rate of over 32% percent annually over this period.*
- *Even after the national toll rate increases in 1989 and again in 1991, national toll call volumes are increasing at about 17.7 percent a year, despite the fact that ARENTO line growth is 14 percent.*
- *International toll call volumes (both originating and terminating) are growing, but at a decreasing rate; similarly, call volumes per line are decreasing.*
- *Local usage is now consuming fully 98 percent of network utilization while generating only about 21 percent of the revenues.*

Despite blockages, local calls (above call allowance) have increased 32.3% annually for the past 6 years, with 14% line growth. Lines in service have increased 14.0% while call volume has increased 32.3% annually. Despite the blockages that ARENTO customers are experiencing local calls above the maximum call allowance continue to grow at a faster rate than net new lines added indicating that each customer is using the local network with increasing frequency.

National toll call volumes are increasing. National toll calls increased 17.7% annually despite two rate increases totaling 56% to 80% in 1989 and 1991. National toll usage is growing faster than access line growth of 14% indicating that as access spreads, the community of interest for subscribers enlarges and stimulates more toll traffic thus increasing the perceived value of network.

International toll call volumes per line are decreasing. International toll minutes of use has increased 13.2% annually over the past six years which has not kept pace with the increase in lines of 14% indicating that calls per/line are decreasing both originating and terminating minutes of use. Terminating minutes of use, which for 1992 constituted 77% of the usage, is subject to intense international price competition as shown in Exhibit V-7 below.

**Exhibit V-7
ARENTO Usage Levels**

(In Thousands)

	Local Calls	National Toll Calls	International Toll (Minutes)		
			Originating	Terminating	Total
1986	425,560	NA	NA	NA	149,039
1987	505,683	NA	NA	NA	162,340
1988	686,000	110,100	NA	NA	188,996
1989	996,492	124,980	40,325	175,692	216,017
1990	1,668,730	146,300	48,395	214,605	263,000
1991	1,842,759	170,800	56,147	223,139	279,286
1992	2,282,255	210,715	73,522	239,505	313,027
Compounded Average Annual Growth Usage	33.6%	17.66%	22.2%	10.9%	13.2%
Avg. Line Growth - Lines	14.0%	NP	30.2%	14.0%	14.0%

Local network usage is consuming 91% of network utilization while generating only 21% of the revenue is calculated in Exhibit V-8. As national and international toll call volume become increasingly subjected to normal market conditions i.e. supply, demand, price elasticity and competition, the cross subsidization of local network usage can not be sustained if ARENTO is to remain a financially sound organization.

**Exhibit V-8
ARENTO
Computed Switched Minutes of Use
Based On Completed Calls FY 1992**

	Unit of Measure	Units (In Millions)	Computed Minutes of Use (In Millions)	% of Total ¹	Revenue (LE)		
					Total Billed (in Thousand)	Per Minute	Per Call
Local Usage (NOTE A)							
AVG. max. (free)	call	1,930.600	5,567.8	41.600	145,148	0.026	0.080
above max.	call	2,282.300	6,582.1	49.200	114,113	0.017	0.050
Total local usage		4,212.900	12,150.0	90.800	259,261	0.021	0.060
National Toll (NOTE B)	call	210.715	885.0	6.610	121,323	0.140	0.588
International Toll	minutes	313.000	313.0	2.340	809,954	2.590	NP
Other							
Local telex	lines	-	-	-	8,536	-	NA
Local telegraph (NOTE C)	messages	12.900	19.4	0.146	6,782	.350	0.530
International telegraph (NOTE D)	word	30.100	.50	0.004	2,905	5.810	0.100
International telex	minutes	13.200	13.2	0.100	44,434	3.370	3.370
Total other		-	33.1	0.250	62,657	1.890	-
Total switched minutes of use (NOTE E)			13,381.1	190.758	1,253,195	0.094	

NOTE A: Each call unit is 2.884 minutes as an average

NOTE B: Each call unit is 4.2 minutes as an average

NOTE C: Assumed switched usage of 1 1/2 minutes per message

NOTE D: Assumed switch usage of 1 second per word

NOTE E: Switched minutes of use does not include:

- a) leased circuits
- b) cellular mobile
- c) television programming
- d) paging

2. Capacity Requirements and Service Operations

This section presents principle findings as well as attendant technical discussions relating to K&M's evaluation of ARENTO's existing capacity requirements and service operations. Six aspects of this detailed review have been selected for expanded discussion below. These include:

- (1) Availability of Timely Data to Technical Operations Decision Makers;
- (2) Trunk Blockages in the Cairo Junction Network;
- (3) Coordination of Central Office Equipment and Outside Plant Timing;
- (4) Repair Strategy and its Impact on Serviceability of Plant;
- (5) Exchange Operations; and
- (6) Need for Vertical Services Marketing.

a. Availability of Timely Data to Technical Operations Decision Makers

Major Findings

- *Almost all engineering and operational data with which ARENTO makes capital investment decisions is assembled manually.*
- *In addition, insufficient data is available on a timely basis to enable ARENTO decision makers to decide on whether to invest in additional junction circuits or outside plant, for instance.*
- *Accordingly, planning for Switch, Junction and Outside Plant relief could be dramatically improved through the implementation of integrated strategic planning in an effort to better match planned investments to changing needs.*

A major problem encountered in performing this subtask assignment was the uneven quality and consistency of data that is used by ARENTO to make operational and capital allocation decisions. Such data is acceptable when an organization is small and the demand is overwhelming; but as an organization grows as in the case of ARENTO where lines in service have doubled in each of the last three five-year planning cycles and are expected to double again in the next five years, more sophisticated tools are needed as ARENTO performs in a larger arena. In addition, the review of technical data in ARENTO was challenging. Almost all of the engineering and operational data upon which capital investment decisions are being made are administered manually, and consequently limit the decision makers' ability. Some say that the quality of the output on decision is only as good as the input data. In the case of allocations of millions of LE per year, an absence of good data input can be costly. While the decisions to date have been markedly worthy, the network is maturing and growing exceptionally in complexity. This means that the good decisions in the future will be more and more difficult to achieve. Conversely, less than good decisions will become more and more expensive over time.

Some of the data was not readily available because it was not used in day to day operations. Obviously, many decisions have been made in the past without the benefit of some of the details that the K&M team received. The questions on how much it costs to install a telephone and on how much it costs to handle a trouble report can never be accurately measured with the current cost allocation procedures. Perhaps that level of detail is not needed presently with the rush to meet unsatisfied demand. However, such cost details will be needed in the future when ARENTO moves to an extremely limited capital environment.

Information is data that has been organized into a useful and meaningful resource. Cost-effective management requires accurate timely information to make decisions. It is difficult for an engineer to determine whether to spend on additional junction circuits or additional outside plant cable pairs without knowing the proper information; or, in the case of junctions, what traffic is being carried during the busy hours of the day. This information is readily available instantaneously from all electronic switches, both analog and digital. For instance, outside plant reinforcement should be based on the cable occupancy rate or percentage fill. This information could be acquired instantaneously via COSMOS if outside plant plans existed showing the cables and counts in each feeder route. This information may not be necessary today to make good capital decision, but it will be mandatory as the backlog of unsatisfied request for service is met.

Another significant problem with manual records resides in the cost associated to gather the data and process it into information. This cost takes two forms: The times delay to gather the data when decisions might be needed immediately and the organizational cost of effort and people. The time delay problem could be as simple as a cut cable that has had a long history of poor service and a high number of defective pairs. If this information was readily available, then the decision to replace the defective and damaged section could be very quickly made. However, if the data resides in a non mechanized paper record, the cable is respliced and shortly thereafter replaced with a new cable. This effectively doubles the cost to ARENTO and subjects the subscribers to an additional service interception. In addition, processing manual data induces another form of cost as it is a "snapshot" in time. The effort that went into gathering and preparing the information must be renewed when the information is needed again. For managers that must make real-time operational decisions, this constant gathering of data with its inherent delay is inadequate and at times counterproductive.

Manually processed data has a large potential for human error. The more checks and rechecks placed on the procedures in an attempt to reduce human error, the less timely the data becomes; this renders less useful the information on which decisions must be made. In K&M's opinion, a more effective methodology would be to spend more effort on developing the necessary computer tools to provide the minimum information essential to decision making. This can be done on a management project basis and all personnel would then benefit from it for years to come. The only way to measure the technical performance of a network as it grows more complex is through the use of computer programs that can gather some of this information. As an example, reviewing the overflow in a trunk group from Maadi to New Maadi would enable the discovery that calls are being blocked. The only non-measurable way to detect such a problem today, is for customers to complain that they cannot call New Maadi from Maadi. This situation leads to revenue losses and makes subscribers unhappy.

The situation cited above has occurred in the past, and still exists today. The information is available, but the operations group or perhaps the trunk planning engineers are unaware of its existence. The COM Center has the information and revenues from call completions that have been lost. Other under-utilized trunks could be rerouted to achieve the cross section with trunk translations and jumpers in the equipment room. This would immediately produce additional revenue from completed call. Another example worth mentioning is where additional OSP pairs are terminated when the fill on occupation is below economical relief percentages. This appears to happen when old central office equipment is replaced and outside plant additions are planned as if it was growth job.

The most cost-effective methodology for collecting and processing data is to have a model that utilizes machine to machine data transfer. There are more initial first costs associated with this approach, however, the payback is totally accurate information available on a real time basis. One of the examples that would help ARENTO would be to have the Billing system computer get the new lines placed in service daily from the electronic switch. Today, the delay can now take up to one year. Perhaps potential revenues are not billed. In addition, computerized information can be accessed by decision makers as needed. If the system to capture the data is manual, the data can either be lost for ever or prepared and not used. Both are not cost effective. Results can be generated and distributed to insure peak performance. Finally, some data is required to keep the computerized planning models current. With mechanized updates the decision maker of ARENTO will be able to more cost effectively provide improved services without over-building or under-signing the network. This will shift the capital expansion allocation to allow the same investment to produce more revenue.

b. Trunk Blockages in the Cairo Junction Network

Major Findings

- *The present design of high usage trunk circuits between central offices is not sufficient today based upon a 10.0 percent blockage criterion, and 0.5 percent for final routes.*
- *An analysis of the tandem to tandem circuit reveals that fully 60 percent of the groups have busy hour blockage; in addition, since these routes carry final route traffic, this means that all such calls blocked at the tandem also become lost calls.*

In undertaking its assessment of available point-to-point traffic data, K&M reviewed the Transport Network for Cairo to determine the level of service and cost efficiency of the existing network. The primary vehicle for analysis was to evaluate a point-to-point traffic study conducted by ARENTO in late 1992. An overview summary is presented below in Exhibits V-9 and V-10. K&M also evaluated switching and trunking data from the Centralized Operations and Maintenance Center (COM Center).

These reviews indicate that the design of high usage trunk circuits between central offices based on calling patterns and final routes to the tandems with 0.5% blockage is not sufficient for the network that exists today. While the initial design may have been proper, the calling patterns of subscribers have shifted significantly. As a result, ARENTO presently is losing significant revenues from these busy-hour blockages. Customers are having to attempt to call

again, further exacerbating the problem by adding more call attempts to a network that is already blocked.

An analysis of the tandem to tandem circuits reveals that fully 60% of the groups have busy hour blockage as illustrated in Exhibits V-11 and V-12 below. Since these routes carry final route traffic, the call completions are extremely low. These tandem circuits also carry the higher revenue traffic, compounding the impact of lost revenues.

Analytical highlights from these exhibits indicate that:

- Of the 109 trunk groups going from the Cairo exchanges to the tandems, 52 or 49% are blocked during busy hour.
- Of the 154 trunk groups coming from the Cairo tandems, 60 or 39% are blocked during busy hour.
- Of the 10 trunk groups going between tandem offices in Cairo, 6 or 60% are blocked during busy hour.
- Of the 4 trunk groups going from the Cairo II National tandem to the tandems, 4 or 100% are blocked during busy hour.

**Exhibit V-9
Summary of Trunk Groups Going to the Cairo Tandem Exchanges**

Tandem Exchange	# Trunk Groups Blocked	Total # Trunk Groups
RAMSIS	4	21
ABBASIA	6	17
RAMSIS II	12	28
ABBASIA II	19	20
CAIRO II (NATIONAL)	12	23
TOTAL	53	109

**Exhibit V-10
Summary of Trunk Groups Going from the Cairo Tandem Exchanges**

Tandem Exchange	# Trunk Groups Blocked	Total # Trunk Groups
RAMSIS	2	36
ABBASIA	8	37
RAMSIS II	23	36
ABBASIA II	9	20
CAIRO II (NATIONAL)	18	25
TOTAL	60	154

Exhibit V-11
1992/1993 Point to Point Traffic Study for Cairo Tandems

	To C.O.	Ramsis	Abbasia	Ramsis II	Abbasia II	Cairo II
RAMSIS	CKTS IN SVC		168	310		264
	CKTS NEEDED		99	351		173
ABBASIA	CKTS IN SVC	216		94	144	96
	CKTS NEEDED	86		101	176	49
RAMSIS II	CKTS IN SVC	262	95		360	95
	CKTS NEEDED	278	122		209	35
ABBASIA II	CKTS IN SVC		72	360		120
	CKTS NEEDED		99	217		15
CAIRO II (NAT)	CKTS IN SVC	180	72	96	120	
	CKTS NEEDED	215	95	120	139	

"CKTS IN SVC" is the number of trunk circuits in service.

"CKTS NEEDED" is the number of busy hour trunk circuits needed to achieve the designed blockage of 0.5%.

Observations:

- 6 of 10 trunk groups between tandems are blocked.
- 4 out of 4 trunks from the national tandem to Cairo tandems are blocked.
- Because the tandems are used as a final trunk route all calls that are blocked at the tandem are lost calls.

Conclusions:

1. Relieving the tandem trunks is not the permanent solution.
2. Studying the traffic to seek out small high usage routes to take unnecessary traffic out of the tandems is the long term solution to relieving the tandems and providing better service at a reduced cost to ARENTO.

Exhibit V-12
1992/1993 Point to Point Traffic Study for Cairo - Summary

From Office	Need Additional			Excess Capacity			Trunks
	Trunks	%	LE	Trunks	%	LE	In Svc.
RAMSIS_1/2	180	10%	20,700	913	51%	104,995	1,790
RAMSIS_3/4	85	5%	9,775	516	29%	59,340	1,774
BAB EL LOUK	133	6%	15,295	436	21%	50,140	2,060
MAADI I	68	4%	7,820	615	34%	70,725	1,806
MAADI II	71	6%	8,165	403	33%	46,345	1,233
HELWAN	18	1%	2,070	874	58%	100,510	1,504
ZAMALEK	368	21%	42,320	523	30%	60,145	1,735
GIZA_1	49	3%	5,635	893	48%	102,695	1,862
GIZA_3	17	2%	1,955	322	39%	36,973	830
PYRAMID	26	2%	2,990	690	47%	79,350	1,479
OPERA_1/2	0	0%	0	797	58%	91,655	1,369
OPERA_3/4	57	4%	6,555	794	62%	91,310	1,271
SHARABIA	5	2%	575	69	29%	7,935	238
RODA_1 & 3	0	0%	0	1,945	99%	223,675	1,963
RODA_E	62	4%	7,130	440	30%	50,600	1,476
DOKKI_1/2	131	7%	15,065	1,029	53%	118,335	1,929
DOKKI_E	0	0%	0	1,843	97%	211,945	1,891
EL MOHANDESSIEN	139	6%	15,985	401	18%	46,115	2,280
EL FAWALA	18	1%	2,070	604	28%	69,460	2,177
SHOUBRA_3/4	29	1%	3,335	1,512	69%	173,880	2,202
SHOUBR EL KHEM	25	1%	2,875	717	40%	82,455	1,806
ALMAZA_1/2	227	11%	26,059	888	45%	102,120	1,989
ALMAZA_E	151	9%	17,365	246	15%	28,290	1,681
HELIOPOLIS_1	151	5%	17,365	1,066	35%	122,590	3,032
HELIOPOLIS_2	97	5%	11,155	433	21%	49,795	2,046
QUALIUB	235	44%	27,025	291	55%	33,465	530
KANATER	10	3%	1,150	178	54%	20,470	330
ABBASSIA_1/2	34	2%	3,910	1,071	49%	123,165	2,195
ABBASSIA_E	183	11%	21,045	335	19%	38,525	1,732
NASR I_1/2	49	3%	5,635	685	39%	78,775	1,748
NASR I_E	226	12%	25,990	118	6%	13,570	1,834
EL KUBBA	139	6%	15,985	488	20%	56,120	2,477
EL MATARIYA	105	7%	12,075	208	14%	23,920	1,461
EXCHANGE TOTAL	3088	6%	355,074	22,343	40%	2,569,388	55,730
RAMSIS TANDEM	41	1%	4,715	1,546	46%	177,790	3,372
ABBASSIA TANDEM	76	4%	8,740	887	41%	102,005	2,149
ARM TANDEM	14	2%	1,610	445	53%	51,175	836
NEW TAR CAIRO II	296	17%	34,040	40	2%	4,600	1,722
RAMSIS 2 TANDEM	330	13%	37,950	309	12%	35,535	2,572
ABB 2 TANDEM	285	17%	32,775	380	22%	43,700	1,695
TANDEM TOTAL	1042	8%	119,830	3,607	29%	414,805	12,346
GRAND TOTAL	4130	6%	474,904	25,950	38%	2,984,193	68,076

44% of the trunks in Cairo are mismatched to load. ARENTO has spent LE 2,509,289 in over-engineering trunks in Cairo.

c. Coordination of Central Office Equipment and Outside Plant Timing

Major Findings

- *Significant additional revenues are possible through simply working Waiting List orders where central office and switch facilities are already available but the service has not been installed; revenues to be expected from local service installation for all 35, 581 Waiting List customers are estimated at approximately LE 7.4 million annually.*
- *In addition to losing revenue from an investment already in place, such an extensive Waiting List has begun to undermine consumer confidence in ARENTO's ability to provide quality service at current tariff rates.*

When there is a mismatch of the timing of relief facilities, the ability to serve customers is adversely affected. Furthermore, revenue is lost since the subscribers cannot be put in service and billed. Currently, ARENTO's primary reason for subscribers being placed on the Waiting List is the lack of central office facilities. Secondly, the Waiting List is blocked due to a lack of OSP cable pairs. In general, the lack of cable pairs is due to the following factors:

- The lack of enough cable pairs to work the demand;
- The cable pairs are not allocated to the areas where the demand is located; and
- The absence of defective pair administration will cause the waiting list not to be worked when sufficient cable pairs have been provided.

This situation is a potentially costly problem. The OSP engineers provide pairs for growth in anticipation of a central office relief job in the future. When the central office is cut into service and the waiting list is attempted to be worked, the extra cable pairs have been used to clear customer fault reports. This circumstance continues to cause ARENTO to provide more cable pairs than needed and delays the provisioning of service.

A review of the automatic exchanges in Egypt reflects another concern. There appears to be an administrative delay in coordination to work the waiting list. This problem was first identified in a review of the data from these exchanges compiled by K&M. A summary table of this data is provided below as Exhibit V-13.

Exhibit V-13
Waiting List Highlights for Specific Exchanges

<u>Specific Exchange</u>	<u>Switch Size</u>	<u>Cable Pairs</u>	<u>In Service Lines</u>	<u>Waiting List</u>	<u>Available</u>
Meneuf	8,000	14,100	4,098	2,387	2,387
Qweisna	7,000	13,660	4,985	1,454	1,315
10th Ramadan	10,000	16,500	6,917	949	949
Sohag	6,000	14,000	4,221	2341	1,179
Taha Nowb	1,000	2,400	334	699	566
El Syoof	20,000	34,000	5,795	27,680	12,205
Side Karia	4,000	7,400	1,410	274	274
Assuit I	10,000	16,000	6,922	6,778	2,078
Shoubra	54,000	91,000	47,596	23,421	1,004
Damietta	25,000	46,500	21,382	13,775	1,118
Kafr El Batekh	2,000	4,200	800	858	858
New Damietta	2,000	8,400	220	800	800
El Suez	20,000	29,200	13,956	10,945	4,044
Ismailia	25,000	42,000	19,450	15,122	3,050
Kafr El Sheik	12,000	22,500	8,259	5,825	2,541
Ashmon	4,000	9,900	1,980	1,213	1,213
TOTAL	210,000	371,760	148,325	114,521	35,581

The Waiting List by Years of Wait was obtained from the computerized records. In many cases the numbers on the Waiting List are lower than those used to plan and design the network. Coupled with the variation discussed in the financial review, the Waiting List may be much less than the 1,212,605 stated in the Total Summary of Exchange Demands and Planned Growth for All Zones (Exhibit V-14). The Waiting List by Years of Wait could be cut from 12 years to 6 years by providing facilities for 56,220 lines, in only 10 Cairo exchanges. See Exhibit V-15.

The conclusion to be drawn from these materials is that where there are central office lines and cable pairs available, coordination is still needed to work the service and that Waiting List orders are completed in a timely manner. The lack of working service causes ARENTO to lose revenue from an investment already made and put in service.

Summary of Exchange Demand and Planned Growth for All Zones

ZONE	EXIST INST LNS (000)	PLANNED SWITCH EXPANSION (000)					PLANNED REPLACEMENTS (000)					LINES END OF PLAN (000)	TERMINATED PAIRS	LINES IN SERVICE	LINES IN SERVICE (000)	WAIT LIST (000)	TOTAL DEMAND (000)
		IN 93	IN 94	IN 95	IN 96	IN 97	IN 93	IN 94	IN 95	IN 96	IN 97						
ALEXANDRIA	364.9	76	70	132	91	24	2	2.5	29	47	2	675.4	544,600	58,864	328,529	185,695	514,224
ASSUTT	45.6	12	7	5	2	0	0	3	0	0	68.6	71,300	0	41,238	17,953	59,191	
ASWAN	27	0	2	11	0	0	0	0	5	0	35	34,800	0	23,906	4,063	27,969	
BENISUEF	24	0	14	3	1	0	0	6	0	0	36	42,100	0	22,843	6,754	29,597	
CAIRO	1109.964	429	306	401	120.2	124	161	51.7	103.464	44	27	2103	1,608,333	168,898	1034,231	629,504	1663,735
DAMANHOUR	59	5	10	0	4	11	0	0	0	0	89	109,200	0	51,019	23,117	74,136	
DAMIETTA	49	2	0	17	3	9	0	0	0	0	80	88,800	0	37,924	21,808	59,732	
EL ARISH	21	0	0	0	0	2	0	0	0	0	23	37,000	0	17,978	0,549	18,527	
EL SUEZ	29.9	0	8	0	17	0	0	5	0	0	49.9	55,300	0	21,280	16,662	37,942	
FAYOUM	19	10	1	1	0	0	0	0	0	0	31	37,600	0	16,802	11,695	28,497	
GHARDAKA	13	0	10	0	0	0	0	4	0	0	19	16,200	0	7,501	5,440	12,941	
ISMAILIA	31	9	12	0	7	0	0	0	0	0	59	51,900	0	24,620	19,490	44,110	
KAFR EL SHEIK	38	58	0	0	0	0	37	0	0	0	59	74,000	0	33,056	14,083	47,139	
LUXOR	13	15	1	0	0	1	9	0	0	0	21	16,800	0	11,845	5,818	17,663	
MANSOURA	74	15	0	51	31.8	16	12	0	10	3	162.8	123,000	0	64,244	62,650	126,894	
MEHALLA	22	0	0	30	0	0	0	0	0	0	52	44,200	0	21,152	14,797	35,949	
MINIA	36	13	24	3	1	0	5	5	0	0	69	66,400	0	35,405	12,360	47,765	
MONOFIA	50.2	20	8	21	4	0	13	0	12.2	0	78	90,690	0	37,346	16,363	53,709	
PORT SAID	49	0	7	25	0	0	0	2	7	0	72	57,900	0	42,010	19,682	61,692	
QUALIOBA	38	0	0	0	20	0	0	0	0	0	58	50,100	0	28,396	10,694	39,090	
QUENA	23	8	11	4	2	0	3	0	0	0	45	39,600	0	21,550	9,986	31,536	
SOHAG	33	2	5	10	6	5	3	0	0	6	52	63,600	0	29,458	13,102	42,560	
SUBURBAN	38.13	26.216	0	38.104	1	2	4	0.85	4	0	96.6	66,020	0	31,913	32,786	64,699	
TANTA	61	10	38	3	0	0	0	4	0	0	108	90,600	0	56,891	24,158	81,049	
ZAGAZIG	82	2	23	6	10	17	0	0	0	0	140	118,100	0	77,590	33,396	110,986	
TOTAL OF ALL ZONES	2350.694	712.216	557	761.104	324	211	249	85.05	170.664	100	29	4,282	3,598,143	227,762	2118.727	1212.605	3331.332

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Exhibit V-15
Samples of Waiting List by Year for Cairo Exchange

EXCHANGE/YEAR	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	TOTAL
Abbassia									12921	7008	2982	1594	5931	30436
Nasr (1)									8903	5609	2047			16559
Nasr (2)									1173	1528	740			3441
Shoubra							2898	4290	2633	4370	122	4		14317
Sharabia									4333	4625	5625	7961		17544
Shoubra El Kherna							2929	7412	7133	9410	5362	2902		35148
Qualioub														0
Nawa														0
Kanater														0
Heliopolis														0
Matarna										7804	5459	3562		16825
Nozha								440	9208	1214	7525	1924		20311
Salam City								761	881	955	955	714		4266
Khanka					1709	1663	1430	1520	1500	1392	3437	3090		6527
Marg						1138	381			3145				11349
Alamaza									1828	1736	2303			4664
Sheraton (Matar)											867			867
Kobba								7835	5423	3353	3362	2943		22916
Ramses										2458	1459	775		4692
Opera				60	1238	1106	1404	1512	2741	1483	1361	847		11752
Kalaa										2478	2736			5214
Talaat Harb									1758	972	581			3411
Mohandeseen						11398	7557	3681	2537	528				25701
Imbaba														0
Dokki										2132	130			2262
Zamalek														0
Bolak El Dakroul								1609		4694	3123			9426
Giza			2262	1521	1093	1414	1773	1531	1227					10821
El Haram	1319	1304	3872	3706	3139	3343	2781	1968	2281	968				24701
Marotia								421	3550	4666				8637
Bab El Louk														0
Roda						6555	4241	3247	1447	463				15953
Dar El Salam							996	3442	1810					6248
Maadi (1)							3005	3334	3648	3061	545			13593
Maadi (2)							2922	2875	3255	1718				10770
Helwan Garden				887	951	1034	1030	1063	479	468				5912
Helwan				1759	1454	1400	1774	1556	398					8341
Tebbin										344				344
15th May						875	754	672	698	218				3217
Total	1319	1304	6134	7933	9604	29926	35875	49169	81765	78800	52076	22196	5931	382032

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d. Repair Strategy and Its Impact on Serviceability of Plant

Major Findings

- *The current Fault Report Rate is excessive leading some subscribers to conclude that ARENTO service is unreliable and therefore not a good value; in this regard, fully 79 percent of subscribers monitored have at least one fault per year.*
- *Defective pairs are not currently being administered or reported by the Facility Control Center, thereby creating uncertainty for OSP engineers as to the number of pairs needed to work Waiting List orders.*

The Facility Control Center is a centralized repair service bureau that operates in three Cairo wire centers. More wire centers are being added since the November 1992 data evaluated here. This vital process is the best way to insure that customer service is provided in a cost effective manner. The management reports provide insight to the local loop and set repair procedures. Omitted from this process is the administration of defective pairs.

With respect to serviceability of plants and network, defective pairs are a true difficulty to every telephone organization. They affect the ability to provide service in a timely manner and cause additional capital expenditures beyond that level required to provide basic service. ARENTO's network is relatively new and the cable is generally serviceable. However, the OSP is growing older each day and the problem of defective pair administration will only get worse with time if thorough action is not taken now.

In an effort to get a better understanding of ARENTO service and repair practices, especially for cable maintenance operations, K&M undertook a thorough review of Facility Control Center (FCC) data comprised of:

- Initial test results,
- Reported faults versus repaired faults,
- Number of customers with repeated faults, and
- Initial test result analysis of repeat faults for the month of November 1992.

Excerpts from this data are presented in Exhibits V-16 through V-19. In November 1992, there were 122,326 lines administered in the FCC and 8,031 line faults were tested in the same month. This signifies that there is the potential to add 8,031 defective pairs or 6.6% of the working lines into the network each month. If this rate continued for the entire year, then 79% of the working lines could be defective during one year.

Exhibit V-16
Summary of Test Results
for Mohandeseen, Dokki, and Zamalek
November, 1992
Facility Control Center Data

Do73: Initial Test Results

Codes	Week 1	Week 2	Week 3	Week 4	Month
Good Line	447	469	514	515	1945
Bad Line	2189	2215	2213	1414	8031
No Initial Test	462	414	423	210	1509
No Code or Wrong Code	5	4	9	11	29

Exhibit V-17
Summary of Reported Faults
for Mohandeseen, Dokki, and Zamalek
November, 1992
Facility Control Center Data

Reported Faults Versus Repaired

Exchanges	Reported Faults	Working Lines	Wk Lns Summary	Faults/100	Repaired Faults	Tested "OK"	Not at Home	No or Wrong Codes
Mohandeseen EWSD	1,347	8,226		16.37	1,079	106	133	29
Mohandeseen EWSA	4,961	38,271		12.96	2,920	1,551	383	107
Mohandeseen Total	6,308	46,497	52,463	29.33	3,999	1,657	516	136
Dokki EWSA	3,092	38,080		8.12	1,911	831	285	65
Dokki ARF 102	1,624	19,130		8.49	1,004	420	165	35
Dokki Total	4,716	57,210	58,517	16.61	2,915	1,251	450	100
Zamalek AESS	853	18,619	16,071	4.58	636	137	34	46
Totals	11,877	122,326	127,051	50.52	7,550	3,045	1,000	282

The repair situation has a very important impact on the quality of customer service. In November 1992, the FCC reported that 41% of the troubles received in that month had recently been reported with faults. This represents a significant portion of the repair work load and should be monitored closely.

**Exhibit V-18
Number of Customers
With Repeated Faults
November, 1992
Facility Control Center Data**

Do12: Repeat Faults

Exchanges	X1	X2	X3	4 or More Faults	Total	Total	% Repeated Faults of Total Faults
	1 Fault	2 Fault	3 Fault		# Repeats	# Faults	
Mohandeseen EWSD	307	119	49	44	519	1,273	41%
Mohandeseen EWSA	1,233	540	249	258	2,280	4,336	53%
Dokki EWSA	674	245	106	101	1,126	3,319	34%
Dokki ARF 102	361	116	39	30	546	1,727	32%
Zamalek AESS	148	45	13	11	217	837	26%
Totals	2,723	1,065	456	444	4,688	11,492	41%

**Exhibit V-19
Summary of Test Results
of Repeated Faults
November, 1992
Facility Control Center**

Initial Test Result Analysis of Repeat Faults

Exchanges	No Code	Test OK	Found OK	Not At Home	Other Codes	Total Faults
Mohandeseen EWSD	15	43	44	45	372	519
Mohandeseen EWSA	60	617	97	192	1,314	2,280
Dokki EWSA	33	254	93	97	649	1,126
Dokki ARF 102	14	134	73	53	272	546
Zamalek AESS	15	26	47	15	114	217
Totals	137	1,074	354	402	2,721	4,688

As a final comment, the repair situation forces close coordination with OSP engineering to insure that valuable cable pairs are available to work service. There have already been several instances where delays have been encountered in working the waiting list orders when the Engineers provided facilities that were later found to be defective. The defective pairs are not kept in the COSMOS database.

e. Exchange Operations

Major Findings

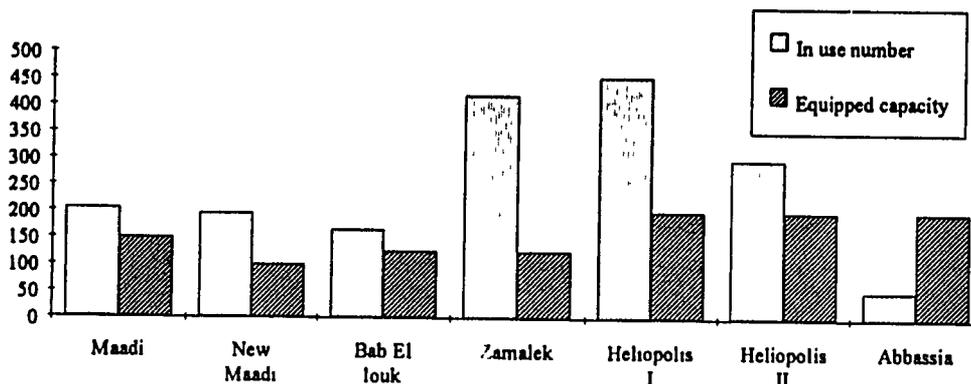
- *Call Waiting demand is presently three times higher than existing equipped capacity in several analog exchanges causing potential revenue to be forgone.*
- *Exchange switching technicians who will be responsible for ultimately maintaining the switch over time are not presently allowed to be trained by either the vendor or ARENTO implementation team prior to the end of the warranty period.*

K&M undertook a review of ARENTO exchange generations to get a better understanding of both the quality of current vertical services being offered by ARENTO and the status of maintenance after ARENTO accepts a newly installed exchange from a vendor. Each of these areas is discussed in turn below.

In providing quality vertical services, the Central office administration must continually review the technical performance of the switch to insure that electronic offices are performing properly. Vertical services by ARENTO offered through the SA ESS offices have exceeded the equipped capacity and customers have been told that they will be put on a waiting list for custom calling features. This situation is summarized in Exhibits V-20 through V-26 below for related exchanges. These exhibits reflect the number of custom calling features in service. The in service lines are more than equipped since this is a time slice of processor time. The service provided is not of the same quality as if the designed capacity had not been exceeded. The source of the data is Centralized Operations and Maintenance Center, Cairo.

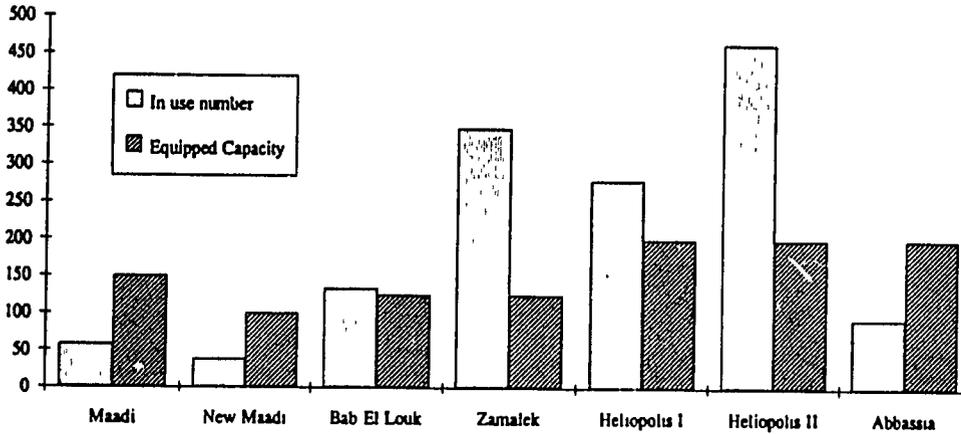
**Exhibit V-20
Calls Waiting**

	Maadi	New Maadi	Bab El Louk	Zamalek	Heliopolis I	Heliopolis II	Abbassia
In use number	205	196	165	419	454	298	52
Equipped capacity	150	100	125	125	200	200	200



**Exhibit V-21
Follow Me**

	Maadi	New Maadi	Bab El Louk	Zamalek	Heliopolis I	Heliopolis II	Abbassia
In use number	58	38	133	349	280	465	93
Equipped Capacity	150	100	125	125	200	200	200



**Exhibit V-22
Conference Calls**

	Maadi	New Maadi	Bab El Louk	Zamalek	Heliopolis I	Heliopolis II	Abbassia
In use number	68	49	31	134	29	28	9
Equipped Capacity	150	100	125	125	200	200	200

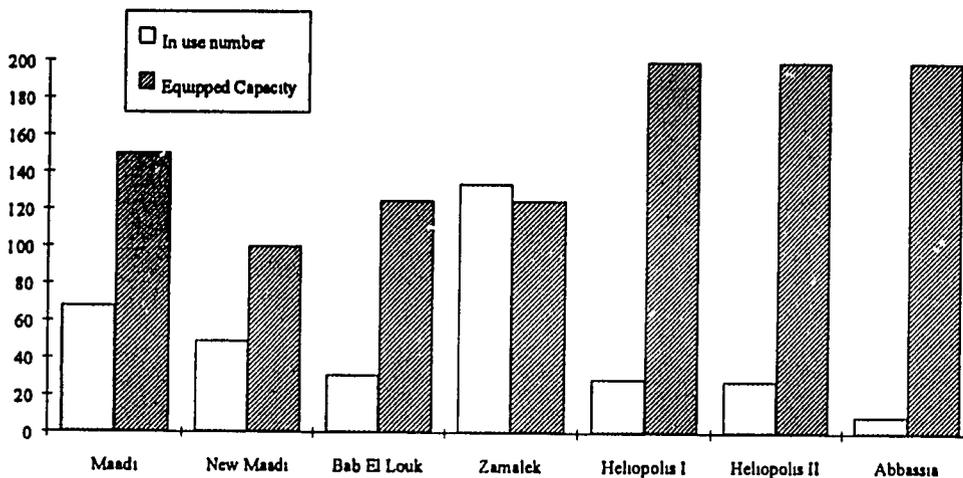


Exhibit V-23 Wake Up Calls

	Maadi	New Maadi	Bab El Louk	Zamalek	Heliopolis I	Heliopolis II	Abbassia
In use number	20	7	20	46	45	48	17
Equipped Capacity	150	100	125	125	200	200	200

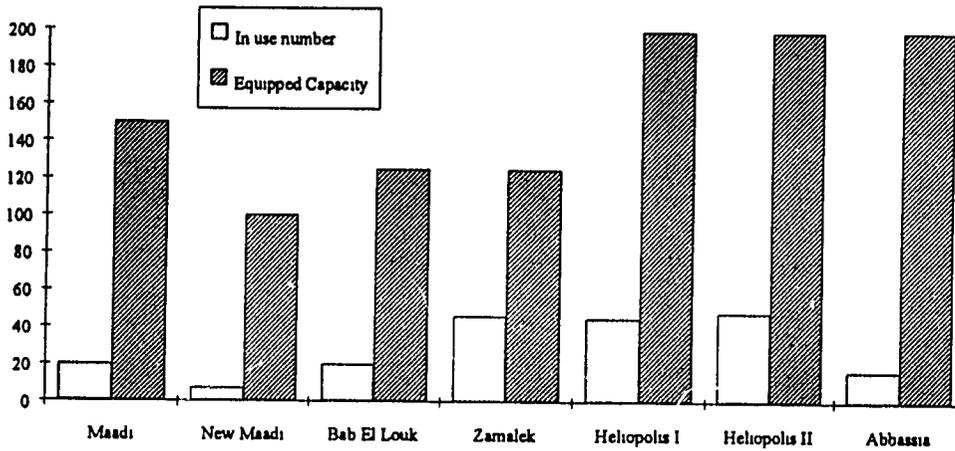
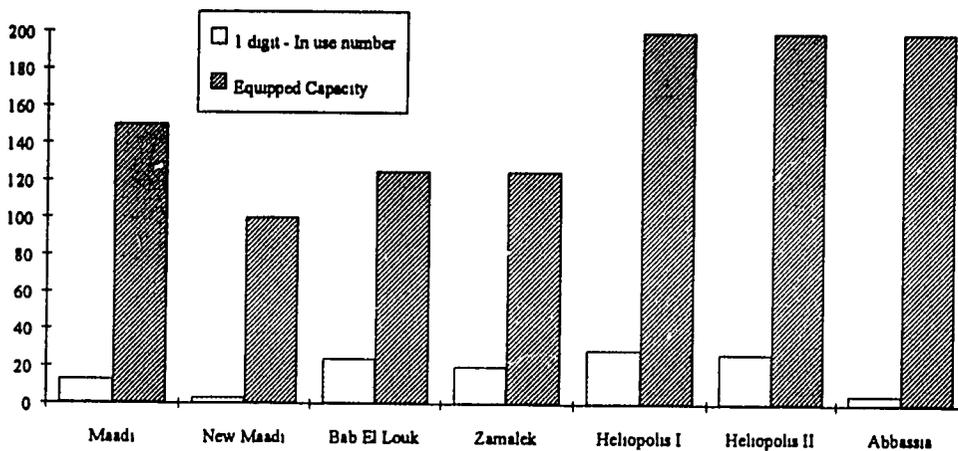


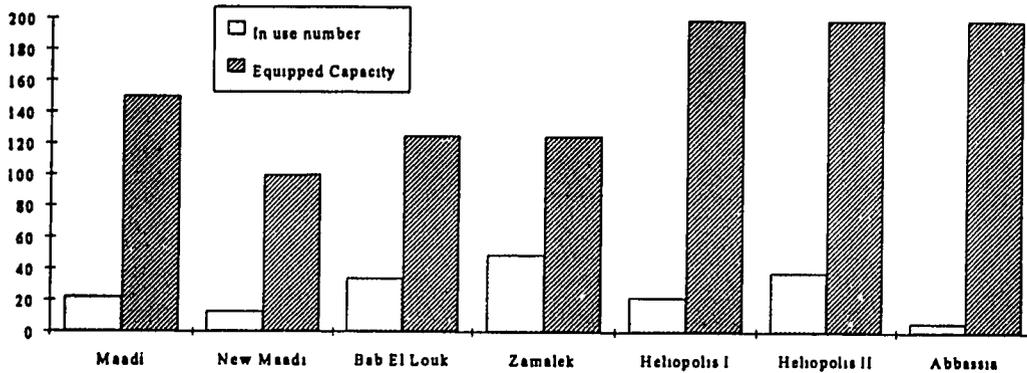
Exhibit V-24 Speed Dialing - 1 Digit

	Maadi	New Maadi	Bab El Louk	Zamalek	Heliopolis I	Heliopolis II	Abbassia
In use number	13	3	24	20	29	27	5
Equipped Capacity	150	100	125	125	200	200	200



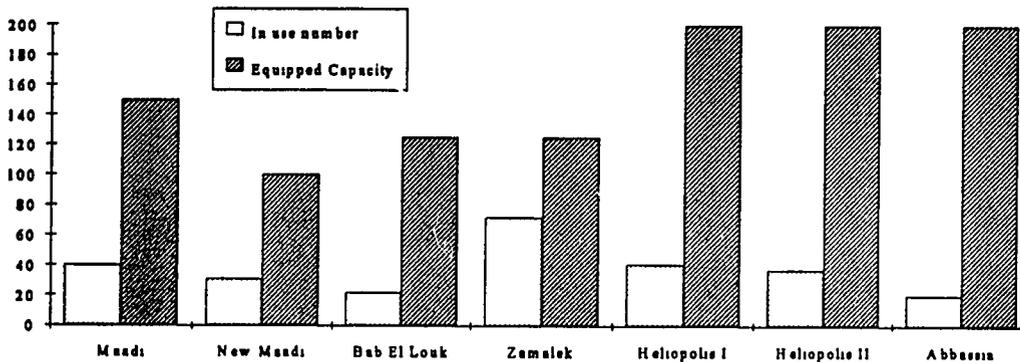
**Exhibit V-25
Speed Dialing - 2 Digits**

	Maadi	New Maadi	Bab El Louk	Zamalek	Heliopolis I	Heliopolis II	Abbassia
In use number	22	13	34	49	22	38	6
Equipped Capacity	150	100	125	125	200	200	200



**Exhibit V-26
Speed Dialing - 1 & 2 Digits**

	Maadi	New Maadi	Bab El Louk	Zamalek	Heliopolis I	Heliopolis II	Abbassia
In use number	40	31	22	72	41	37	20
Equipped Capacity	150	100	125	125	200	200	200



In the general area of maintenance and operations after installation, the ARENTO Project Execution and Implementation Organization accepts the newly installed exchange and works with the vendors' personnel during the Provisional Acceptance to Final Acceptance time frame. After this interval they turn the maintenance of the exchange to the ARENTO Maintenance and Operation Organization. This situation is unusual in that two separate groups of personnel must be trained to operate and maintain the same type of exchange equipment. The personnel who gain the early experience, such as the ARENTO technicians working with the vendors' personnel in the newly installed exchanges, are moved out and are replaced with technicians from the Maintenance & Operations Organization. This practice results in having inexperienced personnel maintaining the exchange after final acceptance.

The exhausting of switch capacity under scores the pressing need to improve coordination between Operations and Engineering. The organizational structure to support Strategic and Integrated Planning will help ARENTO.

f. Need for Vertical Services Marketing

Major Findings

- *ARENTO is presently losing revenue by not marketing and installing additional vertical services such as Call Waiting and Speed Dialing.*
- *ARENTO does not currently encourage customer habits that have the potential for reducing ARENTO's overall cost of providing basic service to customers; for example, Touch Tone can create central office equipment savings and Call Waiting can reduce trunking costs and requirements.*

In its review of ARENTO business operations and practices, K&M could find no evidence of either an active marketing effort to sell additional vertical services or plans to implement such a revenue enhancing activity. In K&M's view, the marketing of vertical services can be tailored to achieve ARENTO's goals of improved service at a reduced cost. Call waiting can reduce the cost of providing trunks and switches since the calls will be completed on the first attempt. Trunks will not need to be sized for multiple attempts. Another example of marketing that would relieve the trunk network and improve revenues would be to market hunting or rotary groups to small multi-line businesses. Not only would ARENTO raise the level of service by completing a higher percentage of calls, but would produce more revenue from completed calls and the charge for the business service.

3. Overall Investment Strategy

K&M conducted a detailed review of ARENTO's overall investment strategy over time as it related to the allocation of capital resources for design, construction and operation in three areas intended to improve the provision of services to ARENTO's customers. These areas included:

- (1) Junction Investment;
- (2) Switching Investment; and
- (3) Outside Plant Investment.

The effectiveness of this investment in each of these areas is discussed in turn below.

a. Effectiveness of Investments in the Junction Network

Major Findings

- *The existing trunking configuration is severely mismatched to present calling patterns thereby negatively impacting both service and revenue per line as well as costing more than would normally be required to provide the same level of service; in this regard, junction circuits appear to have been over-*

built by at least 25,590 lines thereby resulting in an unnecessary cost equal to LE 2,984,293.

- *The exiting design of the junction network is also inadequate due to recent changes in calling patterns and the continued use of obsolete X-Bar offices; in the Bab El Louk exchange for instance, fully 10,161 call attempts per day failed because all trunks were busy.*
- *Call completion rates are consistently low, and call routing is still inefficient resulting in lost revenues per line.*

The junction network in Cairo is provided through fiber optic and microwave. A summary of the existing fiber optic network is presented below in the Exhibits V-27 through V-30. The existing transport network of multiplexers is also reflected. As indicated in these exhibits, there are already 104,938 circuits in the Cairo area on the fiber optic network. These circuits are carried on 5,032,458 meters of fiber. The details are reflected below.

**Exhibit V-27
Multi Mode Fiber Optic Cables : (American System - 24 Channels)**

Cairo Area

Destination	Circuits	1.5 MBS Sys.	45MBS SYS.	# 90 MBS	FO RATE	Dist.- KM
RAMSIS - SHOUBRA	3,360	140	5	2.5	90	3.970
RAMSIS - ABBASIA	3,360	140	5	2.5	90	4.510
RAMSIS - HELIOPOLIS	2,688	112	4	2	90	13.946
ABBASIA - KUBBA	1,344	56	2	1	90	6.577
ABBASIA - NASR CITY	672	28	1	0.5	90	7.340
KUBBA - RAMSIS	2,016	84	3	1.5	90	11.365
HELIOPOLIS-ABBASIA	672	28	1	0.5	90	9.158
RAMSIS - NASR CITY	2,016	84	3	1.5	90	12.128
RAMSIS - OPERA	3,360	140	5	2.5	90	1.440
RAMSIS-BAB EL LOUK	2,688	112	4	2	90	1.740
RAMSIS - RODA	2,688	112	4	2	90	4.310
RAMSIS - DOKKI	3,360	140	5	2.5	90	5.100
RAMSIS - ZAMALEK	2,016	84	3	1.5	90	4.950
BAB EL LOUK-RODA	672	28	1	0.5	90	3.500
GIZA - RAMSIS	2,016	84	3	1.5	90	7.700
GIZA - RODA	672	28	1	0.5	90	3.010
MAADI - RODA	1,344	56	2	1	90	9.980
MAADI I - MAADI II	1,344	56	2	1	90	3.110
MAADI - RAMSIS	2,016	84	3	1.5	90	14.680
PYRAMID - RAMSIS	1,344	56	2	1	90	11.450
PYRAMID - RODA	672	28	1	0.5	90	6.750
MAADI II - RAMSIS	1,344	56	2	1	90	17.790
MAADI II - RODA	672	28	1	0.5	90	13.090
HELWAN - RAMSIS	1,344	56	2	1	90	25.580
HELWAN - RODA	672	28	1	0.5	90	20.880
TOTAL	44,352	1848	66	33	2250	224.054

Single Mode Fiber Optic Cables: Siemens Eqpt (30 Channels)

Cairo Area

Destination	Circuits	2 MBS Sys.	70 MBS SYS	#140 MBS	FO RATE	Dist. - KM
KANATER - RAMSIS	660	22	0 65	0 32	140	40 486
KANATER-SHOUBR. EL KHEMA	450	15	0 44	0 22	140	19 129
KANATER-QUALIUB	60	2	0 06	0 03	140	9.993
QUALIUB - RAMSIS	660	22	0 65	0 32	140	32 237
QUALIUB-SHOUBR. EL KHEMA	450	15	0 44	0 22	140	10 88
QUALIUB - NAW.	480	16	0 47	0 24	140	7 167
SHOUBRA - RAMSIS	2100	70	2 06	1 03	140	4
SHOUBRA-ABBASIA	1080	36	1 06	0 53	140	17 225
SHOUBRA-SHOUBR. EL KHEMA	1650	55	1 62	0 81	140	8 92
SHOUBRA-SHARABIA	480	16	0 47	0 24	140	3.1
SHARABIA-RAMSIS	1440	48	1 41	0 71	140	4 257
SHARABIA-ABBASIA	1080	36	1 06	0 53	140	3 176
SHARABIA-SHOUBR. EL KHEMA	1410	47	1 38	0 69	140	9.469
MATARIA-RAMSIS	600	20	0 59	0 29	140	16 33
MATARIA-ABBASIA	810	27	0 79	0 40	140	11 542
MATARIA-SHOUBR. EL KHEMA	210	7	0 21	0 10	140	5.5
MATARIA-HELIOPLIS	240	8	0 24	0 12	140	9 388
MATARIA-MARG	120	4	0 12	0 06	140	4
MATARIA-KUBBA	120	4	0 12	0 06	140	6.388
KUBBA-RAMSIS	570	19	0 56	0 28	140	12 788
KUBBA-ABBASIA	570	19	0 56	0 28	140	6.158
KUBBA-SHOUBR. EL KHEMA	540	18	0 53	0 26	140	11 888
KUBBA - NASR 1	90	3	0 09	0 04	140	7.018
KUBBA - NASR 2	120	4	0 12	0 06	140	5
KUBBA - ALAMAZA	60	2	0 06	0 03	140	10 2
KUBBA-HELIOPLIS	120	4	0 12	0 06	140	3
HELIOP - RAMSIS	1080	36	1 06	0 53	140	13 946
HELIOP - ABBASIA	900	30	0 88	0 44	140	9.158
HELIOP - ELSALAM	120	4	0 12	0 06	140	20 842
HELIOP - NOZHA	90	3	0 09	0 04	140	7 634
HELIOP - ALAMAZA	60	2	0 06	0 03	140	4
HELIOP - ELMARG	60	2	0 06	0 03	140	13 388
NASR 1 - RAMSIS	510	17	0 50	0 25	140	12.128
NASR 1 - ABBASIA	330	11	0 32	0 16	140	7 34
NASR 1 - OPERA	60	2	0 06	0 03	140	11
NASR 1 - KALAA	60	2	0 06	0 03	140	15 8
NASR 1 - NASR 2	120	4	0 12	0 06	140	5
NASR 1 - ALAMAZA	90	3	0 09	0 04	140	2.7
NASR 2 - RAMSIS	960	32	0 94	0 47	140	17.128
NASR 2 - ABBASIA	930	31	0 91	0 46	140	12 34
NASR 2 - ALAMAZA	120	4	0 12	0 06	140	1 74
NASR 2 - KALAA	60	2	0 06	0 03	140	20 8
GIZA - RAMSIS	1590	53	1 56	0 78	140	7 7
GIZA - ABBASIA	1320	44	1 29	0 65	140	12 21
GIZA - PYRAMID	180	6	0 18	0 09	140	3 75
GIZA-PYRAMID WEST ELMARYOTEYA	660	22	0 65	0 32	140	5 8
GIZA - RODA	90	3	0 09	0 04	140	3 01
GIZA - OPERA	90	3	0 09	0 04	140	8.543
GIZA - OMRANIA	90	3	0 09	0 04	140	5
GIZA-MOHAND SEEN	90	3	0 09	0 04	140	7 1
PYRAMID - RAMSIS	1590	53	1 56	0 78	140	12 7
PYRAMID - ABBASIA	1200	40	1 18	0 59	140	15 96
PYRAMID-PYRAMID WEST ELMARYOTEYA	480	16	0 47	0 24	140	2.05
PYRAMID - IMBABA	60	2	0 06	0 03	140	13 85
PYRAMID - RODA	60	2	0 06	0 03	140	8
PYRAMID-MOHANDESEEN	60	2	0 06	0 03	140	10 85
PYRAMID - OPERA	60	2	0 06	0 03	140	12.293
MAADI - KALAA	540	18	0 53	0 26	140	9.8
MOKATEM - KALAA	16	480	14 12	7 06	140	10

Single Mode Fiber Optic Cables: Siemens Eqpt (30 Channels) - Continued

Calro Area

Destination	Circuits	2 MBS Sys.	70 MBS SYS	#140 MBS	FO RATE	Dist. - KM
MOHAND -RAMSIS	930	31	0 91	0 46	140	8.500
MOHAND -ABBASIA	750	25	0.74	0 37	140	13.182
MOHAND -IMBABA	270	9	0 26	0 13	140	2 917
MOHAND -GIZA	90	3	0 09	0 04	140	7.100
MOHAND -PYRAMID	60	2	0 06	0 03	140	10 850
MOHAND -OPERA	60	2	0 06	0 03	140	10 050
IMBABA-RAMSIS	1,440	48	1 41	0 71	140	12.500
IMBABA-ABBASIA	960	32	0 94	0 47	140	17 182
IMBABA-PYRAMID WEST ELMARYOTEYA	90	3	0 09	0 04	140	13.767
OMRANIA-RAMSIS	510	17	0 50	0 25	140	12 700
OMRANIA-ABBASIA	420	14	0.41	0 21	140	17 210
RODA-RAMSIS	660	22	0 65	0 32	140	4 700
RODA-ABBASIA	480	16	0 47	0 24	140	9 382
NOZHA-RAMSIS	840	28	0 82	0 41	140	23 431
NOZHA-ABBASIA	750	25	0 74	0 37	140	18 634
NOZHA EL SALAM	120	4	0 12	0 06	140	15 696
NOZHA-KUBBA	60	2	0 06	0 03	140	10 634
ALAMAZA-RAMSIS	420	14	0 41	0 21	140	14 988
ALAMAZA-ABBASIA	300	10	0 29	0 15	140	10 200
ALAMAZA-EL SALAM	90	3	0 09	0 04	140	27 330
ELKHANKA-RAMSIS	570	19	0 56	0 28	140	32.330
ELKHANKA-ABBASIA	480	16	0.47	0 24	140	27 542
ELKHANKA-ELSALAM	60	2	0 06	0 03	140	8.700
ELKHANKA-ELMARG	60	2	0 06	0 03	140	12 000
ELMARG-RAMSIS	510	17	0 50	0 25	140	20.330
ELMARG-ABBASIA	420	14	0.41	0 21	140	15.542
ELSALAM-RAMSIS	900	30	0 85	0 44	140	39.126
ELSALAM-ABBASIA	480	16	0 47	0 24	140	34 338
ELSALAM-SHOUBR EL KHEMA	30	1	0 03	0 01	140	38 218
10 RAMADAN-RAMSIS	960	32	0 94	0 47	140	62.479
TOTAL	43,666	1,935	56.91	28.46	12,460	1,154.357

Exhibit V-29

Single Mode Fiber Optic Cables: Ant. Eqpt. (30 channels)

Destination	Circuits	2 MBS Sys	70 MBS Sys	#140 MBS	FO RATE	Dist.- KM
ELMARYOTEYA-RAMSIS	2,880	96	2.82	1.41	140	14.750
ELMARYOTEYA-ABBASIA	2,400	80	2.35	1.18	140	19.432
IMBABA-RAMSIS	600	20	0.59	0.29	140	12.500
IMBABA-ABBASIA	480	16	0.47	0 24	140	17.182
RAMSIS-ABBASIA	480	16	0.47	0 24	140	4.682
BOULAK ELDAKROR-RAMSIS	600	20	0.59	0.29	140	9.275
BOULAK ELDAKROR-ABBASIA	480	16	0.47	0.24	140	13.957
(ELMATAR)-RAMSIS	600	20	0.59	0.29	140	21.172
(ELMATAR)-ABBASIA	480	16	0.47	0.24	140	16.384
HELWAN GARDEN-RAMSIS	600	20	0.59	0.29	140	25.425
HELWAN GARDEN-ABBASIA	480	16	0.47	0.24	140	30.107
DAR ELSALAM-RAMSIS	600	20	0.59	0.29	140	12.832
DAR ELSALAM-ABBASIA	480	16	0.47	0.24	140	17.514
BAB ELKHALK-RAMSIS	1,920	64	1.88	0.94	140	6.300
BAB ELKHALK-ABBASIA	1,920	64	1.88	0.94	140	10.982
MAADI-RAMSIS	1,920	64	1.88	0.94	140	14.700
TOTAL	16,920	564	16.59	8.29	2240	247.194

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Exhibit V-30
Cairo Area
Fiber Optic Cables (11.3.92)

	# FIBERS	LENGTH	FIBER METERS		MANUFACTURER
			IN PLANT	ROUTE #	
KANATER - AGHOUR	8	10,600	84,800		SIEMENS SOE
QUALIUB - KANATER	8	9,993	79,944	428	SIEMENS
QUALIUB - SHOUBRA EL KHEMA	8	10,880	87,040	426	
QUALIUB - NAWA	4	7,167	28,668	429	
SHOUBRA EL KHEMA - MATARYAH	8	5,501	44,008	315	
SHOUBRA EL KHEMA - MATARYAH	8	5,500	44,000		SIEMENS SOE
SHOUBRA EL KHEMA - SHOUBRA	12	8,920	107,040	314	
SHOUBRA EL KHEMA - SHARABIA	12	9,469	113,628	423	
SHARABIA - EL ZAWIA EL HAMRA	12	5,000	60,000		
SHARABIA - RAMSIS	8	4,257	34,056	423	
RAMSIS - ABBASIA	12	4,682	56,184	001	
SHARABIA - ABBASSIA	8	3,176	25,408	424	
RAMSIS - ABBASSIA	12	4,788	57,456	311	
ABBASSIA - OPERA	20	5,126	102,520	403	A.N.T.
ABBASSIA - OPERA	12	3,500	42,000		
ABBASSIA - KUBBA	20	8,000	160,000		
ABBASSIA - MATARYAH	12	6,577	78,924	316	
ABBASSIA - MATARYAH	12	4,965	59,580	316	SIEMENS
HELIOPOLIS - NOZHA	12	7,634	91,608	422	
NOZHA - EL SALAM	8	15,696	125,568	422	
HELIOPOLIS - KUBBA	20	3,000	60,000		A.N.T.
KUBBA - ABBASSIA	20	8,000	160,000		
KUBBA - ABBASSIA	12	6,158	73,896	421	SIEMENS
KUBBA - 10TH RAMADAN	16	59,779	956,464	2	
ABBASSIA - NASR CITY	12	7,500	90,000	404	A.N.T.
NASR CITY - ALAMAZA	8	2,700	21,600	404	
NASR CITY - NEW NASR CITY	8	6,000	48,000		
NEW NASR CITY - ALAMAZA	8	1,740	13,920		
ALAMAZA - SHERATON	12	16,223	194,676	404	
ALAMAZA - HELIOPOLIS	12	4,000	48,000		
RAMSIS - SHOUBRA	8	12,437	99,496		SIEMENS
RAMSIS - SHOUBRA	20	4,000	80,000		
RAMSIS - DOKKI	20	5,100	102,000	401	A.N.T.
RAMSIS - RODA	20	4,700	94,000		
RAMSIS - MASPIRO	8	1,928	15,424	T.V.	SIEMENS
RAMSIS - BAB EL LOUK	20	1,740	34,800		A.N.T.
RAMSIS - FAWALA	8	1,380	11,040	310	SIEMENS
RAMSIS - OPERA	8	1,405	11,240	313	
RAMSIS - OPERA	8	1,441	11,528	T.V.	
OPERA - MOKATEM TV	8	6,279	50,232	T.V.	
OPERA - FAWALA	8	903	7,224	313	

**Cairo Area
Fiber Optic Cables (11.3.92) - Continued**

	# FIBERS	LENGTH	FIBER METERS		MANUFACTURER
			IN PLANT	ROUTE #	
OPERA - EL KALAA	12	4,800	57,600		A.N.T.
OPERA - EL KALAA	12	4,835	58,020	405	
EL KALAA - MOKATEM	8	10,000	80,000		
EL KALAA - DAR EL SALAM	12	6,000	72,000		A.N.T.
DAR EL SALAM - MAADI	12	5,000	60,000		
DAR EL SALAM - RAMSIS	8	11,357	90,856		
DAR EL SALAM - RODA	8	3,200	25,600	402A	
DAR EL SALAM - RODA	20	4,000	80,000		
RODA - GIZA	20	3,000	60,000		
GIZA - OMRANIA	8	5,000	40,000	406	
GIZA - PYRAMID	10	5,800	58,000		
WEST PYRAMID - OMRANIA	12	13,500	162,000		
BOLAK EL DAKROUR - RAMSIS	4	8,833	35,332	401B	
DOKKI - MOHANDESSIEN	6	3,400	20,400		
DOKKI - IMBABA	6	3,400	20,400		
IMBABA - RAMSIS	6	10,099	60,594	401C	
MAADI - NEW MAADI	8	3,123	24,984	402D	
MAADI - HELWAN GARDEN	4	10,900	43,600	402D	
HELWAN GARDEN - RAMSIS	4	25,425	101,700		
NEW MAADI - SATTELITE STATION	8	1,500	12,000	402D	
NEW MAADI - RAMSIS	8	25,425	203,400		
TOTAL CAIRO FIBERS	676	466,441	5,032,458		

The fiber optic cable allows the expansion of the junction network with the addition of low speed cards and, if necessary, additional terminal equipment to virtually increase the junction circuits without practical limits. There is some multi-mode fiber in plant. Care should be given to not exceed its limited design bandwidth. There is capacity to achieve fiber loops in the junction network by bundling trunk groups into expanded small High Usage trunk groups.

The 1992/1993 Point to Point Traffic Study for Cairo shows that due to shifts in calling ARENTO now has 25,950 trunk circuits over provisioned or 2,984,293 LE. This is 38 percent of the total provisioned trunk circuits. This number assumes a 0.5% busy hour blockage. If the design uses a High Usage blockage of 10%, then the trunks would be over provisioned by an additional 25%. This figure assumes the average trunk group size of 90 circuits. This technique should provide enough capacity to place the High Usage trunk groups where needed.

Consistency problems also exist which severely limit the proper capital expansion. For example, the Maadi to New Maadi shows 16 fibers in one schematic and 20 in another.

The point-to-point traffic studies furnished to K&M by ARENTO reflected the trunk groups between Cairo metropolitan offices. The data was manually recorded and it appears that most trunks are sized to carry a much higher traffic load that they are actually carrying. Also, some

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of the trunks are carrying more traffic than they are designed to carry with 0.5 percent blockage. Therefore, the net effect is a blockage rate ranging from 5 to 10 percent blockage. This is proper design if the high usage trunk versus final route tandem is properly utilized. However, the blockage in final route calls represents lost calls and lost revenue. The trunk groups going to the tandems as final routes must not be allowed to rise above the 0.5 percent designed blockage level. This would be achieved through Trunk Administration. By analyzing each call going to the tandem network to see if the volume justified the addition of High Usage group. This is a continuing process. Calling patterns of subscribers constantly change. This shift in calling patterns is amplified with the addition of new subscribers at the rate ARENTO projects in the 5 year plan.

In addition, the trunk or junction planning is not a dynamic process and must be. For example the Maadi to New Maadi trunk has been at 8% over flow at busy hour since September 1992 without relief. The New Maadi to Shoubra 1&2 carries 3.1 Erlangs (equivalent of 9 junctions) when it was designed for 13.25 Erlangs (equivalent of 24 junctions). This comes into play when:

- There is no linkage from the operations data and the trunk planning; and
- The new central office area is cut in service without historical calling pattern data.

Many LE could be saved and used for Central Office Equipment and Outside Plant expansion by using high usage final groups with the tandem being the final route. Then the junctions could be economically grown as the calling patterns developed and service is cut into the switch. This would allow revenue to be gained for each LE of investment instead of spending money that will not produce revenue for several years. Moreover, calling patterns have shifted since the original design resulting in 25,950 trunk circuits being over-provisioned at an additional cost of LE 2,984,293.

In the area of High Usage trunks groups, ARENTO currently has Centralized Operations and Maintenance centers (COM Centers) in Cairo and Alexandria for Stored Program Control exchanges and a national Network Operations Center (NOC) in Cairo. Phase II expansion of the centers has been authorized and is currently in progress. The COM Centers have centralized Switching Control Centers (SCC) to provide efficient maintenance of the SPC exchanges. The SCC have engineers for the analysis and control of trunk and junction translations. The SPC exchange measurements are broken down into three categories: Traffic measurements, plant measurements and service measurements.

These measurements summarize events that have taken within the exchange. Scheduling and printouts of measurement data are controlled by stored program.

Traffic, plant, and service measurements consist of the following types:

- **Peg Count:** A cumulative count of the number of times a specific event occurs during a given interval.
- **Overflow:** A cumulative peg count during a given time of the number of call attempts that failed to seize a member of a specified group of facilities because no idle member was available.

- Usage: A measure of the total amount the members of a group of facilities are busy during a given interval.

Traffic measurements are primarily used for engineering purposes and exchange administration, provide the current status of the exchange as well as external resources such as junctions and trunks. Traffic measurements also provide a means to evaluate the load offered by subscribers to the usage-sensitive components of the SPC exchange.

Plant measurements provide data to identify problem areas and evaluate exchange and technician performance. They also evaluate the impact of troubles on subscriber service. Plant measurements are divided into the following categories:

- Base: Plant base measurements provide counts of service requests, billing volumes, and equipment quantities.
- Plant service: Plant service measurements provide counts of subscriber service-affecting events related to the maintenance condition of the SPC exchange.
- Performance measurements: Plant performance measurements provide counts of events that, regardless of the effect on service, can be related to the maintenance condition of the exchange.

Service measurements evaluate the quality of telephone service given to the subscriber. The main emphasis is on service interruptions, such as, calls that fail to be switched, calls that switch but fail to reach the talking state due trunk or junction failures, and calls in the talking state that fail because of facility or exchange equipment cutoffs.

ARENTO's network operations are constrained by inefficient call routing patterns that are limited by patchwork configuration of multiple vendor's local, transit and tandem exchange equipment. The local exchange equipment used in the network is divided among fifteen varieties of exchange equipment from eight different vendors as illustrated in Exhibit V-31 below. Many of the individual exchanges are interconnected, based on direction provided by the various vendors over time. The resulting inefficiencies in how calls are routed contributes to lower call completion and requires additional facilities.

**Exhibit V-31
Survey of Local Exchange Equipment**

Equipment Designation	Vendor	ARENTO Administrative Capacity	Type Technology
1A ESS	AT&T	40K Lines	Analog Spc
5 ESS	AT&T	60K Lines	Digital Spc
ARF	Ericcson	20K Lines	Em X-Bar
ARE	Ericcson	20K Lines	Em X-Bar
ARM	Ericcson	4K Circuits	Analog Spc
AXE	Ericcson	60K Lines	Digital Spc
E 10 A	Alcatel	60K Lines	Digital Spc
E 10 B	Alcatel	60K Lines/Ckts	Digital Spc
11 F	Thomson	40K Lines	Analog Spc
C 400	Hitachi	20K Lines	Em X-Bar
PRX	Philips	3K Lines	Mobile Analog
MOBILE	NEC		Mobile Digital

With respect to charging and accounting, the #5 ESS provides two charging methods, detailed accounting and bulk metering. Both methods may be used in the same exchange for different types of traffic, for example, bulk metering for local and border zone area calls, while detailed accounting may be used for long distance or toll calls. With detailed accounting, a record is made for each call. Files containing the data can be written to magnetic tape locally or sent to a billing center using a data link. Bulk metering allows (periodic) charge units to be accumulated in software registers that may be provided for each subscriber. The 255 different tariff identity capability allows the bulk metering rate to be determined on a source and destination of the call and on day of the week and time of day.

All local stored program control exchanges have the equivalent ability to record local message unit calls, multi-message unit, national calls and international calls using the local accounting equipment or to forward the data to a centralized billing location. The electromechanical exchanges, which use hardware registers, do not have the capability of local accounting and must continue using separate trunk routings for charging purposes as required.

The trunk groups going to the X-Bar offices account for a significant number of blocked calls. As shown Exhibit V-32 below, 10,161 calls per day are lost in the Bab El Louk exchange. If this happens in each of the 51 Cairo exchanges, then 567,415,210 calls will be lost annually. This would equate to an annual loss of revenue of 28,370,761 LE. Customer satisfaction is negatively impacted by this level of service.

**Exhibit V-32
Call Failure Analysis for Bab El Louk**

All Trunk Busy Peg Count From the COM Center Outgoing Calls to the Network From 15/6/93 11:22:30 to 17/6/93 9:45:54

Exchange	Equipment	Trunk Group #	All Trunks Busy # of Failures
SHOUBRA_B_Q	ARF	200	760
SHORBRA	ARF	201	396
NASR_1_2	ARF	202	936
DOKKI_1_2	ARF	203	3012
ABBASSIA_1_2	ARF	208	1920
RAMSIS_1_2	ARF	212	4095
HELWAN_TEBBIN	ARF	214	1643
ALMAZA_1_2	ARF	215	976
GIZA_1_2	ARF	216	965
PYRAMID_1_2	ARF	217	723
OPERA_1_2	ARF	218	1245
OPERA_3_4	ARF	219	867
RODA_1	ARF	220	1235
RADA_3	ARF	221	870
Number of Calls Lost In the Period			19643
Number of Days In Study Period			1.933263889
Number of Lost Calls Per Day			10,161

Finally, the use of an inherent local call recording capability for billing purposes would eliminate the need to establish a final trunk or junction on a call charging (toll or message unit) basis, as is the case today, and establish the trunk and junction routes solely on traffic requirements. This routing change would result in savings in exchange equipment, transmission equipment provisioning and in the automated billing process. Additional revenues would be derived from the elimination of the "Modified Karlsson Principle" charging delay on call answer and disconnect. This delay may provide as much as eleven (11) minutes plus of unbilled conversation time. Moreover, the early retirement of the remaining electromechanical exchanges would also enhance revenues and the successful call completion ratios of the stored program control exchanges.

b. Effectiveness of Switching Investments

Major Findings

- *The present lack of switching capacity is the primary reason for the current Waiting List making continued deployment of digital switching technology in ARENTO's investment plan a high priority.*
- *Better coordination and timing in the area of switch deployment can reduce ARENTO's future per line cost of providing services.*
- *Insufficient planning for land and buildings at both Maadi and Gleem have forced expensive alternative methods for providing line growth at these two exchanges.*
- *ARENTO currently limits digital office capacity to 60,000 lines resulting in switching costs that are between LE 167 and 500 per line more than they need to be.*
- *Current installed X-Bar equipment is negatively impacting the network through call failures, lost revenues and continued subscriber numbering confusion.*
- *Additional expenses of making area transfers can be avoided through expanded use of Remote Switching Systems.*

The ultimate plan for switch deployment for the Central Offices was developed several years ago. To date, this plan has served ARENTO well in achieving unprecedented growth. It employs a forecasting technique that is the vehicle to determine the future lines for exchanges and serving areas. The plan generally determines the placement of future switches where growth is anticipated in Cairo. This plan has given ARENTO the tools to cost effectively determine the placement of Central Offices. However, full advantage of this plan has not been incorporated into the execution. Too much money is consumed with constant area transfers. This capital expense does not produce revenue and increases the marginal costs. Consideration should be given to acquiring the land for new building before the future area is built up and the land is more expensive. The land can be utilized to house Remote Switching Modules before there is enough demand to justify a full digital office.

Early acquisition land upon which to place a building to house the ultimate switching equipment required to serve a geographical area is the single most significant cost efficient thing any telephone organization can do. The second requirement is that the land be large enough to house the ultimate switch requirements. This has been a costly concern for ARENTO both with Gleem and Maadi as examples where numerous area transfers were required to meet the requirements over time. Close coordination with Government and builders is required to achieve this goal. ARENTO must be willing to spend the money now to acquire the land so that the costs will be saved in the future. With the advent of the Remote Switching Module technology from every major vendor, this concept makes ever more sense. A small building can be designed to house a RSM with the capability to be expanded as the need for additional service dictates. When the demand is large enough, an in service cut can upgrade the switch to a full digital office. Then there will be no need for costly second Central Office buildings such as those that have occurred at Maadi and Gleem.

Another requirement to provide cost-effective telecommunications for the future is that the building must be large enough to accommodate the ultimate growth for the serving area without area transfers. This logic would be expanded to at least plan for an ultimate office when a RSM is placed. The ultimate building may not be built at this time, but provisions would be in the design of the building to allow it to be expanded when the office equipment needed to grow. All area transfers are expensive and very disruptive to service. The capital expense to affect the transfer is wasted Outside Plant money compared to the cost of growing from a small office to a larger one. This expense increases greatly if the area to be transferred does not have feeder distribution interfaces.

ARENTO is also paying a large cost penalty by not growing the electronic analog offices past the administrative size of 40,000 lines. This is the case with the Heliopolis offices. The decision to spend the millions of dollars for an additional digital central processor should be based on the actual call carried by the office compared to the designed capacity of the switch. In addition, also, the decision to limit the size of the digital central offices to 60,000 lines is also a very costly one. The size of the offices is determined by busy hour calling patterns, not the number of subscribers connected. In a digital office where the mix of customers is primarily residential, the number of subscribers approaches 200,000.

When using RSM to provide new central office service, provisions should be made to have the offices be upgraded to full digital offices as growth demands. The first step would be to provide a trunk group other than to the host. This fiber optic connection could then be used to alternate route the umbilical back to the host office thus increasing reliability. In this regard, Stored Program Control systems manufactured by AT&T have a design capacity significantly exceeding the administrative capacity assigned by ARENTO Planning Organization, i.e., analog local exchanges 40,000 lines, digital local exchanges 60,000 lines.

There are other considerations in addition to cost that can enter into the ultimate sizing decision. Factors such as reliability, social considerations and environmental reasons might be considered. There are currently 7 exchanges in Cairo which are planned to be larger than 60,000 lines by the end of the current five-year plan. In addition, strong consideration should be given to the cost penalty of having multiple switches in the same exchange. Moreover, the use of the manufacturers' rated call capacity would permit the expansion of the local Stored Program Control local exchanges without degrading customer service. There are numerous larger than 40,000 lines 1A ESS exchanges operating in metropolitan environments around the

world . The 5ESS local exchange capacity is stated as rated Busy Hour Call capacity. Rated call capacity is defined as that load which the processor can sustain indefinitely while still allowing all performance criteria to be met. This capacity supports normal maintenance personnel operations with sufficient processor reserve capacity for maintenance and administrative functions, fault recovery, and load demand peaking. It is expressed in terms of completed calls per hour. The 5 ESS exchange, equipped with 5E8 generic program provides the following rated call completions per hour capacities:

- **POTS Mix 600k Calls**
- **Metro Mix 350k Calls**

Call Mix refers to the different types of call traffic that the exchange handles and determines the quoted capacity of an exchange. A variable amount of real time is required to process different call types. Processing complex calls requires more real time than processing ordinary calls. A metropolitan call mix consists of complex calls that require more real time and represents a heavy business usage local exchange environment.

As a final comment on this topic, local exchanges manufactured by vendors other than AT&T also have equivalent design criteria that may permit the expansion of their local exchanges. The use of the manufacturer's design criteria to expand the existing exchange would provide additional lines at a minimal cost.

Errors in the manual posting of the exchange, junction, trunk and similar records have also contributed to the overall problem. ARENTO currently has a Centralized Operations and Maintenance centers in Cairo and Alexandria. Additional COM Centers are currently being installed to accommodate the #5 ESS exchanges. There is also a national Network Operations Center (NOC) in Cairo. The NOC expansion is included in the current five year plan. There is an Engineering and Administrative Data Acquisition System (EADAS) located at the NOC. The EADAS is a minicomputer-based, real-time traffic data collection and reporting system. It requests the traffic output from the Stored Program Control exchanges at predefined time intervals. EADAS collects traffic data, performs calculations, generates exception and summary surveillance reports. EADAS also formats and distributes data for use by downstream systems such as exchange equipment reports. The traffic reports generated for any exchange can be routed via a data link to a central location. The EADAS writes the collected data on magnetic tape for further processing. This data can be used to generate weekly, monthly, or busy-season reports for engineering and administrative purposes.

The current design criteria limit the capacity of the analog electronic central offices has been artificially limited to 40,000 lines. This is well below the serviceable limits of the manufacturer's recommendations for call carrying capacity. In this regard, the limit of the switch size should be determined by the number of busy hour calls and not lines terminated. Similarly, the ultimate economical capacity and sizing of the switch must be based on the specific characteristics of the calling patterns of the customers served by that COE. While K&M supports the decision not to expand the existing analog switches, the newer digital switches of all manufactures should probably be expanded to recommended maximum size. Moreover, the same limiting of the COE is applied to the Digital Electronic offices where the size is limited to 60,000 lines. Again this is well below the manufacture's guidelines that are based on the call carrying capacity. It is not uncommon for the 5 ESS to have over 200,000 lines in the united states.

To prove the point that such artificial limits can lead to increased costs, K&M reviewed the history of switching capacity expansions at Heliopolis where it had significant prior working knowledge and experience. In the historical development of this exchange, one 1A ESS was capped at 40k lines, a second 1A ESS was capped at 40k, and now a 20k 5 ESS is being installed. The cost penalty of the central unit of the DSS along with the frame, generators and equipment needed to start up an exchange is reflected in the costs analysis below in Exhibit V-33. In addition to the switch cost penalty the trunking network complexity and cost are increase three fold.

**Exhibit V-33
Approximate Costs of a 5 ESS Digital Switch**

Lines	Cost (\$)	\$/Line	Incremental Costs
20,000	\$5,000,000	\$250	\$250
30,000	\$6,000,000	\$200	\$100
40,000	\$7,000,000	\$175	\$100
50,000	\$8,000,000	\$160	\$100
60,000	\$9,000,000	\$150	\$100

Growing the switch beyond the current administrative capacity which has been artificially set by ARENTO a 60,000 lines can reduce incremental costs per line even though approximately \$300,000 in additional generating and support equipment will be required. Such costs are much less expensive than adding a second DSS in the same location. As illustrated above, growing the switch will cost roughly \$100 per line whereas adding a new switch of 20,000 line capacity will cost \$250 per line plus additional trunking requirements and expenses. As in the trunk analysis, to achieve full return on the investment the marginal cost of providing the equivalent service must be a consideration in a constrained capital environment.

Turning to outmoded switching equipment, X-Bar switching equipment causes many negative impacts on the ARENTO network. The call failure shown in Bab El Louk earlier was significant. There is also a negative impact on the numbering plan. For instance, a National Telephone Number for Egypt presently consists of a maximum of 9 digits. However, in Cairo and Alexandria, a mixed 6 & 7 digit subscriber numbering scheme is used, while in the other zones a 6 digit number is used. The early retirement of the remaining electromechanical exchanges in Cairo and Alexandria would permit the introduction of a uniform 7 digit numbering scheme in these zones. This would provide an opportunity to increase the quantity of available exchange codes. In this regard, the current Engineering plan provides for replacing the 259,000 X-Bar lines in the first year of the five-year plan as illustrated in Exhibit V-34 below.

**Exhibit V-34
Proposed Schedule for Replacing X-Bar Lines**

Plan Year	1992/1993	1993/1994	1994/1995	1995/1996	1996/1997
X-Bar Lines Replaced	136,000	10,000	76,000	10,000	27,000

RSMs are not currently being use to avoid or minimize area transfers. The RSM uses the same type of hardware and software as the host switching modules. Digital transmission facilities connect the RSM and its host, allowing control information to be exchanged as well as providing voice paths. During normal operation, the RSM operates essentially like any other

switching module. However, the RSM provides additional software that enables it to operate if control links to the host switching module fail. This stand-alone function greatly increases the reliability of telephone service and continuity of revenue. The RSM can share the normalized office code designation of the host 5ESS switch the wire center is within the same rate area. If the wire center is not within the same rate area a dedicated normalized office code separate from the host must be assigned.

The RSM is connected over a digital transmission facility using either metallic facilities, radio links, coaxial line, microwave or over an optical link. The number of equipped digital transmission facilities (DS1s) between the RSM and its host is primarily determined by traffic characteristics. A minimum of two separate digital line routings are recommended to provide reliable transport to the host, the regular and protect routings, this arrangement provides a self healing network to increase reliability.

A single module RSM can provide service to a maximum of about 500 subscriber lines with a concentration ratio of 10:1. This number assumes no trunks and no optional equipment such as announcement machines that require trunk units. When trunking and optional equipment are included, a more realistic maximum is approximately 3500 lines for the single RSM. The multi module RSM consists of two to four RSMs connected to each other by dedicated DS1 links. These RSMs must be collocated within a few hundred feet, approximately one hundred meters, of each other in the same building. Each RSM is also connected to a host switching module at the #5 ESS Switch by dedicated DS1 links. When trunking and optional equipment are included, the multimodule RSM can serve over 14,000 lines with a concentration ratio of 10:1. The multimodule RSM has an optional stand-alone capability. In this configuration, all of the RSMs are linked together and work as a unit to perform stand-alone call processing. As presented in the Exhibit V-35 below, in the plan year 1992/1993 in Cairo there are 55,499 working lines transferred to other central offices. The outside plant cost of these area transfers could have been avoided by using RSM earlier.

**Exhibit V-35
Cairo Area Transfer Lines In 1992 / 1993**

Receiving Exchange	From Exchange	Lines In Use	Lines Waiting
El Zawia Elhamra	Abbassia	9,392	15,488
Rod El Farg	Shoubra	8,344	3,526
	Ramsis	2,300	6,780
Ain Shams	Heliopolis	4,000	5,000
	El Matariya	12,363	16,553
Maadi III	Maadi I	15,323	6,739
El Warak	Imbaba	1,627	8,141
Kerdasa	El Mariotayah	1,344	1,339
Shoubramant	El Mariotayah	806	655
El Omrania	Pyramid		
TOTAL		55,499	64,221

Finally, the existing twenty-year switching plan needs to be reviewed and updated to incorporate the technological improvements which have occurred since the plan was developed (about 7 years ago). This plan must be integrated with Junction and Outside Plant Plans to achieve maximum service improvement for the available capital. For instance, recent

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Investment changes made by ARENTO in 1991 designed to increase the use of RSMs have produced savings sufficient to provide service to approximately 28,000 additional subscribers. However, these savings could be increased further if RSMs were also utilized to avoid costs associated with area transfers.

c. Effectiveness of Investments in Outside Plants

Major Findings

- *In some instances, outside Plants provisioning delays are causing difficulties in reducing the Waiting List even though new switching capacity has already been installed and paid for; in addition, expensive switching equipment is sitting idle and not producing revenue;*
- *The increasing number of defective pairs in the network is beginning to negatively impact completion of service list customers;*
- *K&M agrees with ARENTO that it is not cost-effective to use Digital Loop Carriers in urban areas such as Cairo and Alexandria.*

Outside Plant Engineering provides conduit and cables required to connect the switching equipment to the terminal at the customer's premise. In order to perform this task in a cost-effective manner, the occupation or fill of the existing routes must first be determined. ARENTO's OSP Engineers must take the counts shown on the "As Built" drawings, and go to the exchange to review the line record cards for the counts involved. This is a time-consuming process when a 20,000 line switch addition is proposed and scheduled. The switch tender can be let and completed in about nine months. If conduit is required, the OSP work may require more than two years. There are no Outside Plant Plans which would design feeder routes for each wire center. Normally, these OSP plans design the need for facilities to meet growth. For example, if a wire center addition was proposed, the OSP engineer could refer to these plans and then determine the approximate time needed to construct the needed facilities including any needed conduit.

This time consuming process has caused delays in the recent past. Pyramid, Heliopolis, and El Mokattam all had installed switch capacity unused until the outside plant was constructed. In the average of these three cases the switches were installed in 224 days and the outside plant was installed in 600 days. There were additional delays in letting the tender since outside plant design had to be completed to determine what tender should include.

This situation may occur again based on a review of the Summary of Exchanges Demand and Planned Growth for the Cairo Zone cited previously. The information presented below in Exhibit V-36 reflects exchanges where the existing switching capacity and the additions planned to complete in June 1993 provide more switching facilities than there are outside plant pairs terminated on the main frame.

In some cases ARENTO Outside Plant Engineering has provided sufficient outside plant facilities in anticipation of switching expansion as reflected below in Exhibit V-37. This will allow the switching investment to be utilized immediately, thereby reducing the marginal cost of providing service.

Exhibit V-36
Outside Plant Pairs Provisioned Late Compared to Switch Relief

Exchange	Existing Capacity	Expansion In 1993	Terminated OSP Pairs
Abbassia	60,000	40,000	70,800
Almaza	44,000	10,000	48,000
Helwan	15,000	20,000	27,600
Imbaba	10,000	20,000	15,600
Nasr II	8,600	1,500	9,600
Nozha	4,000	20,000	7,800
Sharabia	20,000	20,000	30,200

Exhibit V-37
Outside Plant Pairs Provisioned in Proper Timing with Switch Relief

Exchange	Existing Capacity	Expansion In 1993	Terminated OSP Pairs
EL MARG	4,000	6,000	12,900
EL MATARIYA	30,000	20,000	61,000
NASR I	56,000	14,000	87,800
SHOUBRA	54,000	12,000	91,000

Such OSP Plans can also be used in an integrated planning system to either delay the switch or build the outside plant before starting the switch. This would allow the service to be provided to the customer without delay and produce revenue for ARENTO sooner. In addition, the waiting lists orders could be worked in a timely manner if switch capacity existed. The design of the OSP Plans should include a methodology to up date the route occupation along with the defective pairs on a mechanical basis. This would allow the Engineers to design and time cable relief in the most economical manner. COSMOS is the administrative system available from AT&T. Other vendors O & M systems should be used to feed the OSP Plans. This will be extremely useful since Cairo and Alex will be all Stored Program Control offices by the end of the current planning cycle.

In the area of the growing incidence of defective pairs and the resulting need to consider oversizing the OSP network, the Facility Control Center tested 8,031 "Bad Line" faults in the month of November 1992. These faults occurred on the 122,326 lines managed by this Center. This is 6.6 percent of the pairs in the Center. If every one of these troubles resulted in a defective pair, then each month 6.6 percent of the total pairs would be used up. Of course, all of the troubles are not defective pairs. Some of the defective pairs are repaired. The major finding is that ARENTO does not know how many pairs are changed and how many are repaired. The defective pairs left in plant will destroy the spare capacity that Outside Plant Engineering provided for future growth. An example of this event recently happened when Outside Plant Engineering had provided 300 pairs in a Serving Area Interface and when the switch was placed in service, none of the waiting list orders could be worked because all of the spare pairs were defective. As a result, Defective Pair Administration should be integrated into the Outside Plant Plans. Outside Plant Engineers must know the number and location of all defective pairs in the network if they are to cost effectively design cable relief.

K&M agrees with ARENTO that Digital Loop Carriers should not be used by ARENTO on a permanent basis, and that they are not cost-effective in Egyptian urban areas. The only

compelling reason to use DLCs is the potential savings associated with eliminating long runs of copper cable. Typically, the cross-over point for cost-effectiveness is at 7 kilometers or greater. However, ARENTO does not typically have such long runs in urban areas. Moreover, heat has a significant impact on the serviceability of the electronic packages associated with DLC systems. While it is true that such systems can be deployed in a high temperature environment, extreme consideration and careful attention must be given to monitoring systems performance. Lastly, there is a long learning curve for technicians who have the responsibility for installing, operating and servicing such a system.

There does not appear to be any control at the present time to insure that "As Built" drawings are kept updated. ARENTO uses the contractor provided "As Built" drawings for the permanent record of the location, size and cable counts of the OSP network. However, when cable work is performed by other than a contractor, the "As Built" drawings are not always updated and re-distributed. This happens especially when Zone Managers are required to place a cable to provide Instant Service.

ARENTO does not currently avail itself to building industry consulting services. With the large number of buildings going up in Cairo, great cost savings can be attained by coordinating with the designers of the building and the contractors doing the work. This would provide a protected area for telephone plant and would make it less expensive to serve future customers. Future repair costs associated with string station wire loss on the outside of the buildings could be avoided. The ARENTO customer would have a better quality of service.

ARENTO continues to incur cost penalties for area transfers. Area transfers are where cable pairs are taken from a serving exchange and spliced into the cables serving customers presently served from a different exchange. This procedure is done when the exchange building is too small for switch expansion. All of the LE spent on area transfers in the outside plant are thrown away. The customers already have service connected through existing cable pairs. The area transfer will only move them to a different serving office. Revenue to ARENTO will not increase. Many area transfers are proposed in the current plan. Some may be necessary since cost effective switch and building planning may not have been done in time to avoid the area transfer. However, area transfers only serve to raise the cost of providing telephone service.

Finally, ARENTO appears to limit the size of the cables placed to 2400 pairs. While a few newer cable placements have exceeded this size, conduit reinforcement can be delayed with the use of larger size cables. Cable sizes of 3600 pair and larger can be placed in the existing duct system. The sizing decision should be an economic decision based on growth rates and the availability of spare duct capacity. If using larger cables can delay the building of a conduit system, then the cost savings of future expenditures is obvious. While this does not technically effect the performance of the network, it does increase the marginal cost of providing basic service.

4. Revenue Projections

This section presents principle findings as well as discussions relating to K&M's current five-year revenue projections. Three different sets of projections were reviewed or prepared. These include:

- (1) ARENTO's current five-year revenue projections;
- (2) An updated set of revenue projections based on revised assumptions prepared by K&M; and
- (3) A set of revenue projections based upon implementing suggested modifications to both planned investments and operations and business practices in an effort to optimize the agreed upon objective function.

a. ARENTO's Current Five Year Projections

Major Findings

- *The rate of revenue growth is forecasted to decline by about 70 percent due to a substantially reduced authorized capital spending program; historical revenue growth over the past five years has been about 25 percent annually; for the current five-year plan, revenues are forecasted to increase about 7 percent each year. However, there has been a 70 percent decrease in the number of lines that have been authorized for construction during this same period*
- *Actual revenue for the first seven months of this fiscal year are up 30 percent compared to the first months of last year; and*
- *Actual international toll revenues for the first seven months are expected to keep pace with increases in prior years which has averaged around 20-25 percent a year.*

The "approved" five year plan indicates the annual revenue growth rate will decline 7 percent over the period from 24.7 percent in 1988 through 1992 to 7.4 percent for 1993 through 1997. In addition, the approved five year plan revenue projections reflect a substantial decline in growth rates across the board. The decline in revenue growth is primarily attributable to the limited funding that has been authorized for the construction of new telephone plant additions.

Revenue growth is normally a function of four interrelated variables - demand, supply, price and competition. At ARENTO the supply variable has been the predominate determinate of revenue growth over the past five years. With virtually no competition, artificially low prices for local access, and artificially high prices for international toll access, the supply of ARENTO provided telecommunications services has been unable to meet all known demand. For instance there is currently a waiting list of 1.2 million customers desiring access to the local network.

Past and future revenue growth at ARENTO will, in large part, have a direct correlation to the net new number of lines that are authorized for funding through the construction program. Authorized funding for the five-year period is LE 1.474 million to construct approximately 356,000 net new lines of capacity. This represents a 70% decrease or 700,000 lines from the prior five year period when approximately a million new lines were added (see Exhibit V-38).

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Exhibit V-38
ARENTO
Operating Revenues
Five Years Actual & Five Years Projected
Fiscal Years Ended 1988-1997

Fiscal YR	Telegram	% CHG.	Telephone	% CHG.	International	% CHG.	Misc.	% CHG.	Total	% CHG.	Compound Annual Growth Rate
1988 act	12.7		217.50	-	376.0	-	10.6	-	616.8	-	
1989 act	12.3	-2.60%	279.20	28.30%	493.1	31.10%	14.9	40.60%	799.5	29.60%	
1990 act	12.5 1.30%	1.30%	366.70 36.80%	31.30%	601 60.30%	22.00%	16.2 1.60%	8.70%	996.6 100.00%	24.70%	
1991 act	13.5 1.10%	8.00%	440.20 37.30%	20.00%	703.7 59.80%	17.00%	21.6 1.805	33.30%	1,179.0 100.00%	18.30%	
1992 act	15.4 1.10%	14.00%	528.50 35.50%	20.10%	919.4 61.70%	30.70%	5.9 1.70%	19.90%	1,489.2 100.00%	26.30%	24.7%
1993	15.6 1.00%	1.30%	582.60 37.90%	10.20%	878.2 57.10%	-4.50%	61.2 4.00%	136.30%	1,537.6 100.00%	3.30%	
1994	16.3 1.00%	4.50%	640.00 38.40%	9.90%	922.0 55.40%	5.00%	86.0 5.20%	40.50%	1,664.3 100.00%	8.20%	
1995	17 0.90%	4.30%	704.00 38.60%	10.00%	1,014.0 55.50%	10.00%	91.0 5.00%	5.80%	1,826.0 100.00%	9.70%	
1996	18 0.90%	5.90%	775.00 38.70%	10.00%	1,160.0 55.70%	10.00%	94.0 4.70%	3.30%	2,003.0 100.00%	9.70%	
1997	18.8 0.90%	4.40%	852.00 38.80%	10.00%	1,227.0 55.80%	10.00%	98.0 4.50%	4.30%	2,195.80 100.00%	9.70%	7.4%

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1993 revenue are running 30 percent ahead of last year for a comparable seven month period from July through January (see Exhibit V-39).

Exhibit V-39
ARENTO
FY 93 Interim Operating Results
7 Months Actual
July 1, 1992 Through January 31, 1993

(LE in millions)	FY 1992		FY 1993				
	7 mo. ACT.	7 mo. ACT	7 mo. Budget	VARIANCE			
				Budget	% Change	Last YR.	% Change
Revenues							
Local and National	317.3	478.6	348.9	129.7	37.2	161.3	50.8
International	536.3	553.0	512.3	40.7	8.0	16.7	3.1
Misc	15.1	98.5	35.7	62.8	175.9	83.4	552.3
Total	868.7	1130.1	896.9	233.2	26.0	261.4	30.1
Expenses							
Salaries	98.9	115.7	113.8	1.9	1.7	16.8	17.0
Commodities	27.1		32.1				
Services	18.6	49.6	19.3	-1.8	-3.5	3.9	8.5
Cost of Goods Sold	14.3	17.7	16.3	1.4	8.6	3.4	23.8
Depreciation	132.8	57.2	151.6	-94.4	-62.3	-75.6	-56.9
Interest	95.0	92.6	106.2	-13.6	-12.8	-2.4	-2.5
Other (Rent, Taxes, Duties)	0.5	59.3	60.0	-0.7	-1.2	58.8	1117.0
Exchange Rt. Changes	97.6	97.1	102.7	-5.6	-5.5	-0.5	-0.5
Total Expenses	484.8	489.2	602.0	-112.8	-18.7	4.4	-0.9
Operating Income	383.9	640.9	294.9	346.0	117.3	257.0	66.9
Misc. Income Net	18.0	-7.0	-	-7.0	-100.0	-25.0	-138.9
Net Operating Inc.	401.9	633.9	294.9	339.0	115.0	232.0	57.7
Extraordinary/Delayed	53.5	-	-	-	-	-53.5	-100.0
Net Income	455.4	633.9	294.9	339.0	115.0	178.5	39.2

Source: ARENTO Annual Results for FY 1992; Approved Financial Plan for FY 93; Interim Financial Results through January 93.

This above-expectation growth in actual revenue over planned revenue is attributable in a large measure to the authorized funding of LE 870 million for construction of 287 thousand net new line additions for '92-'93. This one-year level of spending represents approximately 60% of the authorized spending for the five-year period and is relatively consistent with annual funding authorizations in prior periods.

International toll revenues for 1992 and 1993 (illustrated in Exhibit V-40 below), are 8 percent over for the current budget and 3 percent over last year. Historically they have been increasing 20-25 percent annually. For 1993, they were budgeted to decline 4.5 percent. Based on the information supplied by ARENTO, revenue growth is anticipated to be at or near historical trend levels of 20-25 percent.

**Exhibit V-40
International Toll Revenue Summary**

	<u>1992</u>		<u>1993</u>	<u>VARIANCE</u>	
	<u>7mo ACT</u>	<u>7mo ACT</u>	<u>7mo Budget</u>	<u>Budget</u>	<u>Last Year</u>
International Toll	536.3	553.0	512.3	40.7	16.7

International Toll is up LE 16.7 million or 3.1 percent over last year and is up LE 40.7 million or 8 percent over the 1992/1993 budget.

Note: Not all toll revenues have been recorded for the seven month period and are most probably higher than shown above: (probably by as much as 15-20%)

Source: ARENTO Preliminary Financial Statements For Period Ended January 1993.

b. Updated Five Year Projections and Underlying Assumptions

Major Findings

- *The projected rate of revenue growth over the current five-year planning period of about 25 percent annually can be sustained if authorized construction spending is increased sufficiently to provide for a net addition of 1.6 million new lines; and*
- *With the authorized increase in construction spending, the Waiting Lists can be eliminated by December 1995, assuming that a 90 percent fill rate can be achieved.*

Revenue will increase 24 percent annually above the original ARENTO projections with the underlying assumption that authorized construction spending for the five year period will be increased to provide 1,631,000 net new lines.

The ARENTO base case Finance Minister approved, revenue projections for the current five-year plan were based upon an approved construction program of LE 1,474 million for the five-year period. This level of construction spending represents approximately 305,000 net new line additions or 12% total growth in lines over the entire five-year period (simple average of 2.4% growth each year). This is substantially less than the 100% growth in the prior five year period (14 + % average growth each year) and is substantially less than ARENTO feels they need and can fund.

The Finance Plan - Construction Program of LE 4,825 million that provides for 1,631,000 net new lines can most likely be funded during the '93-'97 five-year plan. The following revenue projections are predominately based upon adding 1,631,000 net new lines of capacity versus the base case lines of approximately 305,000, resulting in a 538% increase in net new lines available for revenue generation See Exhibit V-41.

Exhibit V-41
ARENTO Updated Revenue Projections
From Increased Constructed Additions
Five Year Plan (FY 1993-1997)

(LE In Thousands)

	TELEGRAPH				TELEPHONE				INTERNATIONAL			
	Teleg Base Case	Increase From Constr Addns	Total Teleg	% Chg.	Telephone Base Case	Increase From Constr Addns	Total Telephone	% Chg.	Intn'l Base Case	Increase From Constr Addns	Total Intn'l	% CHG.
FY 93	15,566	602	16,168	3.9	582,600	36,488	619,088	6.3	878,182	161,681	1,039,863	18.4
FY 94	16,300	676	16,976	4.1	640,000	54,393	694,393	8.5	922,000	258,796	1,180,796	28.1
FY 95	17,000	825	17,825	4.9	704,000	143,933	847,933	20.4	1,014,000	332,133	1,346,133	32.8
FY 96	18,000	716	18,716	4.0	775,000	200,578	975,578	25.9	1,116,000	424,545	1,540,545	38.0
FY 97	18,800	852	19,652	4.5	852,000	266,239	1,118,239	31.2	1,227,000	542,619	1,769,619	44.2
TOTAL	85,666	3,671	89,337	4.3	3,553,600	701,631	4,255,231	19.7	5,157,182	1,719,774	6,876,956	33.3

	MISCELLANEOUS				SUMMARY TOTAL			
	Misc Base Case	Increase From Constr Addns	Total Misc	% Chg.	Total Base Case	Increase From Constr Addns	Total Update	% Chg.
FY 93	61,203	(28,399)	32,804	(46.4)	1,537,551	170,372	1,707,923	11.1
FY 94	86,000	(44,510)	41,490	(51.8)	1,664,300	269,355	1,933,655	16.2
FY 95	91,000	(38,523)	52,477	(42.3)	1,826,000	438,368	2,264,368	24.0
FY 96	94,000	(27,627)	66,373	(29.4)	2,003,000	598,212	2,601,212	29.9
FY 97	98,000	(14,052)	83,948	(14.3)	2,195,800	795,658	2,991,458	36.2
TOTAL	430,203	(153,111)	277,092	(35.6)	9,226,651	2,271,965	11,498,616	24.6

Moreover, telegraph (0.8 percent of total revenue) will increase 4.3% annually above the original ARENTO projections. There are two primary services included in the telegraph revenue category. These services are telegraph service and telex service. Over the past four years these services have grown at a compounded annual rate of 5.0%. Over the past two years they have grown at a compounded annual rate of 11.0%. 1992 revenues increased 14% over 1991 levels. For the five year planning period these services have been projected to increase 5.0% per year based on the four year growth trend and the likelihood that as telephone service becomes more readily available throughout Egypt, the current annual growth rate of 14% will decline as subscribers increase their use of FAX service. (Revenues for FAX services, since 1991, are included as miscellaneous revenues in the Telephone category).

Telephone (37.0 percent of total revenue) will increase 19.7 percent annually above the original ARENTO projections. There are five primary services included in the telephone revenue category. These services are local access, local usage, national toll calling, move/change and installation service, and miscellaneous. Each is reviewed in turn below:

- **Local Access 23.3 percent of Total Telephone Revenue.** Local access, measured as lines in service, has grown at a compounded annual rate of 14.3% over the past five years. Revenues have grown at an annual compounded rate of 18.8%, while revenue per access line has grown 4.0%. For the five year planning period, local access revenue has been conservatively projected to increase based on the planned net additions of available switching capacity with no change in revenue per line. Lines in service (as included in the Financial Plan Five Year Construction Program) are projected to increase at a compounded annual rate of 10.5%. Historically, revenue per access line has been increasing which indicates a growing percentage of business lines being added. Due to general economic conditions and the decline in new business lines in '92 no change in revenue per line has been included in the plan. The revenue per line is projected to remain at LE 71.58 per line over the planning period.
- **Local Usage 26.1 percent of Total Telephone revenue.** Local usage revenues for calls above the maximum call allowance, have been increasing at a compounded annual rate of 35.2% over the past four years. Revenue per line has been increasing at a compounded annual rate of 18.3% over the past four years and at 11.3% over the past year. These growth rates indicate that a smaller percentage of customers (new and existing) are using their full maximum call allowance, which may be due to the low call completion rates experienced by ARENTO customers. Call attempts are increasing and call completion rates are increasing at a declining rate supporting the findings and conclusions regarding network blockage in section IV, Part B. For the five year planning period, local usage measured as revenue per line, was projected to increase 11.3% annually. This is a conservative estimate and reflects a 38% decline in the growth rate from 18.3% to 11.3%. This decline in the rate of growth can be attributed primarily to general economic conditions and network blockage. If blockage is overcome, as recommended in section IV Part B. of this paper, this is a conservative estimate; if blockage continues, the projection is optimistic and the rate of growth will decline even more.

- **National Toll Calling.** National toll revenue has been growing at an annual compounded rate of 33.0% over the past four years, while revenue per line has been growing at 16.3%. Over the past two years the compound growth rate for revenue has been 22.0% and on a per line basis 8.5%. Revenue per line last year increased 10.6%. For the five year planning period, national toll per line in service has been conservatively projected to grow at 8.5% per year based on the past two year growth trend. This is a conservative estimate and reflects a 42% decline in the growth rate from 16.3% to 8.55%. This decline in the rate of growth can be primarily attributed to general economic conditions and network blockage.
- **Move/Change and Installation Service 17.1 percent of Total Telephone Revenue.** There are two primary services included here. One is for installation and the other is for transferring telephone service for people who have moved. The combined compounded annual growth rate in revenues for the past four years has been 28.6% and for the past two years 15.2 percent. Revenue for each new line added to service averaged LE 438 per line. For the five year planning period, move/change and installation service revenue has been projected to increase 7.8 percent on a per line basis for each new line to be added over the five year planning period. The 7.8 percent growth represents the projected increase in move/activity related to the increasing number of lines that will be in service.
- **Miscellaneous 8.1 percent of Total Telephone Revenue.** These revenues have grown at a compounded annual rate of 5.9 percent over the past four years. For the five year planning period, the historical compounded growth rate was used to project revenues. This category of revenue includes FAX service which prior to 1991 was growing at a 90 percent per year.

Furthermore, international (59.8% of total revenue) will increase 33% annually above the original ARENTO projections. International revenues have two primary components that include originating minutes of use from the lines that have access to the international toll network. Lines with access have increased 24 percent on an annual compounded basis over the past four years, while originating minutes of use have increased 22.2 percent. Minutes of use per line have increased 7 percent over the past year and revenue per minute has increased 13 percent. The second component, revenues from terminated minutes of use have increased at a compounded annual rate of 16.2 percent, while terminated minutes of use have increased 10.9 percent over the past four years. Over the past two years revenues have increased 5.6 percent per year. In addition, for the five year planning period, lines with access to the international toll network are projected to increase 20 percent per year (a conservative estimate based upon the historical growth rate of 24.1 percent). Additionally, no change in minutes of use per line or price per minute of use for originating traffic was forecasted. Consequently, lines were projected to increase at 20 percent per year at LE 9,727 per line. Lastly, terminating minutes of use revenues were forecasted to increase 5.6 percent per year corresponding for the compounded annual rate in the minutes of use for the past two years.

Finally, miscellaneous (2.4% of total revenue) will decrease 36 percent annually from ARENTO's original projective. The two primary components of this category are revenues from the sale of telephones and equipment and from work done for others. The compounded annual growth rate for the past two years has been 26.5 percent. For the five year planning period, these revenues have been projected to increase at the historical compounded growth

rate of 26.5 percent. The Waiting List can be eliminated by December 1995. There is currently, a Waiting List of 1.2 million subscribers for local network access. With the authorization to construct LE 4.825 billion in new plant the Waiting List demand can essentially be met in December 1995 with a 90 percent fill rate. If the fill rate remains at 80 percent where it is today the Waiting List would be eliminated in October 1996. See Exhibit V-42.

Exhibit V-42
ARENTO
Time Table for Elimination of Waiting List
Five Year Plan 92/93 - 96/97

(Lines in thousands)

Year	Line Additions		Waiting List Elimination Schedule	
	80% Fill	90% Fill	80% Fill	90% Fill
	BOP	[3.3]	246.7	1,212.6
92/93	229.9	258.7	986.0	707.2
93/94	211.0	237.3	775.0	469.9
94/95	288.0	324.0	487.0	145.9
95/96	288.0	324.0	199.0	No waiting list after December 95
96/97	288.1	324.1	No waiting list after October 96	0.0
TOTAL	1,305.0	1,468.1		
Lines built	2,175.0		Nov. 96 through Jun.-97	Jan. 96 through Jun.-97
Lines retired	<u>543.7</u>		89.1	502.2
Net lines added	1,631.3		Available for Marketing	Available for Marketing

c. Likely Changes Resulting from Optimizing the Suggested Objective Function

Major Findings

- *With increased marketing of vertical services, five-year plan revenues can be expected to increase by at least LE 25 million; and*
- *Elimination of "blockage", as recommended, will increase revenues by at least LE 16 million during a period of the current five-year plan.*

Service improvements will increase revenues LE 41 million. Based upon the recommendations included in section IV Part B, revenues will increase LE 41 million over the next five years. Increased marketing of vertical services will provide LE 25 million and elimination of blockage by the 1993/1994 plan year will contribute an additional LE 16 million for completed calls representing over 518 million minutes of use on the network as illustrated in Exhibit V-43 below.

Updated revenue projections that include service improvements and net new lines of 1.6 million over the five year period will be 20% of the updated total revenue projections. In summary, changes in constructed additions and service improvements is projected to increase revenues LE 2.3 billion over the next five years as illustrated in Exhibit V-44 below.

Exhibit V-43
ARENTO
Updated Revenue Projections - From Service Improvements
Five Year Plan
FY 1993 - 1997

(LE IN THOUSANDS)

Year	Telegraph	TELEPHONE			INTERNATIONAL			Misc.
		Telephone	Service Improvements (Detail Below)	Updated Telephone	International Telephone	Service Improvements (Detail Below)	Updated International	
FY 93	16,168	619,088	—	619,088	1,039,863	—	1,039,863	32,804
FY 94	16,976	694,393	5,420	699,813	1,180,796	2,839	1,183,635	41,490
FY 95	17,825	847,933	7,322	855,255	1,346,133	2,839	1,348,972	52,477
FY 96	18,716	975,578	8,132	983,710	1,540,545	2,839	1,543,384	66,373
FY 97	19,652	1,118,239	8,600	1,126,899	1,769,619	2,839	1,772,458	83,948
Total	89,337	4,255,231	29,534	284,765	6,876,956	11,356	6,888,312	277,092

SERVICE IMPROVEMENTS-REVENUE PROJECTION-DETAILS						
Telephone	YR. 1	YR. 2	YR. 3	YR. 4	YR. 5	TOTAL
1. Vertical Services	—	4,196	6,098	6,908	7,436	24,638
2. Network Blockage	—	—	—	—	—	—
Local Usage	—	749	749	749	749	2,996
National	—	475	475	475	475	1,900
Total Telephone	—	5,420	7,322	8,132	8,660	29,534
International	—	—	—	—	—	—
1. Network Blockage	—	2,839	2,839	2,839	2,839	11,356
Total Service Improvements	—	8,259	10,161	10,971	11,499	40,890

Revenues	Service Improvement Total (Detail Below)	Total Updated Revenues	% Change
1,707,923	—	1,707,923	—
1,933,655	8,259	1,941,914	0.4
2,264,368	10,161	2,274,529	0.4
2,601,212	10,971	2,612,183	0.4
2,991,458	11,499	3,002,957	0.4
11,498,616	40,890	11,539,506	0.3

Exhibit V-44
ARENTO
Updated Revenue Projections - Summary
Five Year Plan
FY '93-'97

(LE In Thousands)

	TELEGRAPH			TELEPHONE				INTERNATIONAL			
	Teleg Base Case	Increase From Constr Addns	Total Teleg	Telephone Base Case	Increase From Constr Addns	Blockage & Vertical Svs	Total Telephone	Int'l Base Case	Increase From Constr Addns	Blockage	Total Int'l
FY 93	15,566	602	16,168	582,600	36,488	-	619,088	878,182	161,681	-	1,039,863
FY 94	16,300	676	16,976	640,000	54,393	5,420	699,813	922,000	258,796	2,839	1,183,635
FY 95	17,000	825	17,825	704,000	143,933	7,322	855,255	1,014,000	332,133	2,839	1,348,972
FY 96	18,000	716	18,716	775,000	200,578	8,132	983,710	1,116,000	424,545	2,839	1,543,384
FY 97	18,800	852	19,652	852,000	266,239	8,660	1,126,899	1,227,000	542,619	2,839	1,772,458
TOTAL	85,666	3,671	89,337	3,553,600	701,631	29,534	4,284,765	5,157,182	1,719,774	11,356	6,888,312
% OF TOTAL	95.1	4.1	100.0	82.9	16.4	0.7	100.0	74.9	24.9	0.2	100.0
	MISCELLANEOUS			SUMMARY TOTAL							
	Misc Base Case	Increase From Constr Addns	Total Misc	Total Base Case	Increase From Constr Addns	Blockage Vertical Svs	Total Update				
FY 93	61,203	(28,399)	32,804	1,537,551	170,372	-	1,707,923				
FY 94	86,000	(44,510)	41,490	1,664,300	269,355	8,259	1,933,655				
FY 95	91,000	(38,523)	52,477	1,826,000	438,368	10,161	2,264,368				
FY 96	94,000	(27,627)	66,373	2,003,000	598,212	10,971	2,601,212				
FY 97	98,000	(14,052)	83,948	2,195,800	795,658	11,499	2,991,458				
TOTAL	430,203	(153,111)	277,092	9,226,651	2,271,965	40,890	11,498,616				
% OF TOTAL	155.3	(55.3)	100.0	80.0	19.7	0.3	100.0				

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E. Answers to Questions Raised in Earlier Reports

Of the previous studies cited in chapter I above, only the Teleconsult Definitional Mission Final Report raised specific issues in the area of service improvements which are still relevant today. These issues and concerns were developed by Teleconsult in the form of questions to be addressed and were utilized by USAID as one of the inputs in preparing the initial Contractor Terms of Reference and Scope of Work for the current study effort performed by K&M. These questions, along with their answers are presented below:

(1) What are the primary underlying causes behind the current waiting lists for telephone service?

The primary underlying cause of the current waiting list of held applications for service is due to the apparent national telecommunications policy of pricing local service at a level that is relatively affordable by as many Egyptians as possible. This has resulted in pricing local service at a level that is below cost and perceived value and which is heavily dependent upon cross-subsidies from international toll revenue. This pricing structure has created a level of demand that exceeds ARENTO's ability to finance and construct the required switching capacity and related junction and outside plant distribution facilities.

(2) What actions would be most effective in relieving these demand constraints?

Given that the national telecommunications policy on pricing is not likely to change in the short run, ARENTO should continue to aggressively pursue the maximum level of funding authorization from the Minister of Finance to finance continued expansion of switch, junctions and outside plant facilities. Additionally, ARENTO must begin now to make significant investment in infrastructure related to integrated operational, planning and financial processes that are supported with an increased level of computerized mechanization. Without investment now in infrastructure, ARENTO will be unprepared to effectively and efficiently maintain and operate the network when all demand is met near the end of the current five year planning cycle.

(3) Are there other areas of ARENTO operations where demand is blocked, and if so, how can these other bottlenecks be relieved?

When customers attempt to make a call, on too many allocations, the customer must re-dial the call two, three or more times because the original call is "blocked". The traffic demand of completing calls as dialed presents a need for Trunk Administration. Thousands of calls are blocked each day in the Junction network, even though the network is over provisioned by at least a third. The findings are discussed in detail in Section V. B. This trunk provisioning process must be a dynamic procedure of constantly adding high usage trunk groups and diverting high volume traffic out of the tandem switches. This is a large constraint in satisfying the demand of the individuals who have telephone lines and have difficulty in completing calls. A full study on Trunk Administration and Traffic Planning needs to be performed. This involves the analysis of the originating and terminating points for telephone calls and is used to construct cables and facilities to efficiently route calls through the network. ARENTO must have the computerized tools, both hardware and software, to continue the

process of adapting and changing the network configuration to meet the constantly changing calling patterns caused by the growth of subscriber lines.

(4) Is there any portion of ARENTO's current five-year plan for network development that needs to be modified or updated?

The first and most important modification to the investment strategy is to re-implement High Usage trunk groups with Final Routes going to the tandems based on trunk administration studies and analysis of current calling patterns. While this may require some additional funds in the first years of the plan, reduced funding for junction construction could be realized in the later years. The exact shift of funds cannot be determined without completing the Trunk Administration and Traffic Planning study mentioned above.

A change in timing of the X-BAR switch replacements from the last three years to the first two years in the Five Year Plan will greatly improve the billable call completion rates. This shift in investment is within the planning cycle and does not affect the total for the overall plan. This is discussed in more detail in Section V.C. for the impact on Junctions and Switching investments.

ARENTO has an internal management policy to limit the administrative capacity of the Digital Switching Systems to 60,000 lines. This is an artificial "administration limit" that is significantly below the manufacturer's recommended capacity. ARENTO is suffering a cost penalty of approximately LE 500 per switch line by not growing the switch to the manufacturer's recommended capacity. This is discussed in detail in Section V.C.2. However, a review of the Network Plan does not indicate that this administrative limit comes into consideration during this planning cycle. It did in the previous planning cycle and it will in the next, but not in the present.

ARENTO could significantly reduce investment cost per line by reducing the frequency of area transfers. This could be accomplished by establishing a policy of acquiring enough land to construct buildings that are expandable to accommodate growth of central office switches. Small buildings that are expandable could initially be designed and built to house Remote Switch Modules (RSM's). Then the Outside Plant network could be constructed for the new exchange area. Then as the area grows additional switch capacity could be added, thus avoiding the expense of frequent area transfers, where outside plant facilities have to be relocated to a new switch site because the previous switch site was too small to accommodate the growth. Investment in the Network plan was recently modified to include the savings from the use of RSM's. However, the plan does not reflect the penalties associated with too small a piece of land and too small a building. Gleem and Maadi are two examples. Once the physical limitations are established from the embedded plant configurations, the only choice left is to serve the customers in a more expensive configuration.

(5) What aspects of the present five-year plan require further review?

The Planning Process - Five Year Plans

The overall planning process should be reviewed. It appears that a "Network Plan" is developed for the five year period that is independent from ARENTO's funding and financing capabilities. Then a determination is made about the level of funding that may be available.

This level of probable available funding is separate and apart from the funding levels authorized by the Minister of Finance. After the level of probable available funding is determined it appears that the "Network Plan" is never modified to coincide with the available funding. Additionally, the "Network Plan" is not comprehensive. It includes only a switching plan. Specific plans regarding trunks, outside plant, land, buildings and related tools, equipment and operational support are not developed.

This lack of specific coordinated planning creates conditions for sub optimal spending at both the planning and, most importantly, at the implementation stage. However, with the rapid growth ARENTO is experiencing, this sub-optimization is quickly consumed and disappears as it is covered over with new plant additions.

Near the end of the 93-97 plan, demand and growth will level off to the point where more fine tuning and improved planning and coordination will be required, if ARENTO is to fully optimize the use of its capital resources. Additionally, operational support planning will become essential for maintaining and operating the business.

In a more preferred situation, an overall funding level would first be established and then a comprehensive construction and operating plan that includes switching, trunks, outside plant, land, buildings and related tools, equipment and operational support could be developed within those spending constraints. The plan could then be expanded or contracted as economic conditions and available funding dictate.

Timing - COE and OSP Construction

ARENTO needs to continue to coordinate the timing of Switch and OSP investment. specific outside plant plans will give them the tool to achieve this coordination. It may require the OSP construction to be started a year before the Switch to achieve the proper timing. A review of Summary of Exchanges Demand and Planned Growth shows proper examples of this happening.

Training

The present five year plan does not appear to include any provisions for training operational personnel in the maintenance and operation of new technology. Because the plant is relatively new and covered under warranty from the manufacturer, in the short run the lack of skilled maintenance personnel does not present a problem. However, there appears to be no plans to develop the skill sets required to maintain and operate a complex hi-tech telecommunications organization in the future.

Strategic Planning and Operational Support Processes and Related Data Processing Capabilities

Most of the internal processes within ARENTO to plan, build, maintain, market price, bill and monitor results related telecommunications services are loosely fitted together without a high degree of synchronization. It is similar to a complex set of gears that are moving together out of the sheer force of momentum rather than planned synchronization. It works, but fine tuning to prepare for the future would be desirable.

A few of the processes at ARENTO are lightly and independently mechanized without integration to other processes and systems. The present five year plan should be reviewed to determine how the internal processes within ARENTO can be integrated, streamlined, modified or eliminated, and computerized to improve the implementation of stated organizational objectives.

F. Recommendations and Conclusions

1. Recommendations Related to Marketing and Service Operations

This section contains recommendations related to marketing and service operations consistent with optimizing the agreed objective of:

- Increasing Revenue per Line
- Decreasing Long Run Marginal Cost
- Enhancing the Value of Service Provided
- Improving the Quality of Service Provided

Market Telephone Services to Increase Revenue and Reduce Costs to ARENTO

ARENTO could increase the revenue stream and reduce the cost by marketing telephone services. The service operations need to have management control in the areas of trunk administration, exchange performance, and OSP maintenance. The overall orientation of ARENTO needs to focus on customer satisfaction.

The marketing of telecommunication services has two major purposes. The first reason is to increase revenues from services that produce income above the cost to provide the service. An example of this would be aggressively marketing the Follow Me service. The offices are equipped with this service now and the service can be provided without further capital investment. The second reason is to encourage subscribers to shift the telecommunication habits to utilize the technology that will reduce the costs to ARENTO of providing the service. Examples of this reason to market can be clearly seen with the marketing of Call Waiting and Dual Tone Multi Frequency sets. For each line that utilizes the Call Waiting features ARENTO gets a completed call instead of a busy signal for which no revenue is collected. Furthermore, when the busy signal is encountered by the subscriber another attempt will be made and ARENTO will have to provision junctions at a higher level for which no revenue is billed. The DTMF sets will reduce the switching equipment requirement by significantly reducing the time to dial the call.

Implement Expanded Custom Calling Features Impact On The Network

Vertical services such as Call Waiting are available on approximately 409,000 in Cairo today as illustrated in Exhibit V-45 below. A higher penetration of this service would reduce the reduce the blockages in the Junction network and increase revenues that are needed to fund future expansion. The chart below shows the availability of these services at the end of the current 5 year planning cycle to be 2,974,345 lines. If effective marketing were to attain a

penetration of 10 percent of lines, then the revenues generated would be 7,435,863 LE annually at the end of the planning cycle as illustrated in the Exhibit V-46 below. This assumes that each of the customers will have only one vertical service and the average annual revenue from each will be 25 LE.

A marketing technique that may prove beneficial to ARENTO would be to offer some or all of these features free on a six month trial basis. After the trial in which the customer has enjoyed the benefits of the services, ARENTO personnel should offer to sign the customer up for the services for a fee sufficient to at least cover the extra cost of providing such a service. This could be offered to customers that had more than 500 LE in annual billing served by equipped offices. In addition, a study of the impact on call completions should then be conducted during the trial period to see how much call completion rated increased and blockages were reduced.

**Exhibit V-45
Custom Calling Feature Availability and Impact on Revenue**

<u>Exchange</u>	<u>Total Exchange Capacity</u>	<u>Estimating Custom Calling Capacity</u>	<u>Type Switch</u>
TALAAAT HARB	40,000	40,000	EWSD
EL KALLA	30,000	30,000	5ESS
EL MOKATTAM	4,000	4,000	5ESS
ZAMALEK	25,000	25,000	1AESS
EL MOHANDESSIN	60,000	20,000	EWSD
GIZA	34,000	4,000	5ESS
PYRAMID	30,000	4,000	5ESS
EL MARIOTEYA	40,000	40,000	5ESS
BAB EL LOUK	25,000	25,000	1AESS
MAADI I	34,000	4,000	5ESS
ABBASIA	40,000	40,000	1AESS
SHOUBRA	34,000	20,000	EWSD
SHARABIA	20,000	20,000	EWSD
SHOUBRA EL KHEIMA	20,000	20,000	EWSD
QUALIUB	10,000	10,000	EWSD
NAWA	1,800	1,800	EWSD
KANATER	40,000	10,000	EWSD
HELIOPOLIS	100,000	100,000	1AESS & 5ESS
EL MATARIYA	30,000	30,000	EWSD
EL SALAM	15,000	15,000	EWSD
EL ABBOR	900	900	EWSD
KUBBA	60,000	20,000	EWSD
LINES AVAILABLE NOW	639,700	483,700	
TARIFF CHARGES	LE / YEAR	INSTALLATION FEE	
Call Waiting	20	20	
Wake Up	0	0	
Hot Line	30	30	
Follow Me	40	20	
Conference	40	30	
No-Noise	20	20	
Abbreviated	20	20	
Reception only	100	20	
PABX	100	500	

Assume Marketing Can Produce 10% Penetration Of Available Lines

**Exhibit V-46
Estimated Planned Switch Additions**

	EQUIPPED # OF LINES	CUM LINES EQUIPPED	10% PENETRATION	ANNUAL REVENUE @ 40 LE PER LINE
EXISTING	483,700	483,700	48,370	1,934,800
FY 93	1,195,916	1,195,916	119,591	4,783,640
FY 94	1,752,916	1,752,916	175,291	7,008,760
FY 95	2,514,020	2,514,020	251,402	10,056,080
FY 96	2,838,020	2,838,020	283,802	11,352,080
FY 97	3,049,020	3,049,020	304,902	12,196,080

Inaugurate Business Line Hunting in an Effort to Complete More Calls

Business line hunting is a classic service that when marketed can produce needed revenue while greatly improving service and reducing the cost to ARENTO to provide telecommunication service. If ARENTO made a rule that every business with more than two lines had to have those lines in rotary at perhaps 30 LE per line per year, then call completions and revenues would increase. By the end of the current planning cycle, all of the waiting list will be eliminated. Therefore, lifting the restrictions on business to only have two lines with additional justification and marketing additional business lines will provide additional revenue and improve plant utilization.

The 5 ESS local exchange provides subscriber line hunting features such as Series Completion and Multiline hunting. Series Completion routes calls to a busy line to another specified telephone number, for the same subscriber, in the local exchange. Multiline hunting routes calls to a busy line to other specified lines, for the same subscriber, in the local exchange without assigning a telephone number to each succeeding line. Stored program control systems, analog or digital, manufactured by other vendors have the equivalent features. Aggressive marketing of Subscriber Line Hunting features by ARENTO would:

- Increase successful call completion ratios by finding any of the subscriber's idle lines on the first attempt.
- Increase the average call holding time by providing additional successful completions on the first call attempt.
- Reduce the number call attempts by reducing the number of calls encountering a line busy condition.
- Increase revenue by having a tariff that has installation charge for the service and a nominal monthly or quarterly charge in accordance with ARENTO's billing policy.

Install Dual Tone Multi-Frequency Lines to Reduce ARENTO's Costs

The use of tone lines in the place of dial pulse lines will provide an improved quality of service to the customer, reduce ARENTO's cost to provide service and has the potential to increase revenues. For instance, the 5 ESS Customer Digit Receivers can be equipped with Dual

Tone Multi-Frequency (DTMF) Receivers. The DTMF receiver accepts two voice frequencies selected from separate groups of frequencies. Stored Program Control systems, analog or digital, manufactured by other vendors have the equivalent feature.

ARENTO plans to equip all Stored Program Control exchanges added during this five year program with the ability to receive DTMF from all of the subscribers. Aggressive marketing of the use of DTMF by ARENTO would:

- Decrease the dialing time for the subscriber and the requirement for Switch equipment.
- Reduce the Customer Digit Receiver average holding time.
- Increase revenue by using the tariff for the service charge in accordance with ARENTO's billing policy.

The revenue per line can be increased by expanding the marketing of vertical services and additional business lines in hunt groups. The modifications of the switch and outside plant investment strategy can deliver more lines producing revenue. The effective management of the Junction Network will reduce costs and produce more completed calls and there by deliver more billable completed calls.

2. Recommended Operational Actions Relating to Present Five-Year Investment Plan

This section contains operations and service suggestions relating to the present five-year investment plan consistent with optimizing the suggested objective functions of:

- Increasing Revenue per Line
- Decreasing Long Run Marginal Cost
- Enhancing the Value of Service Provided
- Improving the Quality of Service Provided

In general, the junction investment strategy and planning needs to be addressed at higher level in the ARENTO organization so that it can be better integrated with switch and outside plant decisions. The existing design needs to incorporate the design technique of high usage trunks with final tandem routes. More specific recommendations are presented and discussed below:

Commission Trunk Administration and Call Completion Study

K&M's review of traffic data was limited to determine the impact on service and investment. A comprehensive study of the trunk network and design will provide many benefits to

ARENTO. This study would include a complete review of the existing network and recommendations to improve. The design would utilize the High Usage Trunk concept discussed before. The study must provide the hardware and software to allow ARENTO to collect traffic data from every electronic office. The software must process this data into a useful Trunk Administration system that will provide the project engineers with the tools to adjust the network as calling patterns shift and new lines are added. This ongoing project would provide the Junction input to the Integrated Strategic Plan.

Use SPC Switching Data for Traffic Studies

The use of the COM center Trunk Overflow Report and the NOC EADAS traffic measurements would provide an efficient method of designing and servicing the interoffice facilities. This arrangement would achieve effective utilization of the interoffice facilities, provide additional revenue by permitting more chargeable call completions and reduce the cost of providing exchange equipment and transmission facilities through more efficient design.

Increase Reliability of Junction Network and Reduce Costs

ARENTO should use one-for-one protection on all new fiber optic multiplexer designs. This should include alternate routing with the protect fiber pair in a different physical route. This would begin to move ARENTO to a self healing network. In this proposed study, ARENTO should also evaluate the cost effectiveness of placing new fibers parallel to existing multi-mode fibers. The alternative to be evaluated is to raise the bit rate of transmission over the existing fibers. Transport rates of 2.4 giga bits are now available. This is approximately 32,000 circuits over a fiber optic quad.

Similarly, current switching investment plan could be modified to reduce the cost per line of providing switching capacity. For instance, continued and accelerated placement of Digital Switch technology is vital. In addition, land and buildings should be acquired early to house RSM's to save area transfer expense. The buildings should be large enough to accommodate the ultimate demand of the geographical area which may be larger than presently designed 60,000 line offices. Specific recommendations are presented below:

Implement Longer Term Planning for Switching Expansions

Switching expansions should be planned as far into the future as possible. Coordination with governmental and private planners and developers will produce good results. Once the approximate center of gravity of a new area is determined, enough land should be acquired by ARENTO. The building should be designed to house the ultimate switch for the geographical area. A smaller building may be economical to house the type remote switching module selected. However, the building must be constructed to allow for easy expansion in the future. This technique may cost a little more in the first years of the office but the savings will far out way the cost penalty. Area transfer expense will be eliminated if this technique is fully embraced.

Size Digital Switches Based on Customer Usage and Not Administration Limits

There were no opportunities for ARENTO to have digital switch growth beyond the 60,000 line administrative limit in this planning cycle. However, the cost penalty of this decision is so significant the recommendation must be made for the next five-year planning cycle. There are 8 exchanges that will be above 60,000 lines by the end of the planning cycle. Some of these have 3 switches in the same building. This increases the Junction expense necessary to connect these offices to the network.

Replace X-Bars in First Two Years of Plan

The X-Bar offices will be replaced in this five-year planning cycle. The current plan calls for replacing 113,000 X-Bar lines in the last three years of the plan. Due to the loss of revenue on calls as shown in the Bab El Louk example, the recommendation is to replace all metropolitan X-Bar switches in the first and second year of the plan.

Maximize Switch Performance with Computerized Results

The Operations and Maintenance data on switch and trunk performance need to be integrated into the overall planning and engineering process for the network. These operational results will determine the administrative capacity of each vendor's switching equipment rather than arbitrarily set a limit.

Integrate Switch Planning with Junction & OSP Planning

The Integrated Strategic Plan for switching should be shared with outside plant engineering to improve the timing of idle investment. This information will assist the junction designers also.

Finally, the Outside Plant Investment can be improved to reduce the cost per line by proper timing of investment. Outside Plant Plans should be developed now. The management of defective pair administration should be addressed to reduce the constant need to over-provision OSP. Monitoring the occupations in a mature network configuration will be of significant importance in the future as the Network matures. The only major recommendation that K&M has in this area is elaborated upon below:

Development of Formal OSP Plans

K&M recommends the development of outside plant plans to provide ARENTO with the tools to economically provide and time outside plant expenditures. These Plans would take the forecasting data currently used by the switching planners and develop outside plant designs for each wire center. Feeder route boundaries would be established and occupancies would be calculated for existing lines and forecasted growth. Conduit requirements and construction intervals would be established. This information used in the Integrated Strategic Plan would minimize the cost and delays necessary construct the outside plant network.

These outside plant plans should include the hardware and software necessary to gather cable occupation rates from the electronic switch Operations and Maintenance systems. For example, COSMOS has the capability of administrating defective pairs and working lines by cable counts. Presently, ARENTO is not taking advantage of this useful tool.

The Outside Plant Plans may require conduit to be constructed before the cables can be placed to serve the next switch addition. This information would be used by the Switch planner to time the switch addition to come in service after the outside plant conduit had been constructed. This information may be use by the Integrated Strategic Planning team to decide to build the conduit a year before the switch construction is scheduled to start.

The Outside Plant Plans would be updated with the "As Built" cable counts. Monitoring the cable occupation from central office data would identify areas where "As Built" drawings were not updated with new cable placements or cable count changes.

Economic considerations of the size of cables to be placed in ducts would also be part of the Outside Plant Plans. This may delay the expense of future conduit relief jobs. Generally, the largest possible size cables should be placed in ducts. ARENTO uses 2400 pair cables where 3600 pair cables would occupy fewer ducts.

3. Anticipated Benefits to ARENTO from Implementing Suggested Changes

This section presents summary highlights of benefits that can be expected to accrue ARENTO from implementing changes recommended in this draft report.

Accelerated Elimination of the Waiting Lists

With more comprehensive plans, improved coordination between OSP and switch placement and by increasing the fill ratio to 90+%, waiting lists will be eliminated by 1995. Additionally, about 35,000 lines can be placed in service immediately creating additional revenue of about LE 9.5 million.

Elimination of "Blockage" and Increased Call Completion Rates Creating Decreased Requirement for Future Trunking Facilities

With improved trunk administration, multiple benefits accrue to ARENTO. Call completion rates will increase resulting in increased revenue of about LE 16 million; network utilization will improve through a reduction in call attempts and future planned trunk additions can be reduced, freeing up capital for other projects. Additionally, with the accelerated replacement of X-Bar switches, call completion rates increase.

Increased Revenues From the Marketing of Vertical Services

With even a nominal level of marketing effort vertical services, such as "call waiting", will benefit ARENTO in several ways. Most importantly it will result in an increased number of billable calls, reduce call attempts, and produce approximately LE 25 million in additional revenue from such enhanced vertical services.

Costly Area Transfers Can Be Avoided

With improved planning and coordination and with the acquisition of adequate land parcels, switches can be installed in sites that are adequate for the next 20 years of anticipated growth.

Switching and OSP Investment Can Become Revenue Producing Sooner

With improved planning and coordination, OSP and switch installation can be completed simultaneously, thus avoiding idle or non revenue producing investments.

Increased Utilization of Digital Switch Capacity Can Be Realized

When the full manufacturing "administrative capacity" of the digital switch is utilized costs of as much as LE 500 per line can be avoided.

Preparation for the Future

By following the recommendations associated with fine tuning the internal processes within ARENTO to plan, build, maintain market price, bill, collect, and monitor results, ARENTO will begin to prepare for the future with an increased level of confidence and orientation to quality of service.

4. Recommendations to Enhance Management Control and Integrated Strategic Planning

This section contains recommendations that are intended to enhance and facilitate greater management control through the implementation over a more centralized integrated strategic planning process. After doubling the lines in service for the last three consecutive five-year planning cycles and satisfying much of the demand, a larger problem now presents itself, and that is how to manage such a large and unwieldy network in an almost totally manual record keeping environment. The challenge is to provide service to meet the remaining pent-up demand, as well as projected growth over the next five years. Indeed, managing this complex process will require ARENTO to constantly improving the quality of service, keeping the maintenance up to a cost-effective level, and handling the cash flow to judiciously fund future expansions. Coarse adjustments to an organization's direction can be made with experience and advice; however, fine tuning adjustments can only be made based on timely information processed from detailed data. Specific recommendations are highlighted below.

Implement Integrated Resource Planning (IRP)

Integrated Resource Planning can be an important management tool in both reducing marginal costs over time and in increasing revenues per line. As a process, it brings all the elements of an organization together and provides decision makers with the tools and information necessary to effectively manage progress into the future. IRP at ARENTO will result in comprehensive capital spending and operating plans that include all network related functions (switching, outside plant, trunk administration, land, buildings, tools and equipment), marketing, finance, maintenance and service operations. In addition, The organizational structure of this Integrated Strategic Planning group should have representatives from Operations and Maintenance, the three Engineering groups of junctions switching and outside

plant, Finance, Commerce, and Marketing. This group should report the results and recommendations to achieve the Strategic goals directly to the Chairman of ARENTO. This group will study the cost impact and revenue benefit of possible alternatives or changes in the Strategic Planning Objectives.

Upgrade Planning, Operations and Financial Systems

To support Integrated Resource Planning (IRP), additional data processing capabilities are required. Operational systems are needed for:

- Switch and traffic monitoring;
- Outside plant assignment and defective pair management;
- Cable and route assignments;
- Property records; and
- Dispatch and assignment (work scheduling).

Financial systems are needed for:

- Billing, collection and account treatment;
- Costing;
- Forecasting and budgeting;
- Developing comprehensive cost/price monitoring;
- Reporting and monitoring operating results; and
- Tariff design and monitoring.

Updated Network Planning

Outside Plant Plans must be developed to monitor the cable occupancy on fills. These Plans must include and be the vehicle for Defective Pain Administration. Economical designs to meet future growth are a vital part of the plans. These plans must be kept current through mechanized updates from switch occupation and reviewed often. In addition, the 20 year switching plan needs to be updated for technological changes, i.e., Remote Switching Modules and current demographics.

Upgrade Network Utilization Systems

A Call Completion and Junction Design Traffic Study should be completed. ARENTO needs the computerized tools to monitor the network and perform proper Trunk Administration. The Network Operation Center (NOC) must be fully operational to provide the Engineering and Administration Data Acquisition Systems (EADAS) information to keep the Trunk

Administration system current and accurate. In this regard, the deployment of multiple Vendor equipment makes an integrated Trunk Administration system more difficult, but even more important. The trunk usage data from each manufacturers' switch must be included. The same operational data must be gathered from the Tandem Offices to insure that office performance does not negatively impact the junction network. Moreover, the design produced for the Trunk Administration study should advise ARENTO regarding:

- Where to rearrange existing junction circuits;
- Whether additional junction circuits are needed;
- How to design junctions for new exchanges;
- How to monitor the entire local, national and international junction and switch network for performance and blockages; and
- What to do when blockages on network performance problems occur.

All of the above items will utilize the design techniques of High Usage trunk routes from the originating exchanges to the terminating exchange. If the terminating exchange is the international switch, then the junction would go directly from the originating office to the international exchange. Tandem traffic is reserved for final route traffic only. All calls going to the tandem should be analyzed to determine if sufficient traffic volume exists to justify a direct High Usage route.

VI. ANALYSIS OF SERVICE COSTS

This chapter presents K&M's analysis of ARENTO's cost of service for various types of customer and service categories. Key outputs from this analysis include calculations of long-term marginal costs and derived price elasticities of demand for each telecommunications service provided by ARENTO.

A. Task Background and Scope

Consistent with the issues raised and recommendations made in the earlier Teleconsult report regarding the cost of providing each service offered by ARENTO, the K&M team commenced this important analytical effort from the perspective of trying to answer the following questions:

- (1) Are the relationships between ARENTO service long-run marginal costs and the prices for these services aligned to permit long term telecommunications service growth in Egypt?
- (2) Are there areas where pricing alternatives can be explored to enhance revenue generation for future network expansion and, in turn, contribute toward the continued improvement of overall telecommunications service in Egypt?

In this regard, the K&M analysis of network planning and service improvements in Task 3 revealed that an opportunity existed for ARENTO to reduce average costs of providing services while at the same time improve overall revenues significantly through the achievement of higher levels of plant utilization in selected network elements. In particular, vertical and enhanced features that could be provided by ARENTO through expanded software (rather than additional capital expenditures) have relatively low marginal costs similar to, but 50 percent lower than, European and U.S. marginal costs for counterpart services. These services, such as Call Waiting and Abbreviated Dialing have extremely low long-run marginal costs, yet appeal to customers who are willing to pay considerably more to have access to such features. The subsidization power of these services is well known in the telecommunications industry, and can serve as a financial lever to invest in the provision of lower margin services such as rural local access with long loop lengths.

Task 3 also recommended that ARENTO should provide expanded services in the call completion trial consisting of Call Waiting, Call Forwarding, and Voice Messaging. These features also possess the ability to generate high direct revenues with relatively low long-run marginal costs. In addition, they can enhance customer satisfaction (i.e., perceived value of ARENTO services to the customer) while at the same time increasing network usage leading to additional revenues once the free call allowance has been exceeded.

However, before ARENTO can begin to maximize revenues from such enhanced features, it must first be in a position to know the optimal prices it will be able to charge for these relative to other telecommunications services. For this undertaking, ARENTO will need to know both long term marginal costs and price elasticities of demand for all telecommunications services being offered by ARENTO.

Therefore, the principal objective of Task 5 was to evaluate the cost of service for all existing and contemplated telecommunications services to establish specific long run marginal costs, as well as to determine price elasticities of demand, for each of these services. These results will serve as critical data inputs, along with revised revenue requirements, to a computerized model for evaluating alternative investment, revenue, and pricing strategies, as well as testing policy-constrained tariff structure options in determining future ARENTO rate changes.

In undertaking this critical task assignment, the K&M team reviewed the following types of information and data:

- Planned and future network configuration;
- Current network element costs;
- Marginal cost relationships among the various types of services offered;
- Service growth rates; and
- Most recent worldwide survey of demand elasticities for tele-communications service.

B. General Costing Concepts

There are several approaches or methodologies to the determination of telecommunications cost. The most highly accepted approaches are listed below along with key philosophy of each method.

1. Types of Cost Studies

- (a) **Tops Down Fully Allocated** - This approach is used to drive all costs including direct and indirect to major business unit or product line categories. Fully allocated methods are difficult to manage and difficult to provide economic rationale for the allocation of resources. This method requires allocation of broadly defined cost pools not associated with the production of or services.
- (b) **Bottoms Up Fully Allocated** - This approach is typically used to first identify all direct costs and then to allocate or attribute indirect cost pools to each business unit, product line or product. The same inherent full allocation shortcomings in terms of allocation method validity and poor economic rationale plague this approach.
- (c) **Bottoms Up Direct** - This approach avoids allocation of cost pools not directly associated with the provision, maintenance or production of a service. It does not provide adequate information to provide management with the relationship of either increasing or decreasing costs for additional output. In essence it does not provide feedback as to the productivity of resources used to provide additional services.

- (d) **Bottoms Up Long Run Incremental** - This direct costing approach provides feedback to management regarding the productivity of resources and establishes better indications as to the future cost structure of individual products and services as output expands. This approach can be used to establish price floors. The contribution products make above long run incremental costs (or to the indirect cost pools) can be established using this approach.

Tops down cost methods in telecommunications are typically separations based. These methods allocate costs from the company's books to specific service categories based on accounting rules that are in some cases arbitrary. These methods have been used for more than a half century to allocate costs between jurisdictions or state and federal regulatory areas for the purpose of earnings monitoring. (For a more detailed explanation of separations methodology, see Part 36 of Title 47 of the U.S. Code of Federal Regulation).

Bottoms up cost methods are new to the telecommunications industry and are based on relatively sophisticated engineering process models. The more demanding study efforts from the ground up to look at the piece parts of service provision are rewarded by more detailed cost estimates. Service specific cost studies are made available by aggregating cost components. These studies can provide long-run incremental, direct or fully allocated cost results. The bottoms up approach was used for this study to specifically address the adequacy of existing service rates and to determine the effects on the cost structure of ARENTO of increased market expansion as forecasted in their five year plan and service improvement recommendations by the K & M Study Team.

Since bottoms up costing methods use service specific cost studies that are part of the incremental costing model used in this task along with true unseparated costs of inputs obtained from ARENTO, the resulting incremental costs can be used to check for ARENTO service subsidies and service as a benchmark for appropriate pricing. Therefore, a cost counterpart for service prices or average revenues is provide in the form of long run average incremental costs. Marginal costs measure the change in costs associated with the production of one more unit of output assuming the production levels of all other products and services are held constant. This is slightly different from the price counterpart developed here or average incremental costs divided by the quantity of output produced. This average incremental cost approach is more applicable to the purpose of this study since most telecommunications investment is discrete and lumpy relative to output produced. When the marginal and average incremental cost relationships are compared over the long run, there is no distinction between them.

Additionally, incremental costing methods include depreciation, required return on investment, taxes, costs of customer operations, maintenance and other relatively minor cost elements. Fully allocated methods include all of the cost categories above plus non product specific costs and corporate overheads. In ARENTO these overheads can be significant; however, they should not be included in specific service costs for the purposes of this study.

Although the model was developed for use in the United States, the basic network infrastructure is similar to ARENTO's. The K & M Study Team identified areas where the model required alteration to address the specific network and business considerations of ARENTO. A major assumption regarding the cost of switching equipment was not provided

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to the study team due to proprietary considerations of ARENTO. As a result, the K&M Study Team used competitive market prices available in the United States as switch, transmission and outside plant input costs to ARENTO. Since many of the major installation projects in ARENTO are turn key and include foreign engineering and installation labor our assumptions relative to major plant equipment installation costs are not far from reality.

2. Long-Run Incremental Cost Assumptions

In our analysis, no costs are assumed to be fixed. The long-run in this case is a period of time sufficient for the ARENTO to adapt to changes in demand by arranging its plant in the most efficient way possible to produce the level of output demanded by consumers. These cost assumptions are tied to anticipated changes in ARENTO's network in terms of planned capital investment.

Further, these long-run cost estimates are reflective of technologies used to accommodate growth in ARENTO's markets. These anticipated technologies include digital switching and 100 percent fiber optic facilities for inter-office transport. It also includes fiber optic and copper facilities on the subscriber loop anticipated in ARENTO's Five Year Plan. For a more detailed description of these technologies see the "Task 3 - Service Improvement" study results.

The cost of equipment and materials is assumed to be priced at world market rates in the K & M Team analysis of long-run marginal cost. These equipment and material costs were a composite of various plant and switch vendor prices based on the equipment type and size relative to lines and feature availability.

The most significant cost element assumptions included in the ARENTO analysis that differentiate it from other similar analysis in the U.S. are labor rates and taxes. In the ARENTO analysis, the average outside plant engineering labor rate is assumed to be LE 3.97 per hour. Outside plant construction labor was assumed to be LE 1.50 per hour. These assumptions affect almost 80 percent of the total cost of outside plant investment. Although the engineering and installation of central office equipment was assumed to be provided by switch manufacturers, central office maintenance labor is assumed to be provided by ARENTO at LE 2.38 per hour which affects the long-run recurring cost of central office based services. In general, the ARENTO labor rates are assumed to be sixteen times lower than counterpart U.S. rates. These ARENTO labor have a significant influence on the long-run marginal cost estimates developed in this study. Since the Egyptian labor rate trends have been relatively stable over the last five years, no forecasted or trended changes in ARENTO labor rates were assumed in the long-run marginal cost estimates made by the team. A summary of specific long-run incremental cost assumptions utilized in the K&M cost analysis are presented in Exhibit VI-1 below.

**Exhibit VI-1
Long-Run Marginal Cost Analysis Assumptions**

Annual charge factors are multipliers which allow calculated investment to be converted into expense flows. These factors are ratios of expense to investment which have been calculated from ARENTO's books based on selected major items of plant investment. The charges used in this study were taken from a composite of companies operating in the U.S. and modified to ARENTO values where appropriate.

The following table shows the components of expense and how they were used in the calculations. An "x" indicates that the component of expense was included in the calculation.

ANNUAL CHARGE FACTOR ASSUMPTIONS

CATEGORY	VALUE	PEAK	OFF-PEAK
Depreciation	2.10	x	
Cost of Money	14.0	x	
Composit Tax	0	x	
Plant Specific	7.79	x	x
Plant Non-Specific	2.50	x	x
Customer	3.00	x	
Operations	2.66		
Corporate	.01		
Operations	.71		
Other Operating	-		
Misc. Loadings	-		
Total	32.77		

3. Other Cost Attribution Assumptions

Other cost attribution assumptions underlying the K&M cost analysis are summarized below in Exhibits VI-2 through VI-5.

**Exhibit VI-2
Peak and Off-Peak Assumptions**

These assumptions determine the setup (including first minute of use) and subsequent minute of use cost attribution.

Call Set-up Assumptions:

PEAK PERIOD

$$PPF = BHCA * CCR * Wks * PPH * PPCU$$

PPF Peak Period Factor

BHCA Busy Hour Call Attempt

CCR Call Completion Ratio (65%)

WKS Normalized Weeks In A Year (50)

PPH Peak Period Hours Per Week (78)

PPCU Ratio of Peak Period Utilization to BSBH (70%)

OFF-PEAK PERIOD

$$PPF = BHCA * CCR * 365 \text{ days} * 24 \text{ hours} * TFCU$$

PPF Peak Period Factor

BHCA Busy Hour Call Attempt

CCR Call Completion Ratio (65%)

TFCU Ratio of 24-hour utilization to BSBH (35%)

Call Duration Assumptions:

Exhibit VI-2 (Continued)

PEAK PERIOD

$PPDF = BHCCS * CVR * WKS * PPH * PPCU$

PPDF Peak Period Factor

BHCCS Busy Hour Usage In 100 Second Blocks

CVR Conversation Ratio -- CCS to MOU (1.67)

WKS Normalized Weeks In A Year

PPH Peak Period Hours Per Week (78)

PPCU Ratio of Peak Period Utilization to BSBH (70%)

OFF-PEAK PERIOD

$PPF = BHCCS * CVR * 365 \text{ days} * 24 \text{ hours} * TFCU$

PPF Peak Period Factor

BHCCS Busy Hour Usage In 100 Second Blocks

CVR Conversation Ratio -- CCS to MOU (1.67)

TFCU Ratio of 24 Hour Utilization to BSBH (35%)

Exhibit VI-3

Central Office Assumptions (Example)

Example Office Pyramid West

Office size	40,000 Lines
Trunks	3,960
O+T CCS	3.6
Originating CCS	1.8
Terminating CCS	1.8
Average Holding Time	147 seconds
(Line)	200 seconds
Average Trunk Holding Time	11.0 CCS
(Trunk)	50%
Labor Rate	ARENTO/Vendor

Exhibit VI-4

Loop Assumptions (Example)

Example Office: Pyramid West

Office Size	40,000 lines
Loop Length	13,200 Ft. (4.0 KM)
Percent Aerial	10%
Percent Underground	90%
Percent Behind Pair Gain	0%
COE Minor Material Loading	40%
Conduit Minor Mat. Loading	100%
Labor Rates	ARENTO

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**Exhibit VI-5
Transport Assumptions (Example)**

Example Office: Pyramid West	
System Type	Rockwell 150 Megabit
Circuits	2016 circuits
Material Loading: Circuit	25%
Material Loading: OSP	100%
Circuit Utilization Factor	65%
Plant Utilization Factor	65%
Support Plant Factor	30%
Labor Rates	ARENTO/Vendor

C. Discussion of the Network Cost Model

The network cost model utilized in this analysis is similar in structure to the Service Cost Information System (SCIS) developed for use by local exchange carriers in the U.S. by Bellcore. The SCIS model has been used over the past five years to support the development of competitive service rates in the U.S. and to move regulators away from "value of service" pricing. The model has been accepted in many rate filings in jurisdictions across the U.S. including California and Florida. It basically treats all service users alike and apportions costs to services on the basis of plant use. It ensures that feature costs are free of cross-subsidization and that no costs are double counted. It also ensures that all network investment is accounted for.

The cost used in this study is actually three modules joined by unit demand and service level assumptions. The cost of major services are determined by a Loop, Switching and Transport modules that are linked and provide input to each service cost estimate as required. These service modules each have their own components and require specific information and assumptions regarding how service is to be provided.

1. Loop Module

The loop module is an engineering process model that calculates long-run incremental costs and requires detail by plant account. It can describe the cost characteristics of multiple loop types including 100 percent copper, mixed copper/fiber as well as loaded and unloaded plant. It encompasses a variety of end user services such as residence access and usage, business line and PBX access and usage and government line and PBX access and usage. It can be used to describe the costs characteristics inherent in the deployment make up of outside plant such as aerial, buried, and underground or plant that varies by segment size and length from the central office to the subscribers.

Loop segment components include distribution and feeder outside plant capacity in the form of average serving office size, service density and average loop length as well as the distribution technology used to provide services. For example, unlike high growth areas in the U.S., pair gain devices are not normally deployed by ARENTO for various reasons. Also, ARENTO's loop outside plant is largely copper, buried underground which influences the module cost estimate outcome. The Loop Module was tailored to ARENTO's particular deployment and market characteristics. In addition any supplemental features provided that affect outside plant, including specific data or protection features were noted.

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2. Switch Module

The Switch Module which includes practically all central office equipment and features uses information such as the number and type of line terminations, usage by time of day, call duration or holding time and set up requirements dictated by the number of calls and equipment deployed. In this module all switch uses are treated alike and cost is apportioned based on their usage. Supplemental features such as the vertical services of "Follow Me" or "Call Waiting" were noted and costs were developed on the share of switch or processing unit use for each vertical and supplemental feature.

Supporting information in the form of vendor hardware costs, software right to use fees, vendor real time processor and memory requirements as well as industry accepted engineering equations were assumed to be similar to U.S. values. This has been demonstrated by the material received on the international versions of equipment purchased by ARENTO and the K & M Team familiarity with U.S. engineering practices.

3. Transport Module

The Transport Module includes all interoffice and toll facilities as well as any special access or non switched service facilities. Key inputs used by this module include the number and type of terminations the capacity of interoffice trunks as well as the density of switched traffic in CCS or Erlangs and facility deployment distances. Supplemental features are also considered in this module that involve transport.

The transport module includes fiber as well as copper serving and costing algorithms that are used to develop unit costs based on competitive industry prices. The price updates for all plant types in each module have been updated to reflect equipment and material prices available as of May of 1993. Since no dramatic decreases or increases in these model input prices have occurred subsequent to this study, the model output in terms of total direct cost to be attributed relative to network plant elements constructed should be accurate. The incremental cost calculations were based on the latest input prices and do not incorporate potential decreases in input factor prices.

D. Analysis of Long Run Marginal Costs

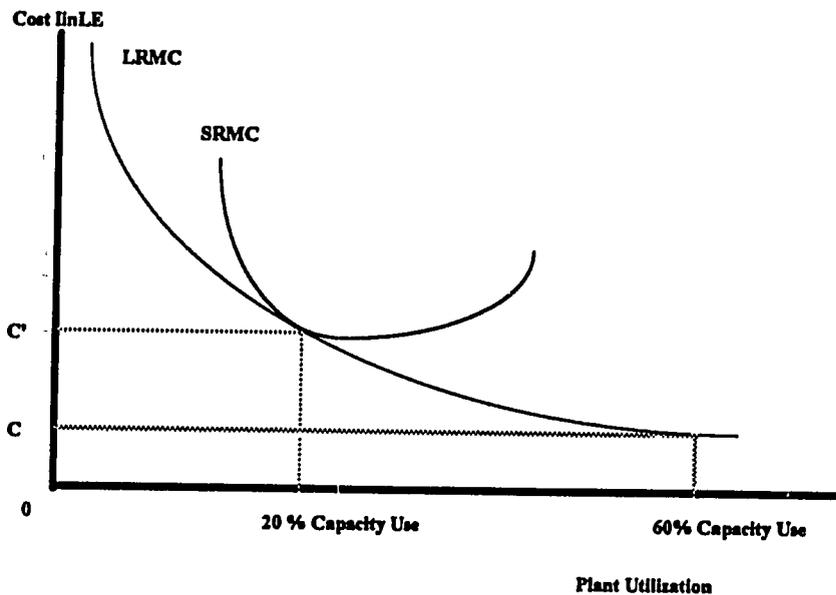
The incremental costs derived in the K & M Team cost analysis rapidly approach long-run marginal cost as the use of plant exceeds fifty percent of capacity. Scale economies are reached quickly in moderate to large size loop, switch, and transport configurations as the usage level exceeds approximately half of the planned capacity. This general rule has been observed in the cost analysis of numerous local exchange carriers and there is no reason as to why it should not apply to ARENTO as well.

The economic counterpart of the short-run incremental cost estimate is the short-run marginal cost of service. An analysis of these costs may be used to show the incremental cost associated with underutilized plant and will be typically higher than the long-run marginal cost of the respective switch and transport based services. These short-run incremental costs are not presented in this study. Steps taken by ARENTO to improve service and productivity of investment as described in "Task-3 Service Improvement" will make short-run incremental costs irrelevant.

Estimation of the long-run marginal costs of the services derived from underused plant required the K & M Team to develop cost scenarios calculated as if the plant were used near full capacity. The incremental costs estimated by the K& M Team Model will essentially equal long-run marginal costs for each service scenario developed and are hereafter referred to as long-run marginal costs.

Exhibit VI-6 below illustrates the cost relationships as plant use increases. Relatively high plant use yields incremental cost estimates that approximate long-run marginal cost estimates (C) while low plant use results in estimates that approximate short-run marginal costs (C').

**Exhibit VI-6
ARENTO COST FUNCTIONS**



These costs can then be compared to the corresponding rates for each service to determine 1) if the service is generating revenues adequate to cover long-run marginal costs and 2) if the service is subsidizing the services that don't cover their long-run marginal costs.

1. Services Analyzed

The services that were examined relative to their respective long-run incremental costs are summarized below in Exhibit VI-7. International, teletype, telegraph and mobile cellular services were not included in the analysis due to lack of information regarding these services and the stated strategy of ARENTO to cap investment on teletype/telegraph services. Although mobile cellular services are typically in a growth segment of the market the K&M Team felt that such services will not be in a position to compete with landline services for decades to come in Egypt. International toll services cost structure is very similar to the toll services structure mentioned below; however, pricing for toll services will be largely determined by international competitive forces beyond the scope of this study.

**Exhibit VI-7
Summary of Services Analysis**

LOCAL ACCESS:

- Flat Rate Structured (local line access)
- Bound Extensions (second or multi-line)
- Measured Structured or Free Call Allowance(set up and duration)

TOLL SERVICES BY RATE BAND (KILOMETERS):

- 1 to 10
- 11 to 25
- 26 to 50
- 51 to 100
- 101 to 150
- 151 to 200
- 201 to 300
- 301 to 500
- 501 to 700
- 701 to 900
- 901 and over

FEATURES

ARENTO SERVICE

- Abbreviated
- Follow Me
- Hot Line
- Wake-Up
- Call Waiting
- Conference
- No Noise

U.S. COUNTERPART

- (30 Number Speed Calling)
- Call Forwarding (Variable)
- Direct switched line
- Wake-up/Reminder
- Call Waiting
- Three Way Calling
- Data Line Security

COIN TELEPHONE ONE MINUTE FEE BY DISTANCE BAND (KILOMETERS):

- 1 to 50
- 51 to 200
- 201 to 300
- 301 to 700
- 700 and over

JUNCTION LINES BY ACCESS ARRANGEMENT AND DISTANCE BAND (KILOMETERS)

- Annual Fee for The First .5 KM
- Annual Fee for Each Subsequent .5 KM
- Installation Fee Within 4 KM

LEASED TRUCK LINES (KILOMETERS):

- | | | |
|--------------|--------------|----------------|
| - 1 to 25 | - 251 to 300 | - 701 to 750 |
| - 26 to 50 | - 301 to 350 | - 751 to 800 |
| - 51 to 75 | - 351 to 400 | - 801 to 850 |
| - 76 to 100 | - 401 to 450 | - 851 to 900 |
| - 101 to 125 | - 451 to 500 | - 901 to 950 |
| - 126 to 150 | - 501 to 550 | - 951 to 1000 |
| - 151 to 175 | - 551 to 600 | - 1001 to 1100 |
| - 176 to 200 | - 601 to 650 | - 1101 to 1200 |
| - 201 to 250 | - 651 to 700 | - 1201 to 1300 |

2. Cost Model Results

The long-run marginal cost estimates for local access are shown in Exhibit VI-8 for each of four distance bands from the consumer to the ARENTO serving office. For most of ARENTO's urban serving offices in Cairo and Alexandria, the four kilometer and less rate band is predominant. The column titled "Up Front Investment" is the estimate of cost in LE associated with the provision of the typical access loop in the respective distance bands. That is the investment for a loop of four kilometers or less is estimated to cost LE 1,492 engineer, construct and provision. This estimate is far less than the U.S. equivalent of about LE 2,700 to LE 3,300 per subscriber loop. The difference is primarily due to lower labor rates in ARENTO associated with the installation of local loops by Egyptians. The labor component of local loop can constitute as much as 80 percent of total installation costs.

The total annual incremental expense of LE 188 is associated with the recurring variable and fixed costs attributed to each local access or subscriber line in the four kilometer distance band. This expense includes an annual interest factor of 14% to cover the opportunity cost of funds use. Other attributions to this cost per loop include, depreciation expense and general administrative expenses.

The "Annual Direct Expense" amount of LE 14 includes the recurring plant specific operations expenses directly attributable to the maintenance and repair of subscriber access plant. "Plant non-specific operations expense" are also included in these direct expenses. This category of expense contains the costs associated with property which is being held for future use and network operations expense including attributable costs from; facility assignment, trouble dispatch, non-trouble dispatch, dispatch administration, and repair answer functions. In addition, "Annual Direct Expense" includes attributions of "customer operations expense" which have been spread over the embedded switch, transport and outside plant investment relative to the local access service. This category includes bill inquiry expense, billing expense, customer accounting expense, bill handling expense and order processing expense.

**Exhibit VI-8
Local Access Cost per Subscriber**

Flat Rate Structure			
Rate Band	Up Front Investment	Annual Direct Expense	Total Annual Expenses
4.0 and Less KM	LE 1492	LE 14	LE 188
4.5 KM	LE 1539	LE 14	LE 196
5.0 KM	LE 1597	LE 15	LE 206
5.5 KM	LE 1712	LE 16	LE 226

In urban areas served by ARENTO such as Cairo and Alexandria the shorter loop length is more prevalent. When compared to the weighted average local access rates charged subscribers annually of LE 53.2, the long-run marginal cost of urban local access is LE 188 or approximately 3.5 times greater than annual revenues. This points to direct subsidization of LE 134.8 for local access by other services.

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Observations of the rate structures of the U.S. and other countries shows that this form of local access subsidization is not unusual. In the U.S. for example, many local exchange carriers subsidize almost fifty percent of residential subscriber access cost with other service margins. Local access service is also a necessary condition for the sale of all other switched and enhances ARENTO network services. From a marketing perspective this defines the "addressable market" for other higher margin services. Strategically, subsidization of the local access service may be seen as appropriate if other more high margin services can be sold to offset the marginal cost deficit of LE 134.8 per subscriber.

Longer distance bands prevalent more rural local access can increase the subsidy by as much as 28 percent or LE 38. Since distance is typically not a factor in access revenues, the directly attributable costs associated with longer loop lengths are not considered in the existing access rate structure for residence, business or government access.

The marginal cost counterpart for the six minute average call unit usage component of the subscribers bill is shown below in Exhibit VI-9 in two parts labeled "Call Set-Ups" and Call Durations". In ARENTO's current pricing scheme, residence subscribers are allowed 1500 six minute average call segments free and pay LE .05 for each call segment or unit over the 1500 limit.

**Exhibit VI-9
Local Usage
Cost of Free Call Units**

Access Lines, Under 4 KM	LE 159/Yr.
Each Add .5 KM	LE 9/Yr.
Call Set-Ups, Peak	LE .015/Set Up
Off-Peak	LE .001/Set Up
Call Durations, Peak	LE .0049/MOU
Off-Peak	LE .0003/MOU

In the Exhibit above, the total annual expense associated with local usage of LE 159 is presented along with the local usage marginal cost associated with loop length increases of each .5 KM. This analysis shows that local loop length or distance is a significant factor in marginal cost of local usage.

Additionally, the call set up and duration marginal costs are presented for peak and off peak periods of local access use. Note that the LE .0248 or $[\text{.015} + 2 \times (\text{.0049})]$ marginal cost for peak period 6 minute average call segment use is significantly less than the LE .05 charge for call units above the 1500 and 750 free call allowance currently set for residence and business/government use, respectively. This margin of 50 percent per average call six minutes or less approaches 70.6 percent or $[\text{.05} - (6 \times \text{.0049})] / \text{.05}$ for longer duration calls.

The off-peak marginal costs for each six minute average call amounts to LE .0016 and the marginal cost for call of longer duration off peak approaches LE .0009. This estimate implies that measures to stimulate calling during off-peak periods will result in margins to ARENTO that approach 98 percent per six minute average call unit.

Using available 1992 data on local access calls and calls billed information, approximately 23.8 percent of all access calls generated exceeded the free call allowances mentioned above. These billed local calls have generated approximately LE 25.9 million. If it is assumed that two thirds of the calls are made during peak periods and the calls have an average holding time of approximately three minutes then a total margin of LE 14.8 million generated from local usage billed can be used to cover the marginal cost of free call allowance local usage (Exhibit VI-10). This analysis reveals that 41.7 percent of free calls are being subsidized by the local usage billed.

Exhibit VI-10
Local Usage Analysis of Calls Billed Versus Free Call Allowances

The assumptions used are:

- 2,177 million local calls in 1992
- 1,930.6 thousand access lines in service in 1992
- 23.8 percent of local calls were billed in 1992
- 66.7 percent of local calls were made during peak periods
- marginal cost are LE .0248 and LE .0147 for peak and off-peak calls, respectively
- revenue per billed local usage is LE .05 per 3 minute average call

Estimate of billed local three minute average calls:
 $2,177 \text{ million} \times .238 = 518.1 \text{ million}$

Estimate of peak period revenue excess over marginal costs:
 $(518.1 \text{ million} \times .667) \times (\text{LE } .05 - \text{LE } .0248) = \text{LE } 8.71 \text{ million}$

Estimate of off-peak revenue excess over marginal costs:
 $(518.1 \text{ million} \times .333) \times (\text{LE } .05 - \text{LE } .0147) = \text{LE } 6.09 \text{ million}$

Estimate of weighted marginal cost per three minute average call (peak and off-peak)
 $(\text{LE } .248 \times .667) + (\text{LE } .0147 \times .333) = \text{LE } .0214$

Estimate of percentage free calls subsidized by local usage billed:
 $[(\text{LE } 8.71 \text{ million} + \text{LE } 6.09 \text{ million}) / \text{LE } .0214] / (2,177 \text{ million} - 518.1 \text{ million}) = 41.7 \text{ percent}$

Source: Data provided by ARENTO

In summary, ARENTO is currently pricing close to half the marginal cost for all calls over the free call allowances. It is making larger margins due to the lower marginal costs for calls of longer duration and calls made during off-peak periods (See "Task 3 - Service Improvement" for a description of peak and off-peak local usage). In addition, the margins generated from billed calls cover less than half the marginal costs of non-billed local access calls.

The features provided by ARENTO and the usage of these features is described in "Task 3-Service Improvements". The K&M Team estimates of the ARENTO annual long-run marginal costs associated with each feature is provided in Exhibit VI-11 below. Due to the unique cost of labor inputs, these costs are approximately half those of U.S. counterpart services. These services will be analyzed relative to the product margin they produce. This product margin is expressed as a percentage and is defined as the annual service price less marginal cost divided by the annual service price.

**Exhibit VI-11
ARENTO Vertical Services and Calling Features**

Egyptian Service		Long-Run Marginal Cost
Abbreviated Dialing	20	LE 8
Follow Me	40	LE 4
Hot Line	30	LE 4
Wake Up	0	LE 3
Call Waiting	20	LE 3
Conference Calling	40	LE 13
No Noise	20	LE 4

"Abbreviated Dialing" is priced at LE 20 with a margin of LE 12 per year per subscriber. This results in a product margin of 60 percent. "Follow Me" service yields an LE 36 margin annually per subscriber or a 90 percent product margin and "Hot Line" results in a LE 26 per year per or 86.7 percent product margin. "Call Waiting" results in a product margin of 85 percent. "Conference Calling" results in a smaller product margin of approximately 67.5 percent and "No Noise" yields a product margin of 80 percent. These product margins increase as the installation fees charged by ARENTO are incorporated into the revenue streams for each product.

In summary, each of these special features provides high product margins for ARENTO that may be used to subsidize other services. Some special features such as call waiting, "Follow Me" and "Conference Calling" also stimulate the use of the network. The additional completed calls resulting from these services assist in moving the subscriber above the free call allowances to stimulate local usage revenues. Therefore, these call completion services can result in the percent of local usage billed to rise above the 23.8 percent level observed in 1992.

Coin Telephone marginal cost estimates are shown in Exhibits VI-12 and VI-13. The coin access long-run marginal cost is shown to be the essentially the same as the marginal cost of non coin access lines. Coin call set-up marginal costs are included in the first minute of use columns for peak periods and off-peak periods. The subsequent minutes do not have the costs associated with call set up.

**Exhibit VI-12
Coin Telephone Access Marginal Cost**

Access Lines	Under 4 KM	LE 188/Yr.
	Each Additional .5 KM	LE 9/Yr.

Coin telephone usage long-run marginal cost is similar to the residential, business and government local usage long-run marginal cost. The costs vary with peak and off-peak usage as well as distance.

**Exhibit VI-13
National Coin Telephone Usage Marginal Cost**

Rate Band	Peak		Off-Peak	
	LE per First MOU	LE per Subsequent MOU	LE per First MOU	LE per Subsequent MOU
1 to 50 KM	0.0289	0.0008	0.0017	0.0004
51 to 200 KM	0.0397	0.0188	0.0022	0.0009
201 to 300 KM	0.0476	0.0267	0.0026	0.0013
301 to 700 KM	0.077	0.0561	0.004	0.0027
700+ KM	0.0921	0.0712	0.0047	0.0034

The usage of coin lines, however, reveals rate band product margins that vary with distance and time of day (peak and off-peak). If we assume a three minute average call duration, the peak period cost for a local call within 50 kilometers is LE .0305 while the revenue for the call is LE .30. This results in a product margin of LE .2695 or almost 90 percent. The same call made to over 700 kilometers results in a 74 percent margin. This indicates that the marginal cost for peak period coin service is more sensitive to distance than the coin rates. The product margin on three minute off-peak calls within 50 kilometers is approximately 97.5 percent while the product margin on more distant calls is 96.2 percent. This indicates that the off-peak pricing structure is more aligned to the long-run marginal cost of providing coin service and makes a higher margin than peak period coin calling. Regardless, coin service is a high margin service when viewed from the long-run marginal cost perspective.

Long distance service marginal cost estimates relative to the existing tariff rate bands for peak and off-peak use are shown below in Exhibit VI-14. The exhibit below includes call set-up in the "First MOU" column while the "Next MOU" does not include the marginal costs associated with call set-up.

**Exhibit VI-14
Long Distance Calling Long-Run Marginal Cost
Cost in LE**

Rate Band	First MOU	Next MOU	First MOU	Next MOU
1 to 10 KM	0.0260	0.0051	.0015	0.0002
11 to 25 KM	0.0268	0.0059	.0016	0.0003
26 to 50 KM	0.0289	0.0080	.0017	0.0004
51 to 100 KM	0.0325	0.0116	.0018	0.0005
101 to 150 KM	0.0361	0.0152	.0020	0.0007
151 to 200 KM	0.0397	0.0188	.0022	0.0009
201 to 300 KM	0.0476	0.0267	.0026	0.0013
301 to 500 KM	0.0627	0.0418	.0033	0.0020
501 to 700 KM	0.0770	0.0561	.0040	0.0027
701 to 900 KM	0.0921	0.0712	.0047	0.0034
901 + KM	---	---	---	---

A three minute average call made during daytime peak periods will yield a product margin of approximately 87.9 percent which increases to 90.8 percent as distance increases to over 700 kilometers. The same call made during the evening peak period but tariffed at night rates will result in a decrease to a product margin of 87.9 for distant calls of 700 kilometers or more. Off-peak product margins are 99.3 percent for calls under 10 kilometers and 99.5 percent for more distant calls. Regardless, toll services in Egypt generate revenues greater than marginal costs. From an economic perspective, ARENTO should be promoting the use of its toll network to stimulate increased high product margin toll calling.

The annual long-run marginal cost of leased special circuits and trunk lines provided by ARENTO is arrayed below in Exhibit VI-15 by the same rate bands that are included in the tariffs. The annual product margins can be estimated from the comparison of the annual long-run marginal costs for this service (as presented in this exhibit) to ARENTO's rates for this same service. For example, in the 1 to 25 kilometer rate band the marginal cost of a leased trunk is LE 190 while the current tariff for this service is LE 544 annually. Trunks in this rate band produce a 65 percent product margin which decreases to 54.6 percent at the most distant rate band. This analysis reveals that leased trunks are relatively high margin services with a relatively stable ratio of prices to marginal costs.

Exhibit VI-15
Leased Trunk Lines Long-Run Marginal Cost
Annual Rates in LE.

Rate Band	Annual Rate	Rate Band	Annual Rate
0 to 25 KM	190	501 to 550 KM	5377
21 to 50 M	473	551 to 600 KM	5848
51 to 75 KM	662	601 to 650 KM	6320
76 to 100 KM	945	650 to 700 KM	6791
101 to 125 KM	1228	701 to 750 KM	7357
126 to 150 KM	1416	751 to 800 KM	7828
151 to 175 KM	1699	801 to 850 KM	8300
176 to 200 KM	1888	851 to 900 KM	8771
201 to 250 KM	2454	901 to 950 KM	9243
251 to 300 KM	2925	950 to 1000 KM	9808
301 to 350 KM	3396	1001 to 1100 KM	10751
351 to 400 KM	3868	1101 to 1200 KM	11789
401 to 450 KM	4339	1201 to 1300 KM	12732
451 to 500 KM	4905		

The long-run marginal cost of junction lines is shown below in Exhibit VI-16. The current tariffed rates for junction lines are LE 150 for installation and LE 800 annually for each line for fiber or microwave connection. Similarly, cable or copper connection is tariffed at LE 36 for installation and LE 9 for the first .5 kilometer and LE 12 for each additional .5 kilometer.

Exhibit VI-16
Junction Line Long-Run Marginal Cost

Annual Cost in LE.

Copper Cable	Investment	LE 110/5 KM
	Annual Expense	LE 19/5 KM
Fiber Cable or Microwave	Investment	LE 1850/4 KM
	Subsqnt. Investment	LE 4/5 KM
	Annual Expense	LE 320/4 KM
	Subsqnt. Expense	LE 1/5 KM

The installation revenue from a 10 kilometer copper facility (in Cable) is LE 180 with an annual recurring revenue of LE 141. The corresponding cost for a copper facility of the same length from the K & M Study Team cost estimates in the exhibit above are LE 2,200 for the investment and LE 380 for recurring expenses annually. From these estimates the marginal cost of copper junction lines is not being covered either in installation fees or recurring charges.

With fiber or microwave technology, the installation investment is LE 1,898 while the recurring marginal cost is LE 332 for a 10 kilometer line. This is contrasted to the LE 150 installation fee and a LE 800 recurring rate charged by ARENTO. Only approximately 8 percent of the installation cost is being covered with the installation tariff. The annual recurring tariff for junction lines produces a LE 468 product margin for the service. ARENTO must receive this revenue stream for slightly over three years and four months to recover the cost of the junction line investment.

E. Estimates of Price Elasticity of Demand

The responsiveness of customers to changes in prices is an absolutely critical input to developing an efficient price structure and to determine an optimum price level. The customary measure for this purpose is the price elasticity of demand. The price elasticity of demand is defined as the percentage change in the quantity demanded for a one percent change in the price. The use of price elasticities is most appropriate since the estimates are pure numbers and thereby escape the problems of units of measurement. That is, since the responsiveness is measured in percentage terms, it does not matter whether the change in price is expressed in pounds, dollars, or any other monetary unit; what matters is the percentage change. While K&M was unable to calculate specific price elasticities of demand for each service because ARENTO does not presently save the necessary historical data on previous price changes, we were able to utilize estimates from a variety of sources in determining the appropriate values to be applied in the case of Egypt.

Given the excellent availability of reference resources to gauge the magnitude of the price elasticity of demand for various telecommunications services, no new estimates will be presented in this analysis. Rather, this section will briefly summarize the existing literature¹.

¹ The primary source of this material and data is Lester D. Taylor, *Telecommunications Demand: A Survey and Critique*, Ballinger Publishing Company, Cambridge, Mass., 1980.

1. Summary of Results

In Exhibit VI-17, an overall summary of price and income elasticities for the demand for network access, local usage, long-distance calls, and for the duration of long-distance calls is provided. These estimates represent a subjective interpretation of the empirical record available. The estimates refer to long-run, steady state elasticities and for residence and business customers combined. Later sections will desegregate these customer classes where possible. To reflect the uncertainty associated with these subjective estimates, a range of likely outcomes is also provided in Exhibit VI-17.

Exhibit VI-17
Point & Interval Estimates of Price and Income
Elasticities of Demand for Selected Telephone Services

Type of Demand	Elasticity			
	Service Connection Charge	Monthly Service Charge	Toll Price	Income
Network Access	-0.03 (0.01)	-0.10 (0.09)	-	0.50 (0.10)
Local Calls	-	-0.20 (0.05)	-	1.00 (0.40)
Toll Calls (conversation MOUs)				
Intrastate (short-haul)	-	-	-0.65 (0.15)	1.25 (0.25)
Interstate (longer-haul)	-	-	-0.75 (0.20)	1.50 (0.40)
International Calls	-	-	-0.90 (0.30)	1.70 (0.40)
Duration of Toll Calls	-	-	-0.15 (0.05)	0.25 (0.10)

(Numbers in parentheses are subjective standard errors.)

The foregoing Exhibit represents a summary of a number of studies available in the literature. The following sections will take each of the types of service and quickly review the evidence of the price sensitivities associated with it.

2. Network Access

Network access may be defined as the ability of a consumer to originate and terminate calls independent of his actually doing so. In the U.S., this is provided on a monthly recurring charge basis as well as, in some cases, involving the payment of a one time service connection charge. For purposes of contributing to or maintaining universal service over time, the value of the price sensitivities are critical matters for public policy concerns. As indicated in Exhibit VI-17, of all the services offered by telecommunications companies, the price elasticity of demand for access to the network is the least elastic service. This inelasticity suggests that as a matter of public policy, the price of the monthly connection charge can be increased by relatively large amounts without serious degradation of the number of customers who will want to purchase and maintain a connection to the phone companies on a continuing basis. While the figure provided in the foregoing table was a summary, Exhibit VI-18 provides the estimates of price and income elasticities of the demand for access to the telephone network on a more disaggregated basis.

The studies cited in Exhibit VI-18, are largely based on data from the United States and from Canada, although the Waverman study for residential and business combined is based on a

time series from Sweden. To give a perspective on the variety of data employed, the Alleman study was based on a cross-section of U.S. cities as the unit of observation. Feldman also employed cross-sectional data, but used state level observations, rather than cities. Perl's data base was an extensive cross-sectional survey of U.S. households, and is perhaps the most robust and detailed of all the studies indicated. The Rash and Waverman studies were based on annual time series data from Ontario and Quebec, Canada, while the Davis, et al. study relied on a time series of observations from the former Bell System in the United States.

Exhibit VI-18
Estimates of Price and Income Elasticities of the
Demand for Access to the Telephone Network

Class of Customer and Study	Dependent Variable	Price Elasticity		Income Elasticity
		Service Connection Charge	Basic Service Charge	
Residential				
Alleman	mains	NE	-0.17	0.56
Feldman	mains & extensions	NE	-0.05	0.54
Perl	telephone availability	-0.2	-0.08	0.15
Rash	mains	NE	-0.11	0.61
Waverman	mains	NE	-0.12	0.15
Business				
Waverman	mains	NE	-0.09	NE
Residential & Business Combined				
Davis et al.	total telephones	NE	-0.08	0.39
Waverman	mains	-0.04	-0.06	0.56

NE: Not Estimated

As can be seen from an examination of Exhibit VI-18, the results of the studies with respect to the price elasticity of demand for network access are remarkably consistent, regardless of the statistical methodology employed, the form of the data, or the country of origin. This lends an air of confidence to the fact that the price elasticities can be employed for the Egyptian situation, based on the experience of other countries.

3. Local Usage

The empirical evidence on the demand for local usage is relatively limited, largely due to the pricing of it on a flat rated basis in both the United States and Canada. Nevertheless, some researchers have been able to analyze the question using an assortment of estimation techniques and a variety of data sources. The results of these estimates are illustrated graphically in Exhibit VI-19 for residential customers. All estimates show local usage demand by residential customers to be relatively inelastic, with the range of estimates, surprisingly

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compact.² Based on a judgmental synthesis, the white area in Exhibit VI-19 illustrates the overall range in which the usage elasticity falls for residential customers. Numerically, the anticipated range is from -0.05 to just over -0.20.

In Exhibit VI-20, elasticity estimates are presented for business customers. While fewer studies are available which address the business customer as a class, those which are available indicate a price elasticity of demand for local usage roughly in the same range as that of residential customers. Once again in this figure, the range in which the usage elasticity may be expected to fall for business customers is indicated by the non-shaded region and is virtually identical to that for residence customers.

In both the case of residence and business customer demand for local usage, it appears that calls are somewhat less elastic than minutes of use, and that usage during the peak period³ usage is more inelastic than usage in the off-peak periods. The latter situation is similar to results which have been found by research into the time-of-day characteristics of electricity demand.

4. Toll Usage

The vast majority of the empirical literature in telecommunications demand consists of examinations of the demand for toll services. The literature is so extensive that only a summary will be presented here. The reader is referred to the appendix for discussions of the principle studies available. The subjective point estimate of long-run intrastate toll call price elasticity is -0.65. If one were to place a subjective range around this point estimate, the best estimates of long-run price elasticity for short-haul toll would lie between -0.50 and -0.80. As a proxy for short-haul toll traffic, the analysis relies upon estimates of intrastate toll calls in the U.S. from the former Bell System. There is no real distinction between interstate and interstate (or for that matter local calling) so far as customer behavior is concerned. Accordingly, it should be anticipated that the shorter-haul toll demand elasticities should lie between those of local calls and longer haul toll calls. Exhibit VI-19 contains the summarized estimates of the short-run and long-run price elasticity estimates from individual states. All the estimates are based on time-series estimates for the individual units of observation. Most of the models are logarithmic specifications with a Koyck lag structure imposed.

²For countries or companies using a pulse system for metering, this is equivalent to calculating the duration of a call and the price elasticities for minutes of use are probably the more accurate reflection of the demand responsiveness.

³The peak period is generally between 8 am and 5 PM weekdays; shoulder period is consistent with the evening, 5 PM to 11 PM and all day weekends; night refers to 11 PM to 8 AM.

Exhibit VI-19
Estimates of Price Elasticities of Demand for Short-Haul Toll Calls

State	Dependent Variable	Price Elasticity		Income Elasticity	
		Short-Run	Long-Run	Short-Run	Long-Run
A-1	messages	(-0.16)		(0.92)	
A-2	M/MT	-0.15	-0.22	0.58	0.86
A-3	M/MT	(-0.12)		(0.88)	
B-1	M/T	-0.32	-0.60	0.63	1.18
C-1	messages	-0.07	-0.14	0.24	0.53
D-1	PDR	-0.35	-0.45	0.31	0.40
E-1	M/MT	-0.03	-0.85	0.05	1.40
E-2	M/MT	-0.21	-0.73	0.19	0.65
E-3	M/MT	-0.17	-1.04	0.09	0.55
E-4	M/T	-0.26	-1.04	0.14	0.56
E-5	M/MT	-0.13	-0.81	0.21	1.28
F-1	PDR/POP	-0.14	-0.62	0.21	0.91
G-1	PDR/POP	-0.16	-0.56	0.80	2.71
H-1	PDR	-0.37	-0.50	0.63	0.88
I-1	M/T	-0.44	-0.84	0.19	0.36
I-2	PDR/POP	-0.29	-0.64	0.24	0.54
I-3	M/T	-0.35	-0.96	0.31	0.81
I-4	M/T	(-0.59)		(0.52)	
J-1	PDR/POP	-0.14	-0.23	0.58	
K-1	PDR/T	-0.021	-0.91	0.39	
L-1	M	-0.20	-0.39	0.45	0.85
L-2	M	-0.23	-0.43	0.59	1.12
M-1	PDR/POP	-0.12	-0.69	0.47	2.77
M-2	PDR/POP	-0.17	-0.83	0.46	2.23
N-1	PDR/POP	-0.14	-0.82	0.33	2.01
N-2	PDR	-0.24	-0.86	0.60	2.10
N-3	PDR/POP	-0.15	-0.79	0.44	2.35
N-4	PDR/POP	-0.13	-0.91	0.36	2.52
O-1	PDR/POP	-0.07	-0.84	0.23	2.65
R-1	PDR/POP	(-0.21)		(0.59)	
Q-1	PDR	-0.31	-0.37	1.08	1.32

Symbols: M=messages; MT=main telephones; T=telephones less residential extensions; PDR=price deflated revenues; POP=population

As can be seen from an examination of the Exhibit above, our hypothesis is largely confirmed. The short-run price elasticity of demand for short-haul toll is very close to the values for local calling, indicating that customers respond approximately the same way to changes in the price of calling, regardless of the jurisdictional nature of the traffic. It is only the long-run elasticities which are significantly larger than that for local calls.

Estimates for the price elasticity of longer-haul toll calls may be obtained from the literature on interstate toll demand from the United States as well as some Canadian numbers. The results of a number of such studies are presented in Exhibit VI-20. As can be seen from

examining this Exhibit and comparing longer-haul to the short-haul results, the demand for long-haul toll is generally found to be more elastic and increases with the distance of the call. With the exception of one study by Kwok, Pearce and Lee, all studies place the price elasticity of demand for toll in the range of unitary elasticity or even in the elastic range. Also keep in mind that these studies were performed prior to the development of competition that has been experienced in the United States over the past several years. Accordingly, the estimates may be too low for present purposes. Some may argue that the elasticities in these studies are overstated, but those doubters should be reminded that the rate reductions that have been witnessed in the United States interstate toll market are exactly what one would expect to see implemented by a company attempting to increase its revenues in the face of elastic demands for its services.

Exhibit VI-20
Estimates of Price Elasticities of Demand for Long-Haul Toll Calls

Study & Type of Demand	Dependent Variable	Price Elasticity		Type of Data
		Short-Run	Long-Run	
Residential				
Dobell et al.	PDR	-0.30	-1.90	TS: Ontario & Quebec
Khadem	PDR	-1.28	-2.58	TS: Trans-Canada
Larsen & McCleary	messages	NE	-1.01	CS: States
Rash	PDR	NE	-0.94	TS: Ontario & Quebec
Waverman	PDR/T	NE	-1.16	TS: Ontario & Quebec
Wert	day calls	-0.29		TS-CS: Bell System
Business				
Larsen & McCleary	messages	NE	-0.98	CS: States
Waverman	PDR/T	-1.20	-1.35	TS: Ontario & Quebec
Residential-Business				
AT&T	messages	NE	-0.4 to -0.5	TS: Bell System
Davis et al.	PDR	-0.88	-1.03	TS: Bell System
Dobell et al.	PDR	-0.11	-2.57	TS: Canada
Kwok, Lee & Pearce	messages	-0.18	-0.41	TS: Ontario & Quebec
Kwok, Lee & Pearce	messages	-1.70	-2.71	TS: Trans-Canada

Symbols: PDR: price-deflated revenues; T: number of main telephone stations; TS: time series; CS: cross section; NE: not estimated.

Obviously, the question of the current price elasticity of toll services is of great policy importance. The estimates available would indicate that the long-run price elasticity for long-haul toll calls is in the range between -0.70 and -1.30 with a subjective mean of -1.00.

For immediate pricing purposes, the short-run impacts may be more important than the longer-run elasticities; although we clearly must consider the long-run impacts in our planning for future price changes. A subjective estimate of the short-run price elasticity of demand would be in the neighborhood of -0.40. This number, like the longer-run estimates will clearly exhibit variation across market segments, but should provide some rough guidance in day-to-day rate design.

5. Other Price Elasticity Estimates

Estimates of price elasticity for other services are presented in Exhibit VI-21 below. The price elasticity estimates for vertical services such as Call Waiting and Call Forwarding usually fall into a relatively broad range of elasticity estimates due to the bundling of these vertical features. Call Waiting is widely known as the most popular of the vertical features and, as a result, the price elasticity for this feature is likely in the low end of the range of vertical service elasticity estimates.

Exhibit VI-21
Estimates of Price Elasticities of Demand for Other Services

<u>Service</u>	<u>Elasticity Estimate</u>
Private Line	-1.03
Coin Access	-0.88
Coin Usage	-0.19
Vertical Services	-0.99 to -0.07
International	-0.52 to -3.65

Source: Taylor, Lester D.; *Telecommunications Demand: A Survey and Critique*, 1980.

6. Derived Service Elasticities of Demand

Utilizing the results of this detailed review of the literature and tempered by previous experience gained in countries similar to Egypt, the K&M Study Team derived service elasticities of demand for all telecommunications services offered by ARENTO. This summary listing was then vetted with ARENTO to validate the assumption and results of K&M's elasticity of demand analysis. The final results of this iterative process are presented in Exhibit VI-22 below.

Exhibit VI-22
Price Elasticity of Demand
Estimates for Each Service Category

Telecommunications Service Category	Derived Price Elasticities	Worldwide Survey Elasticity Estimates
Features:		
Abbreviated	-0.20	-0.70 to -0.99
Follow-Me	-0.12	-0.70 to -0.99
Hotline	-0.12	-0.70 to -0.99
Wake-Up	-0.12	-0.70 to -0.99
Call Waiting	-0.12	-0.70 to -0.99
Conference	-0.12	-0.70 to -0.99
No Noise	-0.12	-0.70 to -0.99
Hunt Group	-0.80	-0.70 to -0.99
Fax	-0.12	-0.70 to -0.99
Touch Tone	-0.12	-0.70 to -0.99
Long Distance:		
Access	-0.01	NA
Usage: Day	-0.13 to -0.14	-0.05 to -0.59
Usage: Night	-0.14-0.05 to -0.59	
Local Access:		
** Flat Rate **		
Domestic	-0.14	-0.10 to -0.19
Public	-0.12	-0.10 to -0.19
Non-Domestic	-0.12	-0.10 to -0.19
Government	-0.12	-0.10 to -0.19
** Usage **	-0.11	-0.10 to -0.19
International		
** Access **	-0.99	-0.23 to -1.02
** Usage **	-0.80	-0.60 to -1.20
Coin Telephone:		
Day MOU	-0.13	-0.19 to -0.78
Night MOU	-0.13	-0.19 to -0.78
Leased Trunks	-0.12	-0.07 to -0.99
Local Telex	-0.99	-0.07 to -0.99
Local Teleg	-0.99	-0.07 to -0.99
Intl Telex	-0.99	-0.07 to -0.99
Intl Teleg	-0.99	-0.07 to -0.99
Cellular	-0.20	-0.07 to -0.99
Telephone Sets	-0.12	-0.07 to -0.99

$\text{Price Elasticity} = \frac{\% \text{Change in Units}}{\% \text{Change in Price}} \quad (\text{always negative})$
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VII. ANALYSIS OF SERVICE PRICES

This chapter contains the results an analysis of service prices performed on a personnel computer-based pricing model developed specifically for ARENTO under Task 6. This model is capable of evaluating alternative investment, revenue, and pricing strategies, as well as testing policy-constrained tariff structure options.

A. Background and Introduction to the Task

Prior analysis in Tasks 2, 3, and 4 recommended refinements to ARENTO's operations that would make the accounting results more accurate, improve billing and revenue collection, and enable more existing and new services to be offered with improvements in network efficiency. In effect, the previous studies have presented methods for ARENTO to reduce costs, generate more revenues, and bring more value to the Egyptian public through improved service.

The purpose of this particular tasking assignment is to use the previous study recommendations as a basis to examine the current rate structure and rate levels in ARENTO for each service offered, and recommend price changes within an acceptable range that would optimize the return to ARENTO. This Task 6 is a culmination of the suggestions of previous studies in terms of the identifying the best set of prices for ARENTO in the short and long-run.

In addition, the K&M Study Team was charged with the responsibility of delivering a user friendly tool in the form of a personal computer-based pricing model that can be easily used by ARENTO staff to develop optimal rates. It is not the intention of K&M to deliver a highly sophisticated econometric pricing model that will never find use within ARENTO. In the course of developing optimal rate recommendations and presenting a user friendly pricing model, the needed activities are identified that will transform ARENTO into a financially strong and self-sufficient telecommunications firm.

These transformation-enabling activities require an approach to the Egyptian market that has not been taken previously. This approach is centered around a principle of portfolio management that makes interdependent service pricing decisions and not the exclusive or single product pricing decisions made today. In addition, this approach is based on the principle of marginal cost pricing in which the periodically recurring cost of each service is a primary determinant of how each service should be priced.

The basic premise underlying Tasks 5 and 6 is similar to and wholly consistent with the objective function utilized to develop service improvements in Task 3. Essentially, K&M recommends that all ARENTO decisions in this area seek to optimize an objective function that seeks to:

- (1) Increase anticipated revenue per line;
- (2) Decrease the long-run marginal costs of providing telecommunications services;
- (3) Increase network utilization and overall efficiency;
- (4) Enhance the overall value of the network over time; and

- (5) Improve the perceived quality of services provided to the customer.

In the course of meeting the objectives of this study, several key questions will be addressed. These questions are derived from the Teleconsult Definitional Mission Final Report and are listed below.

- (1) Given marginal cost and price elasticity estimates from the Task 5 study, what are the optimal prices for ARENTO services?
- (2) Can ARENTO revenue requirements be met in the short run and long run without significant increases in service prices?
- (3) How should ARENTO manage product performance and pricing?
- (4) What are the tools required to successfully price and manage ARENTO products and services?

The answers to these specific questions are addressed in sections VII (D) through VII (F) below.

1. Rate Analysis Applications

Analysis of ARENTO rates reveals specific modeled pricing alternatives that will appear to be highly quantified and accurate. The reader is cautioned not to use either the model results presented here or the output of the pricing model outside the scope of this study as final determinants of product prices. As shown in the pricing analysis in this study, models indicate the general direction and magnitude of potentially optimal price changes and not the definitive pricing answer. The current rates developed by ARENTO and presented in Appendix A will be shown to be generally close to optimal pricing using long run marginal cost pricing. Given the shortage of pricing information, current costing information, and lack of consumer behavioral analysis, ARENTO has exceeded expectations in price development.

The K&M Team suggested method presented in this study of service pricing supports many of ARENTO's current pricing decisions and provides guidance for future refinements. These refinements again are derived from the modeled results, but do not rigidly adhere to them. Above all, the test of reasonableness must be applied to all recommendations. Appropriate pricing of services will be shown to be a combination of science and art. The task here is to imbue the reader with more scientific alternatives and tools to pricing that will replace the artful side and result in better prices and product market performance than before.

A large portion of the art of pricing is balancing changes in rate structure with changes in rate levels. Structural changes such as changing flat rate local service to usage sensitive service or transforming existing flat rate local access to usage sensitive priced toll services can be used to generate future additional revenues given the same initial average revenue per line. Flat rate local subscriber access price increases can also be developed that have the same revenue generating effect as the usage sensitive rates. *Therefore, the way services are priced such as local free call allowances, flat rate and usage sensitive methods can be just as effective in generating additional revenues as direct price level increases.*

The recommendations presented in this analysis will be an appropriate blend of structural changes and level changes to some rates to achieve the required revenue objective. Please keep in mind that although the pricing model used in the analysis deals specifically with rate level changes, the best recommendation by the K&M Team includes various mixes of rate level and price structure changes to achieve the same end.

2. Availability of Data

Previous task reports will reveal that ARENTO generally produced adequate data for the analysis required. In this task, however, inadequate data was available to derive specific ARENTO price elasticity estimates for services. In many cases, this is not ARENTO's fault. Waiting lists for primary services create problems for analysis of price elasticity of demand. As a result, basic telephone service, special features and other services that have had waiting lists for years do not provide the type of information that can be easily transformed into subscriber price elasticity analysis.

In some cases, conflicting data was received that created confusion and erroneous conclusions until the conflicts were sorted out. These instances can be attributed to the lack of clear communication between ARENTO staff and K&M Team members. An example of a misunderstanding in this area occurred in the number of call and minutes of use associated with national toll services reported to the K&M Team. To minimize the chance of error, acid tests of reasonableness were initiated on all data that led to major conclusions and recommendations. For example, average revenues for toll service minutes of use were checked against the average rates for toll services to determine if the reported units were reasonable.

In many cases, ARENTO does not collect the information or has great difficulty in collecting the information. Minute of use distributions by rate band and time-of-day were not available to the K&M Team. Coin service total minutes of use and coin service minutes of use by rate band were not available. Additionally, the coin share of the coin and cash revenue accounts was not easily determined from the data made available.

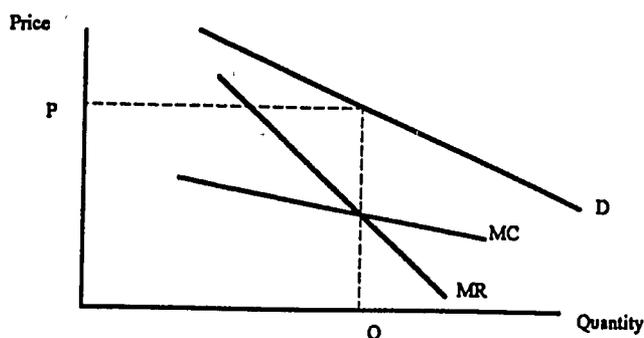
The monthly unit data surrounding service price changes was not available from ARENTO. These data were required to derive reliable estimates of service price elasticities. The capability to collect the information exists within the organization; however, the use of service sales information to indicate the effects of price changes is not viewed by the staff as a high priority activity.

Generally, ARENTO was very responsive to the K&M Team information requests and made heroic efforts to support the team in a timely manner. This was facilitated by the superb cast of K&M Team Egyptian counterpart contacts.

3. Task Approach and Structure

Economists have long held that profits are maximized when services are priced where marginal costs equal marginal revenue. This general principle is demonstrated in the Exhibit VII-1 diagram where P and Q are priced optimally from a profit maximizing perspective.

**Exhibit VII-1
Traditional Profit Maximizing Price**



Additionally, pricing for the long term should be evaluated considering long-run marginal cost. This is marginal cost when all inputs to the service are assumed to be variable. In the ARENTO case, switches and outside plant are assumed variable in the long run. Long-run marginal costs were described in more detail in Task 5.

In some cases, such as natural monopolies, the profit maximizing solution of price and marginal cost cannot be reached due to the limits of the extent of the market demand and the continually decreasing marginal cost function. Unlike the example demonstrated in Exhibit VII-1, in these monopolistic cases the marginal cost and marginal revenue functions may fail to intersect and, therefore, not reveal the profit maximizing price and output. When the monopolist sells a wide variety of services, many of which are dependent on the sale of some specific basic services such as domestic local access, the problem of reaching a marginal cost and marginal revenue solution is further complicated. K&M has developed a pricing model that employs a "second best" profit maximizing solution that has been widely used in the telecommunications industry world wide. Additionally, this solution applies to multi-service monopolies and fits ARENTO business conditions were optimal prices must occur simultaneously for a long list of services and marginal costs are declining as service outputs increase.

Optimal pricing under either the traditional marginal cost equals marginal revenue concept or the "second best" concept addressed in this study requires the determination of marginal costs for each service. The marginal costs are the direct costs associated with incremental units sold. Unlike average costs that lead the analyst to be concerned with generating revenues to cover the average of all costs of all preceding units sold, marginal cost leads the analyst to be concerned with generating revenues to adequately cover the costs of the last units of service sold. Since these last units sold are the newest cost conditions to be met by the firm, pricing at least at these levels will ensure basic cost coverage. Marginal cost pricing typically uses marginal costs as an effective floor for product pricing. Differing marginal costs of service will result in differing marginal cost floors from which optimal prices can be derived.

The third key concept is the understanding of price elasticity of demand for each service and the relationship that it has on the price of each service. Price elasticity (E_p below) is typically described as the percentage change in quantity divided by the percentage change in the price of the service demanded.

$$E_p = \frac{\% \text{ Quantity Change}}{\% \text{ Price Change}}$$

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Since the higher the price charged for services the lower the quantity of the service sold in any given period, this elasticity relationship is always negative. That is, price and quantity demanded for a given service always move in opposite directions. This is true of course if other effects such as the number of competitors or the prices of other related goods and services are held constant. The assumption of constant outside effects is difficult to find in the real world and, as a result, economists have developed methods to adjust for such non-direct effect changes. These methods are discussed at length in the survey of telecommunications price elasticities by Lester Taylor in the Appendix of the Task 5 draft report.

Observation and common sense can be used to estimate relative price elasticities. By using the equation of price elasticity above, one can easily see that a large percentage price increase accompanied by a small percentage decrease in quantity results in a price elasticity that is relatively small in absolute value. On the other hand, a large percentage increase in price accompanied by an even larger decrease in the quantity of the service demanded results in an elasticity in absolute value greater than one.

The value of the price elasticity is a direct quantification of consumer behavior relative to service price changes. Without elasticity analysis, products are priced on the analyst's feel for how the market will react. The analyst without knowing it is using an internal value for price elasticity to estimate market reaction to price changes. The model presented by K&M allows the ARENTO analyst to document the degree of subscriber response to changes in price for services as well as direct studies using ARENTO data to estimate them. This will reduce the risk of pricing erroneously especially where many services being sold by a single company use the same equipment as in ARENTO's case. Switches and outside plant provide the equipment and plant basis for basic services as well as enhance features.

Without appearing too scientific, the K&M pricing model is a blend of marginal cost pricing that considers consumer behavior through quantified price elasticities and considers the joint production of services from the same basic ARENTO telecommunications network investment.

Task 5 conclusions and recommendations were developed from the analysis of a model specified to address the pricing problems that ARENTO faces. The pricing model employed in the analysis is tailored to face problems with pricing a large number of interdependent services to meet a target revenue requirement that can't be achieved with current price structures and levels. This is the same model that is made available to ARENTO by K&M to help ensure the continued analysis of product and service pricing.

Before the model is discussed in detail, however, the scope of the study is defined in terms of services analyzed, business periods examined, and expectations of the study. Then each key input is analyzed for accuracy and reasonableness. These inputs include current and future levels of service sales, current prices, current and forecasted revenue requirements. The pricing model is discussed relative to methodology and results. Finally, pricing structure and level recommendations are presented along with a description of future activities to ensure better product and service pricing in ARENTO.

B. Scope of Analysis

This study addresses the current rates that ARENTO charges subscribers of telecommunications services listed in Appendix B. In some instances, the analysis addresses service groups rather than existing services when little information is available relative to the quantities of the services sold or the revenue obtained from the services is unclear and the service units provided by ARENTO are not significant. For example, Local Telex service is not analyzed in great detail relative to type of customer such as "Hotel" or "Foreigner" or other service fees such as "pulse fees". Local Telex was analyzed in a single group.

The primary focus of this study is the rate structure and level of basic and enhanced telephone services. Although telex, telegraph, cellular and telephone sets were included in the services modeled, local access and usage, toll access and usage, coin telephone service, leased trunks and enhance feature services were analyzed in greater detail.

Long-run marginal cost pricing of telephone services addresses the recurring direct costs of service. The analysis presented in this study focuses on the optimal set of recurring prices of service that address the counterpart long-run marginal costs identified in the Task 5 study. Therefore, service installation prices will not be addressed in this study. It will be shown later that the revenue requirement will be adjusted to exclude service installation in order to accurately compare the revenues derived from marginal cost pricing techniques to required revenues. Installation pricing, which in many cases in the telephone business are relatively arbitrary with little cost basis, are beyond the scope of this study.

Upper management interviews suggest that Telex and Telegraph are currently planned to be simply managed on a "harvest" basis by ARENTO. This implies that no major marketing effort or pricing reform will attend these services and that they will eventually be replaced by basic telephone service in most areas.

In addition, international toll service is assumed in the study to be subject to competition. This manifests itself in the pricing analysis and modeling through the assumption that prices will at least remain at or near current rates. Given the marginal cost of international toll services and the range of price elasticities that seem to apply, the pricing model must be constrained to produce prices consistent with the increased competition assumption.

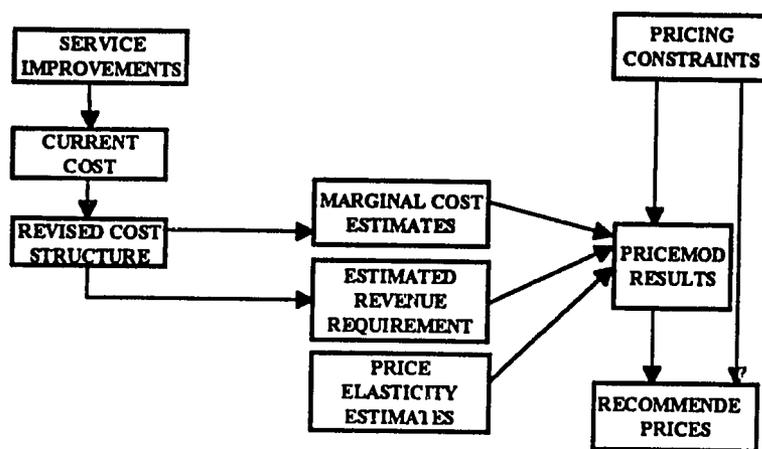
The temporal scope of this study is from current 1993 level of service sales and prices to required prices by the end of the strategic plan period in 1997. Beyond 1997, the pricing recommendations should follow the 1993 to 1997 recommended trends discussed in this analysis. The model developed by the K&M team is capable of forecasting required prices for services beyond 1997, however, little supporting input exists that must be provided by ARENTO relative to planned investment applicable to subsequent years.

During the course of interviews with ARENTO executives, it became clear that some service prices are extremely sensitive politically. For example, a recommendation to triple existing local access rates stands little chance for acceptance by either the ARENTO's Board of Directors or the Policy Cabinet who have oversight over ARENTO relative to service pricing issues. The K&M team, therefore, has endeavored to develop a flexible model that permits selected prices to be frozen or capped at politically acceptable levels so as to prevent solutions that are spurious and unrealistic.

C. Price Analysis Methodology

The analysis of ARENTO pricing required the development of an analytical model that optimizes the entire portfolio of service offerings considering the long-run marginal costs and own price elasticities for each service. This "PRICEMOD" model is subsequently used to develop revenue estimates that are then compared to estimated revenue requirements for ARENTO. The objective of the analysis is to determine the set of product prices for the entire portfolio that best approximates the required revenues and maximizes the returns to ARENTO.

Exhibit VII-2
ARENTO Rate Structure Study
Price Analysis Methodology



The Task 6 Analysis of Service Pricing methodology is described in Exhibit VII-2. Revisions to ARENTO's cost structure includes Task 2 accounting recommendations relative to interest and exchange rates, Task 3 service improvement recommendations relative to investment planning, new service introduction, and marketing along with Task 4 billing and collection recommendations. In Task 5 the revised cost structure is then used to determine the marginal costs of existing and recommended new services. In Task 6 the revised cost structure is used to develop a revenue requirement for ARENTO.

Marginal cost estimates for each service and revenue requirements are then used along with price elasticity estimates from Task 5 as pricing model inputs. Other inputs to the pricing model include current prices, forecasted quantities demanded relative to the service recommendations of Task 3 and price constraints or caps to specific services. The pricing model uses the specific input for each service to determine the optimal service prices that meet revenue requirement targets.

In order to determine the appropriate pricing recommendation, the K&M team examined prices resulting from four scenarios. This first or "Base Case" scenario was developed for 1993 with all recommended improvements except the introduction of new revenue generating services. An "Adjusted Base Case" was developed for 1993 that includes the impact of new services and effective marketing for existing features. To estimate longer term effects of forecasted services on prices and revenues a 1997 "Plan Case" was developed. The long-term

case was also developed without a targeted revenue requirement since the estimated revenues generated by the 1997 "Plan Case" exceed the estimated revenue requirement for the same year.

1. Service Marginal Costs

Task 5 Cost of Services Study by the K&M Team contains estimates of the marginal costs of each service. These cost estimates are shown in Exhibit VII-3 ARENTO Long-Run Marginal Cost of Services and are included in the marginal cost section of the PRICEMOD program.

The marginal cost estimates required for the PRICEMOD model are developed from direct recurring costs associated with each service. Attributions of indirect cost or costs associated with initial capital outlays in terms of depreciation expenses are included. Additionally, marginal costs are not based on historical average costs and should be derived relative to the most recent or projected incremental units of service provided.

Exhibit VII-3 ARENTO Long-Run Marginal Cost of Services

(Costs in LE)

SERVICE	MARGINAL COSTS	SERVICE	MARGINAL COSTS
Features:		Local Access:	
Abbreviated	8.00	** Flat Rate **	
Follow-Me	4.00	Domestic	9.00
Hotline	4.00	Public	9.00
Wake-Up	3.00	Non-Domestic	9.00
Call Waiting	3.00	Government	9.00
Conference	13.00	** Usage **	
No Noise	4.00	International	
Hunt Group	2.00	** Access **	250.00
Fax	20.00	** Usage **	2.30
Touch Tone	1.00	Coin Telephone:	
Long Distance:		Day MOU	0.01 to 0.08
Access	10.00	Night MOU	0.01 to 0.01
Usage: Day	0.04 to 0.23	Leased Trunks	540.00 - 2808.00
Usage: Night	0.01 to 0.02	Local Telex	1000.00
		Local Teleg	0.53
		Intl Telex	0.10
		Intl Teleg	3.37
		Cellular	1200.00
		Telephone Sets	23.00

2. Service Demand Forecasts

In order to provide the PRICEMOD model with adequate information relative to the growth of addressable markets, forecasted units for each service are required. Exhibit VII-4 Forecasted ARENTO Service Units shows the current 1992/1993 unit quantities for each service along with 1996/1997 forecast unit quantities. A brief statement as to the source of the information and the growth assumption used in the forecast accompanies each service.

These K&M Team forecasts appear to be consistent with historical growth patterns of ARENTO services and fall within the service objectives of the five-year plan. When

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ARENTO service level forecasts were based on the appropriate assumptions relative to future service growth, they were used in the analysis. The forecasted quantities by service are a key input into the PRICEMOD '97 Plan Case scenario.

**Exhibit VII-4
Forecasted ARENTO Service Units**

SERVICE	92/93	96/97	FORECAST ASSUMPTIONS	
FEATURES				
ABBREVIATED	25,105	40,375	* 10% of local access subscribers will take features distributed in the same shares as 92/93 sales. TASK 3 EXHIBITS 20 through 26	
FOLLOW-ME	61,621	99,101		
HOTLINE	20,540	33,033		
WAKE-UP	9,129	14,682		
CALL WAITING	77,597	124,795		
CONFERENCE	15,975	25,693		
NO NOISE	18,258	29,364		* Included in above.
HUNT GROUP	138,500	241,800		* 25% bus subscribers
FAX	6,260	8,175		* Revenues/rate.
TOUCH TONE	199,169	367,042		* 10% of total local subscribers
LONG DISTANCE				
ACCESS	38,915	39,000	* No change TASK 3 EXHIBIT 7	
USAGE: DAY	656,147,000	1,102,277,700	* ((93 Rev/avg. rate)/93 subscr.) x 97 subscr. x 0.70 = call units.	
USAGE: NIGHT			* ((93 Rev/avg. rate)/93 subscr.) x 97 subscr. x 0.30 = call units.	
LOCAL ACCESS				
** FLAT RATE **				
DOMESTIC	1,473,659	2,703,112	* 14% ann. growth, TASK 3 EXHIBIT 7.	
PUBLIC	415,215	837,964	* Constant Ratio of Public to Domestic local access subscr.	
NON-DOMESTIC	0	0	* No data	
GOVERNMENT	102,806	129,346	* 4% annual growth, TASK 3 EXHIBIT 3	
** USAGE **	2,282,260,000	9,250,481,500	* 25% ann. growth, TASK 3 EXHIBIT 7.	
INTERNATIONAL				
** ACCESS **	39,684	5,600	* Intl rev-intl usage rev/intl access rate.	
** USAGE **	313,027,000	557,571,200	* avg. ann. growth, TASK 3 EXHIBIT 7.	
COIN TELEPHONE				
DAY MOU	252,700,000	108,300,000	* Cash & Coin Rev/ avg. rate, TASK 6 EXHIBIT 1.	
NIGHT MOU				
LEASED TRUNKS				
LOCAL TELEX	8,536	8,536	* 50% increase over '93 act.	
LOCAL TELEGRAPH	12,900,000	12,900,000	* No growth as per ARENTO plan.	
INTL TELEX	30,100,000	30,100,000	* '93 ac. TASK 3 EXHIBIT 8	
INTL TELEGRAPH	13,200,000	13,200,000	* Same as above.	
CELLULAR	6,000	7,950	* Revenues/avg rate of L.E. 4000	
TELEPHONE SETS	199,507	384,133	* '93 Rev./avg. rate of L.E. 130 x 14% avg. ann. local line growth	

3. Service Price Elasticities

Demand elasticities are also critical to the operation of the PRICEMOD model from the standpoint of determining optimal pricing for the products in the portfolio and determining new estimates of service units sold and revenues generated from sales. These elasticities describe consumer behavior to price movements, and should not be altered until further detailed service price studies are conducted and better estimates of price elasticity are derived.

The Task 5-Cost of Service Study included a study survey of the own price elasticities estimated for various telecommunications services. A major conclusion drawn from the survey and general observation of ARENTO customer response to price changes is that ARENTO customers exhibit, in general, behavioral responses to telecommunications service price changes similar to the consumers in the survey studies.

The selected service price elasticities are listed below in Exhibit VII-5 ARENTO Service Demand Elasticities and included in the PRICEMOD program "Data Entry" section. Each of these demand elasticity estimates fall within the range of those described in the Lester Taylor survey with a few noted exceptions. The feature services are assumed to be more inelastic than the survey information due to the low existing penetration of .24 percent, and the size of the current waiting list for features discussed in Task 3. Future price elasticities for these feature services may increase as conditions change. However, and price elasticity estimate of -.12 was assumed for 1993 and 1997 which fall outside the -.077 to -.99 range of the Task 5 Survey.

In addition, coin usage survey elasticities in the Task 5 study range from -.19 to -.78. These estimates were considered to price responsive given the place coin and cash telephone service is used in Egypt. The studies that derived these survey estimates were conducted in countries with higher penetration of basic residential and business telephone service. In Egypt, users of coin and cash services often do not have easily addressable alternatives to use telecommunications. The coin elasticity estimate used for the purposes of this study is -.12 which reflects a similar elasticity to basic residential and business telephone service usage in other countries.

**Exhibit VII-5
ARENTO
Service Demand Elasticities**

Service	Current Price Elasticities in the Model	Worldwide Survey Elasticity Estimates
Features:		
Abbreviated	-0.20	-0.70 to -0.99
Follow-Me	-0.12	-0.70 to -0.99
Hotline	-0.12	-0.70 to -0.99
Wake-Up	-0.12	-0.70 to -0.99
Call Waiting	-0.12	-0.70 to -0.99
Conference	-0.12	-0.70 to -0.99
No Noise	-0.12	-0.70 to -0.99
Hunt Group	-0.80	-0.70 to -0.99
Fax	-0.12	-0.70 to -0.99
Touch Tone	-0.12	-0.70 to -0.99
Long Distance:		
Access	-0.01	NA
Usage: Day	-0.13 to -0.14	-0.05 to -0.59
Usage: Night	-0.14	-0.05 to -0.59
Local Access:		
** Flat Rate **		
Domestic	-0.14	-0.10 to -0.19
Public	-0.12	-0.10 to -0.19
Non-Domestic	-0.12	-0.10 to -0.19
Government	-0.12	-0.10 to -0.19
** Usage **	-0.12	-0.10 to -0.19
International		
** Access **	-0.99	-0.23 to -1.02
** Usage **	-0.80	-0.60 to -1.20
Coin Telephone:		
Day Mou	-0.13	-0.19 to -0.78
Night Mou	-0.13	-0.19 to -0.78
Leased Trunks		
Local Telex	-0.12	-0.07 to -0.99
Local Teleg	-0.99	-0.07 to -0.99
Local Teleg	-0.99	-0.07 to -0.99
Intnl Telex	-0.99	-0.07 to -0.99
Intnl Teleg	-0.99	-0.07 to -0.99
Cellular	-0.20	-0.07 to -0.99
Telephone Sets	-0.12	-0.07 to -0.99

4. Estimated Revenue Requirements

Current and planned revenue requirements were estimated by the K&M Team and are shown in Exhibit VII-6. There are various methods to forecast revenue requirements such as linking current revenue requirement estimates to historical relationships and long-run marginal cost estimation techniques. Although the latter technique is discussed in the work performed previously under Task 5 Cost of Services, the revenue requirement estimates used here were derived from ARENTO actual and planned expenses, investments, and return on investment.

Exhibit VII-6
ARENTO
Revenue Requirement
Based on Switched Minutes of Use
Fiscal Years Ending 93 - '97

LE in millions	92/93	93/94	94/95	95/96	96/97
Total Rev. Req.	1788.5	1837.3	2002.7	2180.5	2369.7
Less NCR*	(129.10)	(132.70)	(144.60)	(157.40)	(171.10)
Adjusted Rev. Req.	1659.4	1704.6	1858.1	2023.1	2198.6

* NCR= Non Recurring Charges

The revenue requirement estimates shown in the exhibit include the results of recommendations made in previous K&M Team analyses performed under Tasks 2, 3 and 4. For example, these estimates include the recommended increase in interest expense and unrecorded liability for foreign currency transactions. The basis for the return on investments are ARENTO projections of construction expenditures over the five-year plan. Detailed support for the revenue requirements used for 1993 and 1997 is presented in Appendix A.

Since PRICEMOD deals with optimal pricing relative to long-run marginal cost, an equivalent revenue requirement comparison to pricing results must be made. Therefore, the revenue requirement estimates were adjusted for non-recurring charges such as move and change, installation, and priority fees. The return on assets is assumed to be fourteen (14) percent which matches the rate of return used in the Task 5- Cost of Service Study estimate of long-run marginal cost.

The iterative process of adjusting prices until the revenue requirement is achieved results in an attribution of depreciation expense on the access plant investment to be spread back to each of the services. As a result, all costs that are reflected in the revenue requirement are attributed to the portfolio of services.

Local access is the only service that does not include depreciation expense in the specific marginal cost estimate for the service. The marginal cost for local access only includes direct recurring costs such as maintenance and repair. However, local access depreciation expense is included in the revenue requirement and is accounted for in the pricing process. The rationale for not including the capital consumption or depreciation expense in the local access marginal cost is straightforward. Since local access is a necessary service required for the use of other derived services, the joint cost of access is assumed to be spread to all services on the basis of value or price.

All services other than local access include depreciation expense, as well as maintenance and repair expenses for each unit in the marginal cost estimates. Marginal cost becomes the floor for pricing. The price for each service is adjusted until all of the revenue requirement has been met. This adjustment process includes an attribution for the cost of local access depreciation.

D. Discussion of the K&M "PRICEMOD" Model

In the PRICEMOD program, upward movement in prices that would intuitively increase revenues is countered with the effects of price elasticity that intuitively reduces the quantity of services demanded that, in turn, reduces revenues. Given a specific target revenue that deviates from the initial revenue generated from the initial price set, PRICEMOD will move service prices to achieve the target revenue. For example, if the initial revenue generated by the current price and quantity sold by ARENTO is LE 1.5 billion, and a target revenue requirement of LE 2.1 billion is input, the model will generally increase prices for the entire list of services to achieve the target. Service prices will be increased relative to associated marginal costs and price elasticities to achieve optimum total product contribution.

A detailed explanation of how to load and run the K&M PRICEMOD model is given in Appendix C of this study. The model is robust and adequate space is available for additional services to be added by the analyst.

1. Demand Structural Forms and Ramsey Pricing

At the heart of the model is a structural demand equation that has been widely used in the U.S. and other countries. In the Task 5: Cost of Service Study by the K&M team, the price elasticities presented in Dr. Lester Taylor's survey use the functional form included in the study team model. This form is shown below and is applied to each service presented in the model.

$$Q = C_0 Y^\alpha P^\beta$$

Q = Quantity
 Y = Income
 P = Price
 α = Income Elasticity
 β = Price Elasticity

Calibration:

At Q_0, P_0 with β and Y assumed fixed

$$C_0 Y^\alpha = \frac{Q_0}{P_0^\beta} \quad \text{or} \quad Q = Q_0 \frac{P^\beta}{P_0^\beta}$$

This demand form assumes that the income effect of all service price changes is equal. That is, the income effect on consumer behavior relative to telecommunications service price changes is equal for all consumer groups.

Additionally, this form also assumes that price elasticity is constant over the relevant range of price changes. This assumption was selected since no detailed information on ARENTO price elasticities is available to warrant another functional form of the demand equation. Further,

point observations of price elasticity in Dr. Lester Taylor's survey do not create a clear picture of elasticity changes relative to either market share or total unit quantity observations.

These assumptions do not significantly endanger the real world application of the model results. Model refinements to discharge these assumptions push the results into the realm of an academic exercise with little relevance to ARENTO's business results.

The PRICEMOD model also includes an approach to optimal service pricing for services with traditional natural monopoly characteristics. The "Ramsey" pricing methodology is based on the premise of the inverse elasticity rule. That is, the differences between price and marginal cost as a fraction of price should be inversely related to price elasticities.

$$\frac{P_j - MC_j}{P_j} = \frac{1}{E_{jj}}$$

Where:

P_j = Price of product j

MC_j = Marginal Cost of product j

E_{jj} = Price Elasticity of product j

As mentioned above, this approach has been used in the U.S. and international telecommunications industry intensively over the past five to six years in the area of promoting competitive tariff reform.

The model uses a transform of this inverse elasticity principle to optimize the relative prices of the entire ARENTO portfolio of services. By stepping through successive values of K in the equation below, the model converges on the target revenue requirement.

$$\frac{P_j - MC_j}{P_j} b_j = K \quad \text{for all } j \text{ products at the final solution}$$

The model takes steps of approximately half the distance from the initial or previously calculated values. Therefore, the model iterates to the solution by taking half steps to the target revenue for each product in succession until the target revenue is approximated.

The basic inputs may either be exogenous or not controllable by the analyst or endogenous and controllable by the analyst. Essentially, initial prices and initial quantities for each service along with a total revenue target should be considered endogenous variables. Other inputs such as the long-run marginal costs and own price elasticities of demand should be considered exogenous and not be manipulated by the analyst in developing optimal pricing scenarios.

The model will automatically calculate the optimal prices for each of the services, as well as estimates of the estimated units sold at the new prices. It will also sum the revenues from each product and display this on the first screen of the program.

The output may be printed and saved or discarded on exit. The results shown at the end of Appendix C are examples of the model output. A detailed step-by-step procedure for loading, initiating and running the PRICEMOD program is also described in Appendix C.

2. Service Portfolio Approach

In the K&M analysis, incremental price adjustments to meet the desired revenue requirement for each product would be extremely time consuming if not impossible to calculate separately given the wide variety of services that ARENTO makes available to the public. Moreover, such a single calculation performed in isolation would not be particularly relevant or meaningful. Accordingly, this study intends to treat the list of services available as a portfolio that is to be optimized relative to contribution and price. This approach treats the optimal pricing solution for each product and service in a simultaneous fashion

Changes in the price, marginal cost or price elasticity of a given service will cause each of the other services to be addressed in terms of optimal price level. In addition, changes in the targeted revenue requirement will cause all services to be re-evaluated relative to optimal prices. The K&M pricing model will assist the analyst in addressing all prices, and eventually give the analyst a "feel" for the interrelationships of the various services provided by ARENTO.

3. Price Constraints

Interviews with top level ARENTO executives revealed that in general the Egyptian public and its governmental representatives are sensitive to some telecommunications price changes. Although the executives see a need in pricing reform, in many cases they see changes in some prices as politically unacceptable. The public sensitivity to price increases is primarily focused on basic local access and usage services. The analysis presented here takes this sensitivity into consideration by limiting upward movement of certain prices and presents an alternative structure that may be more acceptable to the ARENTO Board of Directors and the Policy Cabinet of the Government of Egypt.

International toll services are another area of pricing concern due to the increase in international toll competition. Major price increases in this area may create further inroads for competitors and, as a result, are avoided in the recommendations presented by K&M.

Competition also influenced the decision by the K&M Team to constrain the price of telephone sets since subscribers have the alternative to purchase their telephone instruments in the open market. Although changing the price elasticity of telephone sets may achieve the same objective, it was decided that placing a LE 200 ceiling on prices would remove all opportunity for unrealistic upward movement.

Local and international Telex and Telegraph services are also viewed as sensitive to significant increases in price. Since the demand for these services is expected to rapidly decline over the next several years as telephone service expands in Egypt, major price increases were avoided for this service as well. The decision may be made by ARENTO to increase the prices of these services and exit the business more quickly; however, this decision is ARENTO's and not a recommendation of K&M.

All other service prices were relatively unconstrained in the analysis. As with all optimization techniques, the more constraints applied the greater the burden placed on the unconstrained variables. In the analysis of Task 6 this problem becomes apparent.

4. Model Scenarios

Two points in time were selected for the K&M Team analysis of ARENTO service pricing. Current 1993 conditions were analyzed given recommended productivity improvements and cost recognition presented in each of the previous K&M Tasks. The forecasted and planned 1997 position of ARENTO was then analyzed also assuming the K&M recommendations were implemented.

The 1993 prices were first analyzed by comparing current price levels to a set of counterpart prices or "unconstrained" that would occur using marginal cost and demand elasticities presented in this study (see Appendix D for a printout of results from this particular pricing scenario). In addition, the K&M Team developed a set of "recommended" prices for 1993 that address many of the sensitivity issues ARENTO faces in obtaining approval for pricing reform (see Appendix E for a similar printout for this particular scenario). The recommended prices also show significant movement toward marginal cost-based pricing for several key services. Both sets of pricing options are compared side by side in Exhibits VII-7 through VII-13. Each set of revised prices meet the revenue requirement of LE 1,659.4 million for 1993. However, current prices are unable to provide sufficient revenue to meet this requirement as discussed below in section V(E).

The unconstrained and recommended feature prices show the inclusion of the additional feature services recommended by the K&M Team in the Task 3-Service Improvement Study. These additional Hunt Group, Touch Tone and Voice Messaging features will appear in all of the pricing alternatives analyzed. No other services were added to any of the scenarios examined.

**Exhibit VII-7
ARENTO 1993 Feature Price Analysis**

SERVICE	CURRENT PRICES	UNCONSTRAINED PRICES	RECOMMENDED PRICES
ABBREVIATED	20.00	12.00	20.00
FOLLOW-ME	40.00	10.00	60.00
HOT LINE	30.00	10.00	40.00
WAKE-UP	20.00	7.00	20.00
CALL WAITING	40.00	7.00	60.00
CONFERENCE	40.00	32.00	60.00
NO NOISE	20.00	11.00	12.00
HUNT GROUP	0.00	5.00	99.00
FAX	575.00	48.00	575.00
TOUCH TONE	0.00	2.00	20.00
VOICE MESSAGING	0.00	19.00	30.00

**Exhibit VII-8
ARENTO 1993 National Toll Price Analysis**

SERVICE	CURRENT PRICES	UNCONSTRAINED PRICES	RECOMMENDED PRICES
ACCESS			
DAY USAGE:			
RB-10	0.15	0.08	0.45
BR-25	0.15	0.08	0.48
RB-50	0.15	0.09	0.50
RB-100	0.20	0.13	0.52
RB-150	0.25	0.12	0.52
RB-200	0.35	0.16	0.53
RB-300	0.45	0.20	0.69
RB-500	0.55	0.30	1.00
RB-700	0.60	0.38	1.00
RB-900	0.65	0.47	1.00
RB+	0.70	0.47	1.00
NIGHT USAGE:			
RB-10	0.10	0.02	0.07
RB-25	0.10	0.02	0.07
RB-50	0.10	0.02	0.07
RB-100	0.15	0.02	0.07
RB-150	0.20	0.02	0.07
RB-200	0.25	0.02	0.07
RB-300	0.35	0.02	0.07
RB-500	0.40	0.04	0.14
RB-700	0.45	0.04	0.14
RB-900	0.50	0.04	0.14
RB+	0.55	0.04	0.14

**Exhibit VII-9
ARENTO 1993 Local Service Price Analysis**

SERVICE	CURRENT PRICES	UNCONSTRAINED PRICES	RECOMMENDED PRICES
FLAT RATE:			
DOMESTIC	45.00	18.00	45.00
PUBLIC	75.00	22.00	75.00
GOVERNMENT	75.00	22.00	75.00
USAGE:			
CALL ABOVE ALLOWANCE	0.05	0.24	0.05

**Exhibit VII-10
ARENTO 1993 International Service Price Analysis**

SERVICE	CURRENT PRICES	UNCONSTRAINED PRICES	RECOMMENDED PRICES
ACCESS	250.00	250.00	250.00
USAGE	2.56	2.52	2.60

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Exhibit VII-11
ARENTO 1993 Coin Service Price Analysis

SERVICE	CURRENT PRICES	UNCONSTRAINED PRICES	RECOMMENDED PRICES
DAY MOU:			
RB-50	0.05	0.02	0.23
RB-200	0.10	0.07	0.68
RB-300	0.15	0.07	0.68
RB-700	0.20	0.14	1.36
RB+	0.25	0.18	1.82
NIGHT MOU:			
RB-50	0.05	0.02	0.23
RB-200	0.10	0.02	0.23
RB-300	0.15	0.02	0.23
RB-700	0.15	0.02	0.23
RB+	0.15	0.02	0.23

Exhibit VII-12
ARENTO 1993 Leased Trunk Price Analysis

SERVICE	CURRENT PRICES	UNCONSTRAINED PRICES	RECOMMENDED PRICES
TRUNK LINES			
RB-25	544.00	486.00	816.00
RB-50	1,080.00	1,155.00	1,620.00
RB-75	1,620.00	1,617.00	2,430.00
RB-100	2,160.00	2,308.00	3,240.00
RB-125	2,700.00	2,999.00	4,050.00
RB-150	3,240.00	3,458.00	4,860.00
RB-175	3,780.00	4,149.00	5,670.00
RB-200	4,320.00	4,610.00	6,480.00
RB-250	5,400.00	5,993.00	8,100.00
RB-300	6,480.00	7,142.00	9,720.00
RB-350	7,560.00	8,293.00	11,340.00
RB-400	8,640.00	9,446.00	12,960.00
RB-500	10,800.00	11,978.00	16,200.00
RB-550	11,880.00	13,130.00	17,820.00
RB-600	12,960.00	14,280.00	19,440.00
RB-650	14,040.00	15,433.00	21,060.00
RB-700	15,120.00	16,583.00	22,680.00
RB-750	16,200.00	17,965.00	24,300.00
RB-800	17,280.00	19,116.00	25,920.00
RB-850	18,360.00	20,268.00	27,540.00
RB-900	19,440.00	21,418.00	29,160.00
RB-950	20,520.00	22,571.00	30,780.00
RB-1000	21,600.00	23,950.00	32,400.00
RB-1100	23,760.00	26,254.00	35,640.00
RB-1200	25,920.00	28,788.00	38,880.00
RB-1300	28,080.00	31,091.00	42,120.00

**Exhibit VII-13
ARENTO 1993 Telex, Cellular and Telephone Price Analysis**

SERVICE	CURRENT PRICE	UNCONSTRAINED PRICE	RECOMMENDED PRICES
LOCAL TELEX	1,000.00	1,077.00	1,137.00
LOCAL TELEGRAPH	0.53	0.57	0.60
INTL. TELEX	0.10	0.11	0.11
INTL. TELEGRAPH	3.37	3.63	3.83
CELLULAR	4,000.00	4,000.00	4,000.00
TELEPHONE SETS	190.00	154.00	200.00

The prices that could occur at the end of the plan in 1997 are presented in Exhibit VII-14. Each of these scenarios produce different revenues and each exceed the revenue requirement derived from the ARENTO plan. The first set of prices in the exhibit shows the marginal cost based prices that would occur given the ARENTO plan forecast. In order to test the sensitivity of the prices to changes in the forecast, two additional pricing scenarios were developed which test a 20 percent increase in each service forecast and a 10 percent decrease in the plan forecast.

An additional scenario presented in the exhibit was developed by the K&M Team that shows the pricing results of moving ARENTO to usage sensitive local service. This price set generates revenues comparable to the 20 percent forecast increase price set while moving ARENTO closer to optimal marginal cost-based pricing.

The 1997 estimates begin with current price levels and uses forecasted demand for services to derive an estimate of 1997 revenues given optimal portfolio price adjustments. In these scenarios long-run marginal cost and price elasticity for each service is assumed to be unchanged from the values used in the 1993 Base Case.

The K&M recommendations found in the previous studies are included in the analysis through changes to revenue requirements, or forecasted service sales capability. These are included as inputs to the PRICEMOD scenarios presented here. It must be kept in mind that this study focuses on recommendations as to pricing solutions that are required to meet business objectives given the implementation by ARENTO of previous recommendations.

**Exhibit VII-14
Long Run ARENTO Price Sensitivity Analysis**

(PRICES IN L.E.)

FEATURES:	CURRENT PRICES	ARENTO PLAN	20% FCST INCREASE	10% FCST DECREASE	K&M RECOM.
ABBREVIATED	20.00	49.00	46.00	47.00	45.00
FOLLOW-ME	40.00	25.00	23.00	23.00	23.00
HOT LINE	30.00	25.00	23.00	23.00	23.00
WAKE-UP	20.00	18.00	17.00	17.00	17.00
CALL WAITING	40.00	18.00	17.00	17.00	17.00
CONFERENCE	40.00	80.00	74.00	76.00	74.00
NO NOISE	20.00	5.00	5.00	5.00	5.00
HUNT GROUP	20.00	12.00	11.00	12.00	11.00
FAX	575.00	123.00	114.00	116.00	114.00
TOUCH TONE	10.00	6.00	6.00	6.00	6.00
VOICE MESSAGING		24.00	24.00	24.00	24.00

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(PRICES IN L.E.)

Exhibit VII-14
(continued)

FEATURES:	CURRENT PRICES	ARENTO PLAN	20% FCST INCREASE	10% FCST DECREASE	K&M RECOM.
NATIONAL TOLL					
ACCESS	10.00	10.00	10.00	10.00	10.00
DAY USAGE:					
RB-10	0.15	0.16	0.15	0.15	0.15
BR-25	0.15	0.17	0.16	0.16	0.16
RB-50	0.15	0.20	0.19	0.19	0.19
RB-100	0.20	0.20	0.19	0.19	0.19
RB-150	0.25	0.24	0.23	0.23	0.23
RB-200	0.35	0.27	0.26	0.27	0.26
RB-300	0.45	0.36	0.34	0.35	0.34
RB-500	0.55	0.52	0.50	0.50	0.50
RB-700	0.60	0.67	0.65	0.65	0.64
RB-900	0.65	0.83	0.80	0.80	0.80
RB+	0.70	0.83	0.80	0.80	0.80
NIGHT USAGE:					
RB-10	0.10	0.04	0.03	0.03	0.03
RB-25	0.10	0.04	0.03	0.03	0.03
RB-50	0.10	0.04	0.03	0.03	0.03
RB-100	0.15	0.04	0.03	0.03	0.03
RB-150	0.20	0.04	0.03	0.03	0.03
RB-200	0.25	0.04	0.03	0.03	0.03
RB-300	0.35	0.07	0.07	0.07	0.07
RB-500	0.40	0.07	0.07	0.07	0.07
RB-700	0.45	0.07	0.07	0.07	0.07
RB-900	0.50	0.07	0.07	0.07	0.07
RB+	0.55	0.07	0.07	0.07	0.07
LOCAL ACCESS:					
FLAT RATE:					
DOMESTIC	45.00	32.00	31.00	31.00	31.00
PUBLIC	75.00	55.00	51.00	52.00	51.00
GOVERNMENT	75.00	55.00	51.00	52.00	51.00
USAGE:					
CALL ABOVE ALLOWANCE	0.05	0.06	0.06	0.06	0.06
INTERNATIONAL					
ACCESS	250.00	250.00	250.00	250.00	250.00
USAGE	2.56	2.60	2.60	2.60	2.60

(PRICES IN L.E.)

Exhibit VII-14
(continued)

FEATURES:	CURRENT PRICES	ARENTO PLAN	20% FCST INCREASE	10% FCST DECREASE	K&M RECOM.
COIN TELEPHONE					
DAY MOU:					
RB-50	0.05	0.05	0.05	0.05	0.05
RB-200	0.10	0.13	0.12	0.13	0.12
RB-300	0.15	0.17	0.16	0.16	0.16
RB-700	0.20	0.32	0.30	0.31	0.30
RB+	0.25	0.40	0.38	0.38	0.37
NIGHT MOU:					
RB-50	0.05	0.05	0.05	0.05	0.05
RB-200	0.10	0.05	0.05	0.05	0.05
RB-300	0.15	0.05	0.05	0.05	0.05
RB-700	0.15	0.05	0.05	0.05	0.05
RB+	0.15	0.05	0.05	0.05	0.05
LEASED TRUNK LINES					
RB-25	544.00	816.00	816.00	816.00	816.00
RB-50	1,080.00	1,620.00	1,620.00	1,620.00	1,620.00
RB-75	1,620.00	2,430.00	2,430.00	2,430.00	2,430.00
RB-100	2,160.00	3,240.00	3,240.00	3,240.00	3,240.00
RB-125	2,700.00	4,050.00	4,050.00	4,050.00	4,050.00
RB-150	3,240.00	4,860.00	4,860.00	4,860.00	4,860.00
RB-175	3,780.00	5,670.00	5,670.00	5,670.00	5,670.00
RB-200	4,320.00	6,480.00	6,480.00	6,480.00	6,480.00
RB-250	5,400.00	8,100.00	8,100.00	8,100.00	8,100.00
RB-300	6,480.00	9,720.00	9,720.00	9,720.00	9,720.00
RB-350	7,560.00	11,340.00	11,340.00	11,340.00	11,340.00
RB-400	8,640.00	12,960.00	12,960.00	12,960.00	12,960.00
RB-500	10,800.00	16,200.00	16,200.00	16,200.00	16,200.00
RB-550	11,880.00	17,820.00	17,820.00	17,820.00	17,820.00
RB-600	12,960.00	19,440.00	19,440.00	19,440.00	19,440.00
RB-650	14,040.00	21,060.00	21,060.00	21,060.00	21,060.00
RB-700	15,120.00	22,680.00	22,680.00	22,680.00	22,680.00
RB-750	16,200.00	24,300.00	24,300.00	24,300.00	24,300.00
RB-800	17,280.00	25,920.00	25,920.00	25,920.00	25,920.00
RB-850	18,360.00	27,540.00	27,540.00	27,540.00	27,540.00
RB-900	19,440.00	29,160.00	29,160.00	29,160.00	29,160.00
RB-950	20,520.00	30,780.00	30,780.00	30,780.00	30,780.00
RB-1000	21,600.00	32,400.00	32,400.00	32,400.00	32,400.00
RB-1100	23,760.00	35,640.00	35,640.00	35,640.00	35,640.00
RB-1200	25,920.00	38,880.00	38,880.00	38,880.00	38,880.00
RB-1300	28,080.00	42,120.00	42,120.00	42,120.00	42,120.00

(PRICES IN L.E.)

Exhibit VII-14
(continued)

FEATURES:	CURRENT PRICES	ARENTO PLAN	20% FCST INCREASE	10% FCST DECREASE	K&M RECOM.
OTHER SERVICES					
LOCAL TELEX	1,000.00	1,113.00	1,111.00	1,112.00	1,111.00
LOCAL TELEGRAPH	0.53	0.59	0.59	0.59	0.59
INTL TELEX	0.10	0.11	0.11	0.11	0.11
INTL TELEGRAPH	3.37	3.75	3.74	3.75	3.74
CELLULAR	4,000.00	2,410.00	2,376.00	2,385.00	2,374.00
TELEPHONE SETS	190.00	200.00	200.00	200.00	200.00

E. Pricing Model Analytical Results

Analysis of current pricing and revenues for 1993 shows that ARENTO is facing a dilemma relative to its ability to meet required revenues. Current prices will generate approximately LE 1.37 billion in 1993 while the counterpart revenue requirement based upon planned investments and service improvements is LE 1.66 billion. Without changing the investment strategy, this shortfall may be addressed by either accepting a lower rate of return than the 14 percent used to estimate the 1993 revenue requirement or raising prices and revenues in the near term

The near term problem of meeting revenue requirements seems to subside in the longer term. The comparison of revenue requirements to estimated revenues generated from services is shown below in Exhibit VII-15 .

Exhibit VII-15
Near Term and Long Term ARENTO Revenues and Revenue Requirements
(In Millions of LE)

	<u>1993</u>	<u>1997</u>
Projected Revenues at Current Prices	1,365.6	2,635.2
K&M Derived Revenue Requirement at 14 percent IRR	1,659.4	2,198.6
Excess (Shortfall)	(293.8)	436.6

1. Near Term Pricing Analysis

Near term prices for 1993 as shown in Exhibits VII-7 through VII-13 do not readily point to the problem of meeting the 1993 revenue requirement. Observation of the unconstrained pricing scenario reveals that marginal cost pricing results in a much larger share of revenues flowing from local usage. Calls above the free call allowance move from the LE .05 current level to LE .24 in the unconstrained scenario. The unconstrained price generates approximately LE 406 million more than the current price.

Major observations that can be derived from the analysis of current prices and the marginal cost-based unconstrained prices are:

- (1) Marginal cost-based prices align revenue sources to cost-causing services and result in higher prices for local telephone usage;
- (2) Feature prices when realigned on a marginal cost basis fall to at least half of their current levels to product-optimal revenue streams;
- (3) Prices of flat rate local services such as domestic, public and government access fall from 40 to 60 percent given optimal marginal cost pricing; and
- (4) Toll and Coin usage prices fall over the entire range of rate bands with marginal cost pricing.

The primary conclusion from the observations is that marginal cost-based pricing will stimulate easier access to the ARENTO network and shift the burden of paying for the network investment to the users of the network. This is usually termed shifting the burden to the "cost causer".

As mentioned earlier in Subsection VII (D) (3) of this study, the acceptance of a single price move of this magnitude for local service will be viewed as highly unacceptable. In fact, stimulating greater demand for access is not a high priority issue for ARENTO in the near term as shown in by the rather large basic service waiting lists discussed in the Task 3-Service Improvement Study. Therefore, the alternative scenario of recommended prices presented in Exhibits VII-7 through VII-13 is a more acceptable near term pricing path that covers the entire revenue requirement shortfall of LE 293.8 for 1993. Although this path increases feature, toll and coin prices in the near term above the current price levels, it covers the shortfall while not increasing local usage prices.

A comparison of current rates to the recommended rates in Exhibits VII-7 through VII-13 produces the following observations.

- (1) The burden of the revenue shortfall is pushed to higher feature, toll and coin prices in the near term.
- (2) New features are introduced to generate new revenues and improve the efficiency of the existing network.

- (3) Local and national service access rates are held constant until unsatisfied demand for basic service is met and waiting lists are eliminated.
- (4) The revenue requirement is met which positions ARENTO for future network investment.

The major conclusion to be drawn from the observations is that although the majority of services are moved slightly away from marginal cost prices in the recommended scenario, the key revenue generating local usage and access prices are not pushed further from marginal cost-based price solutions. This gives ARENTO the chance to catch up with basic service demand and pre-positions it for the marginal cost-based prices in the long run.

2. Long Term Pricing Analysis

Potential marginal cost-based prices at the end of the five-year plan are shown in Exhibit VII-14 - Long Run ARENTO Price Sensitivity Analysis. These prices are shown in the column labels "ARENTO Plan" and can be compared to the current prices. Other alternatives were examined relative to long term prices by increasing and decreasing the forecasted units that drive the PRICEMOD model. These prices are shown alongside the K&M "Recommended" local usage sensitive pricing scenario in the same exhibit.

The revenue generating characteristics of each scenario is shown in Exhibit VII-16 below.

Exhibit VII-16
1997 ARENTO Pricing Alternative
Revenue Performance
(In LE millions)

	REVENUES	% OF PLAN
ARENTO PLAN	2,635.2	100
20 % FCST. INCREASE	3,149.6	120
10% FCST. DECREASE	2,395.0	91
RECOMMENDED	3,097.7	118
REVENUE REQUIREMENT	2,198.6	83

Analysis reveals the following observations:

- (1) All scenarios exceed the revenue requirement developed from the ARENTO five-year investment plan;
- (2) The revenue performance of the ARENTO plan produces lower revenue results than the revenues generated by the K&M recommendation; and

- (3) The K&M recommendation produces revenue results similar to those found in the plan that is based upon a 20 percent increase in forecasted units.

F. Pricing Structure Recommendations

An examination of current and planned ARENTO revenue performance relative to the revenues required to provide service and return 14 percent on investment has indicated a significant revenue shortfall in 1993, 1994 and possibly 1995. ARENTO can react by either increasing prices, accepting a significantly lower rate of return, or reducing network investment. Key executives in the firm will make the decision as to which of these alternatives or mix of these alternatives is chosen. The assumption taken here is that prices will be increased to cover the full burden of the revenue shortfall. From the perspective of the K&M Team, this is preferable to decreasing future investment in the network infrastructure. *This analysis assumes no leakage of implicit tax on ARENTO revenues for use by other governmental entities.*

In the long run, ARENTO will be faced with the reverse situation as revenues rise above operational requirements. This provides a unique opportunity to apply marginal cost pricing to the entire spectrum of services to maximize benefits to the Egyptian public as well as ARENTO. Marginal cost or "user based" pricing which has been difficult to achieve in other national telecommunications firms is an achievable goal for ARENTO. The benefits to marginal cost pricing can be demonstrated by the observation that it will approximate the revenues generated from a 20 percent forecast increase.

The K&M Team has developed near term recommendations relative to the current pricing and performance of ARENTO services which logically lead to longer term recommendations.

1. Near Term Recommendations

Near term recommendations of the K&M Team to generate the required revenues and preposition ARENTO for the future include the actions listed below.

- (1) Lower the free call allowance to capture at least 20 percent of the free call units. This entails moving from 1,500 residential free calls annually to 1,200 annually. The same 20 percent reduction in free calls should also apply to business and government subscribers as well.
- (2) Calculate the usage of subscriber-allowed calls on a quarterly basis of 300 calls each by 1994 to increase the probability that heavy users of local service will pay for using the network.
- (3) Move to a monthly allowance of 100 call each by 1995 to capture additional revenues from heavy local service users.
- (4) Introduce Touch Tone and Hunt Group services in 1994 to improve network efficiency and reduce both investment needs and marginal cost.

- (5) Actively promote and market call completion features such as Touch Tone, Call Waiting, Call Forwarding, and Voice Messaging to stimulate local and toll service minutes of use and messages while reducing high cost failed call attempts.
- (6) Increase feature, coin and toll rates by 1994 to provide adequate financial performance to fund new network investment.
- (7) Review the impact of earnings leakages on ARENTO's ability to generate sufficient internal funds for future network investment.
- (8) Establish a formal marketing presence in ARENTO that is responsible for developing pricing strategies and service forecasts that meet financial performance requirements and actively marketing and promoting selected services. This marketing function must be tightly linked to the strategic planning function.
- (9) Develop long-term pricing objectives and evaluate various pricing using the K&M pricing model as a key tool. This action will entail formal price analysis training for selected members of the ARENTO staff.
- (10) Immediately collect and retain information relative to subscriber responses to changes in ARENTO prices. This information should result in tailored price elasticity estimates for the Egyptian telecommunications market.
- (11) Continue internal cost analysis to estimate and monitor the marginal costs of each service. This will require specialized training on marginal cost estimation techniques for telecommunications services and the acquisition of computer-based cost analysis tools.
- (12) Create a strategic pricing unit as part of the Strategic Planning Group reporting directly to the Chairman.

Success of these recommendation requires commitment by ARENTO top management to price optimization relative to marginal cost. Management must firmly believe that Egyptian telephone subscriber will benefit from the provision and accessibility of services prices relative to marginal cost.

2. Long Term Recommendations

The long term recommendations of the K&M Team are the following.

- (1) Move all prices toward optimal marginal cost/price elasticity determined levels to optimize revenue streams to ARENTO while providing customer satisfaction with appropriately value-priced services;
- (2) Focus price reform on local usage pricing to eventually eliminate free call allowances and migrate to a total usage sensitive-priced local service;

- (3) Significantly lower local and national network access fees to provide low cost accessibility to communications in Egypt and optimize the financial performance of ARENTO; and
- (4) Encourage marketing organization participation in key management and business decisions.

APPENDIX A
REVENUE REQUIREMENTS ANALYSIS

ARENTO
ADJUSTED BALANCE SHEET/RATE BASE
FISCAL YEARS (FY) ENDING '93-'97

(LE millions)	FY'92	FY'93	FY'94	FY'95	FY'96	FY'97
Total Operating Assets/Rate Base	4842.4	6278.3	6639.3	6995.0	7555.0	8096.4
Less:						
Depreciation (ARENTO Budget)	0.0	260.0	276.0	292.0	310.0	329.0
Sub Total	4842.4	6018.3	8363.3	6703.0	7245.0	7767.4
ADJUSTMENTS:						
1. Unrecorded Assets (Note 1)	1435.9	-44.3	-7.7	3.4	11.4	7.0
2. Billing Chgs/Incr Working Capital (Note 2)		-14.8	14.8	3.7	11.1	0.0
3. Net Constr Addns (Note 3)	0	680.1	624.6	851.7	851.7	851.7
Total Adjustments	1435.9	621	631.7	852.0	851.4	844.7
ASSETS/RATE BASE	6278.3	6639.3	6995.0	755.0	8096.4	8612.1
Rate of Return	14.00%	14.00%	14.00%	14.00%	14.00%	14.00%
Rate Base Revenue Requirement	N/A	929.5	979.3	1057.7	1133.5	1206.7

Note 1 - For the year 1992, this amount represent the unrecorded asset values arising form foreign currency exchange rate changes. See EXHIBIT J-ARENTO Recasted Foreign Held Debt; Deliverable 2 - Recasted Income Statements. For subsequent years, the amount represents retirements of those asset values based on consultant estimates.

Note 2 - These amounts represent changes in working capital requirements arising from changes in billing. See page 83, Deliverable 4-Billing and Collection Practices for the years 1995 and 1996. For the years 1993 and 1994 these amounts represent conversion from annual to semi-annual billing.

Note 3 - These amounts represent the expected unapproved net constructed additions. See Deliverable 3-An Analysis of Network Planning And Service Improvements; Appendix I, ARENTO Construction Plan Spending Scenarios, Five Year Plan (1993-1997)

**ARENTO AGGREGATE REVENUE REQUIREMENT
FISCAL YEARS (FY) ENDING 93-97**

	FY 93	FY 94	FY 95	FY 96	FY97
(LE in millions)					
Operating Expenses (note 1)	846.0	846.0	934.0	1,037.0	1,154.0
Less:					
Interest Expense	<u>173.0</u>	<u>180.0</u>	<u>187.0</u>	<u>194.0</u>	<u>201.0</u>
Net Operating Expenses Provided by ARENTO	674.0	666.0	747.0	843.0	953.0
ADJUSTMENTS					
Additional Operating Expenses					
1. Changes in prices of hard currency (Note 2)	176.0	163.0	189.0	195.0	202.0
2. Increased billing costs (Note 3)	9.0	9.0	9.0	9.0	9.0
Total Adjustments	185.0	192.0	192.0	204.0	211.0
Adjusted Operating Expenses	859.0	858.0	945.0	1,047.0	1,164.0
Return on Rate Base (Note 4)	<u>929.5</u>	<u>979.3</u>	<u>1,057.7</u>	<u>1,133.5</u>	<u>1,205.7</u>
AGGREGATE REV REQMT	1,788.5	1,837.3	2,002.7	2,180.5	2,369.7
Revenue Projections (Note 5)	<u>1,707.9</u>	<u>1,941.9</u>	<u>2,274.5</u>	<u>2,612.2</u>	<u>3,003.0</u>
Projected Rev Change Reqmts	80.6	(104.6)	(271.8)	(431.7)	(633.3)

Note 1 ARENTO's approved five year plan

Note 2 Represents recasted exchange rate change expense

Note 3 Increased biling costs

Note 4 See attached schedule for computation of telephone plant rate base

Note 5 Consultant revenue projections.

**ARENTO
BALANCE SHEET/RATE BASE AS REPORTED
FISCAL YEAR (FY)**

(LE in millions)	FY 1992
Telephone Plant in Service	4490.7
Less:	
Reserve	<u>1040.1</u>
Net Telephone Plant in Service	3450.6
Telephone Plant Under Construction	556.4
Inventories	88.1
Accounts Receivable	522.5
Cash	206.8
Prepaid Expense	<u>18.0</u>
 Total Operating Assets/Rate Base	 4824.4
Non Operating Assets	66.0
Total Reported Assets	4908.4

Information Source ARENTO's Balance Sheet for FY Ended June 30, 1992

APPENDIX B
ARENTO TARIFFS 1981-1993

ARENTO TARIFFS, 1981-1993
(Egyptian Pounds)

	81	82	85/86	86/87	87/88	Jan-89	Oct-89	Feb-90	Aug-90	91	92	93
Tph Annual Subscription												
Automatic exchange												
Domestic	18	18	30	30	30	30	30	30	30	45	45	45
Public Sector	18	18	30	30	30	30	30	30	30	75	75	75
Governmental	18	30	50	50	50	50	50	50	50	75	75	75
Non-domestic	18	30	50	50	50	50	50	50	50	75	75	75
Manual exchange												
Domestic	21	30	30	30	30	30	30	30	30	45	45	45
Public services	21	30	30	30	30	30	30	30	30	75	75	75
Governmental	21	50	50	50	50	50	50	50	50	75	75	75
Non-domestic	21	50	50	50	50	50	50	50	50	75	75	75
Facsimile							550	550	550	550	575	575
Tph Installation Fee												
Domestic	50	50	100	100	100	200	300	300	300	300	400	400
Public services	100	100	500	500	500	600	750	750	750	750	900	900
Individual activities	150	300	500	500	500	600	750	750	750	750	900	900
Companies	150	300	500	500	500	600	1000	750	750	750	900	900
Governmental	50	75	125	125	125	225	325	325	325	325	450	450
Invest.cos.,banks & hotels	150	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Priority Fee												
Domestic		1000	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Non-domestic		2000	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500

9.26

	81	82	85/86	86/87	87/88	Jan-89	Oct-89	Feb-90	Aug-90	91	92	93
Transfer Fee												
Out of bound transfer												
Domestic	50	50	50	50	100	100	100	100	100	100	100	100
Public services	50	50	50	50	200	200	200	200	200	200	200	200
Non-domestic	50	100	100	100	200	200	200	200	200	200	200	200
Other Companies	50	150	150	150	200	200	200	200	200	200	200	200
Invest.cos.banks & hotels	50	200	200	200	200	200	200	200	200	200	200	200
Governmental	50	75	75	75	150	150	150	150	150	150	150	150
Interior transfer												
All Subscribers	5	5	5	5	5	5	5	5	5	5	5	5
Application Fee	20	100	100	100	100	100	100	100	100	100	100	
Annual Local Call Allowance												
Domestic	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Public services	300	300	300	300	300	300	300	300	300	300	300	300
Non-domestic	300	300	300	300	300	300	300	300	300	300	300	300
Governmental	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Domestic w/trade extension	1000	1000	1000	1000	300	300	300	300	300	300	300	300
Domestic w/professional use	1000	1000	1000	1000	300	300	300	300	300	300	300	300
Rented flat	300	300	300	300	300	300	300	300	300	300	300	300
Excess Call Charge												
Subscribers	0.03	0.03	0.03	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Public services	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.05	0.05	0.05	0.05	0.05
Extension Fee												
Out of bound extension												
Subscription w/in 500 meters	12	12	12	12	12	12	12	12	12	12	12	12
Sub.ea.add'l 500 meters	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25
Installation w/in 4 kilometers	30	30	30	30	30	30	30	30	30	30	30	30
Inst.ea.add'l 500 meters	12	12	12	12	12	12	12	12	12	12	12	12
Interior extension												
Annual subscription	9	9	9	9	9	9	9	9	9	9	9	9
Installation	9	9	9	9	9	9	9	9	9	9	9	9

7.2.2

	81	82	85/86	86/87	87/88	Jan-89	Oct-89	Feb-90	Aug-90	91	92	93
Vertical Service Fees												
Subscriptions												
Abbreviated			20	20	20	20	20	20	20	20	20	20
Follow Me			40	40	40	40	40	40	40	40	40	40
Hot Line			30	30	30	30	30	30	30	30	30	30
Wake Up			0	0	0	0	0	0	0	0	0	0
Call Waiting			20	20	20	20	20	20	20	20	20	20
Conference						40	40	40	40	40	40	40
No Noise											20	20
Reception											20	20
PABX											100	100
Installations												
Abbreviated			20	20	20	20	20	20	20	20	20	20
Follow Me			20	20	20	20	20	20	20	20	20	20
Hot Line			30	30	30	30	30	30	30	30	30	30
Wake Up			20	20	20	20	20	20	20	20	20	20
Call Waiting			20	20	20	20	20	20	20	20	30	30
Conference						30	30	30	30	30	30	30
No Noise											20	20
Reception											20	20
PABX											100	100
Telephone Set Charge												
Ordinary dial	50	50	50	50	70	70	80	80	100	100	100	100
Color dial		62	62	62	80	80	90	90	100	100	100	100
Ordinary push button			82	82	95	95	95	95	130	130	130	130
Color push button			82	91	100	100	100	100	130	130	130	130
Lease Trunk Line												
up to 25 kilometers	544	544	544	544	544	544	544	544	544	544	544	544
26-50 kilometers	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080
more than 50 kms (per km)*	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6

* Approximate; actual tariff is fixed at a uniform price for each block of 25, 50 or 100 kilometers.

	81	82	85/86	86/87	87/88	Jan-89	Oct-89	Feb-90	Aug-90	91	92	93
Junction Line Fee												
Through cables												
Subscription w/in 500 meters	9	9	9	9	9	9	9	9	9	9	9	9
Installation w/in 4 kilometers	36	36	36	36	36	36	36	36	36	36	36	36
Inst.ea.add'l 500 meters	12	12	12	12	12	12	12	12	12	12	12	12
By any other connection												
Subscription	800	800	800	800	800	800	800	800	800	800	800	800
Installation	150	150	150	150	150	150	150	150	150	150	150	150
Telex Service Charge												
Subscription	600	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Installation	500	1000	500	500	500	500	500	500	500	500	500	500
Pulse			0.01	0.01	0.01	0.01	0.01	0.01	0.4	0.4	0.4	0.4
Telex Priority Fee												
Companies & foreigners	3000	3000	2000	2000	2000	2000	2000	2000	2000	2000	2000	0
Others	1500	1500	1000	1000	1000	1000	1000	1000	1000	1000	1000	0
Telegraph Service Charge												
Ordinary word	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.04	0.04	0.04	0.04
Urgent word	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.1	0.1	0.1	0.1

	81	82	85/86	86/87	87/88	Jan-89	Oct-89	Feb-90	Aug-90	91	92	93
Mobile Service Fees												
Subscription												
Cairo												
Out of bound										2900		
Distinguish service										3000		
Carried mobile apparatus										500		
Additional apparatus										3000		
Cairo car call fee										50		
Alexandria car call fee										0.05		
Other car call fee										0.1		
Calling apparatus w/whistle tone										0.35		
Calling apparatus w/whistle tone and digital indicator										300		
Calling apparatus w/whistle tone, digital indicator & words										450		
Installation										450		
Cairo												
Out of bound										500		
Distinguish service										2500		
Transfer										100		
Carried mobile apparatus										100		
Additional apparatus										5500		
Cairo car call fee										6500		
Alexandria car call fee										0.15		
Other car call fee										0.35		
Calling apparatus w/whistle tone										0.5		
Calling apparatus w/whistle tone and digital indicator										300		
Calling apparatus w/whistle tone, digital indicator and words										450		
International Fees										600		
Bond												
Connection										150		
Temporary connection										250		
Wireless station license										50		
										200		

APPENDIX C
PRICEMOD HANDBOOK

PRICEMOD HANDBOOK
HOW TO USE THE K&M PRICEMOD MODEL
7/20/93

INSTALLATION

PRICEMOD is an analytical tool that runs on any IBM or IBM compatible 286, 386 or 486 personal computer. It may be loaded from the disk operating system from floppy 3.5 inch disk directly into the hard drive or internal memory of the computer. The model is self contained, and does not require any spreadsheet or other supporting software to execute. A printer with a standard interface with the computer, however, is desirable. A mouse is not required to run the application. Up, Down, Left, Right, Page Up, Page Down and Scroll commands from the computer's keyboard are adequate to use the model. The cursor control keys are the best way to move within this application.

After copying the model to the computer's hard drive in a PRICEMOD directory, check the directory to ensure that PRICEMOD.EXE and PRICEMOD.WKB are present. If they are, the model has been copied successfully. The operator can then initiate the model with the command "PRICEMOD" which will prompt an opening screen that indicates the model is loading.

The PRICEMOD model has essentially three screens, not including the introduction or opening screen that is displayed when the model is loading:

The first screen seen after loading is the "MENU" screen that contains operating functions and a revenue target section. This screen requires a manual selection of the function to be performed and input from the user relative to the revenue target.

The operator choices from the first screen include:

- "ENTER DATA",
- "RUN",
- "PRINT",
- "VIEW RESULTS" and
- "QUIT".

A description of each command and function is presented below.

ENTER DATA

This command enables the operator to access the service input screen. The operator should note that this screen is the equivalent to a large spreadsheet, and that to effectively execute the PRICEMOD model, it must be completed for each service. The services are identified in the first column from the left.

The up or down, left or right cursor control arrows can be used to move among the cells in each row and column. To change an entry in any cell, simply highlight the appropriate cell

and type in the new data. Moving the cursor to a new location leaves the cursor in the cell in which it was placed. Do not use the "ENTER" or "RETURN" keys to place information in highlighted cells. These keys simply return the operator to the menu screen.

An (*) indicates that the row is blank but can accept a new product or service to be included in the analysis. To enter a new service, simply type in the name of the service in the far left by first using the up or down arrows to highlight the row cell to accept the new service name. This program has room for approximately ten additional user defined services which the operator may enact by filling in the appropriate information. These new services will process along with the existing services to obtain a portfolio optimizing price set.

The operator should ensure that each cell in all defined rows contains the required information. This information includes:

- Product Name
- Initial Product Price
- Price Ceiling or Limit
- Initial Product Quantity Sold (not installed or equipped)
- Product Marginal Cost (recurring costs for incremental units of the product)
- Product Price Elasticity

1. The Initial Product Price should be expressed in Egyptian Pounds (LE) with Piasters denoted by decimal points (5 Piasters is entered as 0.05). Egyptian Pounds are expressed in whole numbers. In the analysis, the current tariffed prices can be used or any other potential prices can be entered.
2. Price Ceiling or Limit is a column for limiting the increases to prices. It is included to enable the analyst with the option of not allowing specific service prices to increase beyond a preset limit. For example, the price for Domestic Access can be locked at LE 45 by placing 45 in the "Limit" column. The operator can limit the prices at any level above the initial level in the price column.

Please note that a model run can become "over constrained" which will impede the ability to converge or will cause some product prices to decrease in the face of increased revenue targets. If prices seem to move in the wrong direction, try reducing the active constraints placed on product prices. Also, if the model fails to converge after approximately 150 iterations, stop the model and then restart it again.

3. The Initial Product Quantity column is dedicated to initial product demand information relative to units. If the operator is evaluating current prices relative to prices required for new additional revenues, then the current units sold for each service should be placed in this column. This column should include only units sold or forecast units sold and not "installed" unit values. For example, "local access lines billed" may be entered in this column, but not "access lines installed". The operator may examine the effects of more or less successful sales by entering other estimates in this column. Again, this column must have entries for each service in order for the model to run successfully.

4. The Product Marginal Cost column should contain entries or estimates of the long-run marginal cost for each service stated in Egyptian LE. The ARENTO/USAID TASK 5 study of marginal costs for each service may be used as a reference for entries in this column. The model copy includes the appropriate entries from this study. A more in-depth discussion of the methods for determining long-run marginal costs and their application may be obtained from the TASK 5 document.

Marginal costs used in this model should reflect only recurring costs relevant directly to the products or services. No installation fees, bonds, franchise fees, or priority fees should be included in these costs. In the PRICEMOD model, marginal costs function as a floor for the price estimates, as well as a determinant of the projected demand for each of the services.

If a price floor is to be set for any given service, the marginal cost column can be equated to the price value entered in the second column. This will effectively prevent the price from moving downward. As with the other information in the "ENTER DATA" screen, each column must be filled out completely for each designated service.

5. The Product Price Elasticity column on the far right contains the price elasticity estimates for each of the products and services. These estimates were also discussed in the TASK 5 study, and should not be adjusted or changed unless more accurate estimates are derived from actual analysis of ARENTO service demand. The specific demand equation form used in PRICEMOD is extremely sensitive to changes in these elasticities. The values are set at levels that yield results that have been revealed by historical ARENTO service performance, and are in the relevant range of the price elasticity survey information discussed in the TASK 5 study. Each of the elasticity estimates should be preceded by a negative (-) sign denoting the "law of demand" relationship between price and quantity demanded of each service.

After all information is entered and verified, the operator should press the "Enter" or "Return" key to return to the menu. If changes are required to the data entered, the operator may return to the "ENTER DATA" screen at any time by highlighting the "ENTER DATA" line in the menu and striking the "ENTER" or "RETURN" key on the computer keyboard.

SAVE

The "SAVE" command is embedded in the PRICEMOD "QUIT" command. If the scenario is to be saved, the operator should highlight the "QUIT" command on the menu and strike the "ENTER" or "RETURN" key. If the operator desires to save the changes made to the "ENTER DATA" screen (product headings, prices, pricing limits, quantities, marginal costs, and price elasticities) the "SAVE" option should be selected. This action saves the current data file to PRICEMOD.WKB noted in the PRICEMOD directory. If multiple data scenarios are to be kept, the WKB files may be renamed at the DOS prompt, and saved under different names; for example, SCENAR1.WKB, SCENAR2.WKB, etc....

Please note that only the file named PRICEMOD.WKB is accessible with the program PRICEMOD. In other words, if you would like to return to a previously created scenario that

was saved under a different name, you must rename that file to PRICEMOD.WKB in order to make changes to it.

After the data has been saved, the program the operator will automatically exit the application. Reentry is accomplished by reloading PRICEMOD with the PRICEMOD.EXE command from the DOS or disk operating system cursor.

If the data is not saved via the "QUIT" command, the scenario will revert to the previously saved version of the data. Although cumbersome, this method of saving scenarios does require thought and reduces the proliferation of multiple scenario files.

RUN

The "RUN" command executes the iterative process of moving from an initial revenue level and price set to the target level of revenues and resulting prices. The equations that underlay this process of "Ramsey" pricing for a portfolio of services is described in the TASK 6 SERVICE PRICING STUDY for ARENTO and USAID.

Initiating the "RUN" command moves the highlight and cursor to the revenue block on the first screen. A "PERCENTAGE" area is highlighted for the operator to adjust the revenues to a percentage increase or decrease from the initial revenue level to create a target level for revenues. If the operator wishes, the increase can be expressed in absolute LE by moving the cursor to the line below the "PERCENTAGE" line and making the appropriate entry for the added revenues required to reach the target. After the entries are made with either or both of the revenue change cells, a new revenue target is calculated and shown below the change cells. Do not make changes directly to either the initial or the target revenue cells. Directly changing these values may prevent the model from converging to a solution.

VIEW

If the operator wishes to see the model results, a "VIEW" command in the main menu can be selected. This third screen shows the estimated optimal prices and quantities that result from executing the model on the data provided for each service.

PRINT

The operator may wish to create a hard copy of the results by selecting "PRINT" from the main menu of the first screen. It is advisable to label the results of each scenario, the revenue targets, and the date that the scenario was executed.

PROBLEMS

If errors occur or processing problems exist, contact K&M Engineering and Consulting Corporation's Garden City Office at 354 4544 and ask for assistance with PRICEMOD. The K&M contact will likely arrange U.S. support for the application in a timely manner if local support cannot find a workable solution.

On occasion, service headings do not appear after running and saving the "ENTER DATA" screen. The cause of this intermittent discrepancy is currently being investigated; however, it is possible to reenter the service names and continue processing.

Additional copies of the program and lost or stolen disks can be acquired or replaced through the K&M contact cited above. As with other software covered by copyright, duplication of this program without the owner/developer's permission is forbidden.

APPENDIX D
CURRENT 1993 UNCONSTRAINED PRICING
STRUCTURE

CURRENT 1993 UNCONSTRAINED PRICING STRUCTURE
LE 1,659,400,000

Product Description	Initial Price	Initial Quantity	Model Price	Model Quantity
Features				
Abbreviated	20.00	25,105	12.39	27,628
Follow-me	40.00	61,621	9.77	72,979
Hot line	30.00	20,540	9.77	23,501
Wake up	20.00	9,129	7.33	10,298
Call Waiting	40.00	77,597	7.33	95,128
Conference	40.00	15,975	31.75	16,424
No Noise	20.00	18,258	10.97	29,516
Hunt Group	20.00	138,500	4.88	164,029
Fax	575.00	6,260	48.84	8,416
Touch Tone	10.00	199,168	2.44	235,880
Voice Messaging	40.00	8,300	18.58	96,752
Long Distance	0.00	0	0.00	0
** Access**	0.00	0	0.00	0
Rate	10.00	210,000	10.00	210,000
** Day MOU **	0.00	0	0.00	0
RB 1-10	0.15	285,423,900	0.08	309,943,561
RB 11-25	0.15	114,169,600	0.08	122,947,167
RB 26-50	0.15	57,084,800	0.09	61,189,525
RB 51-100	0.20	57,084,800	0.13	60,740,314
RB 101-150	0.25	57,084,800	0.12	63,153,242
RB 151-200	0.35	57,084,800	0.16	63,892,461
RB 201-300	0.45	17,059,800	0.20	19,051,248
RB 301-500	0.55	2,624,500	0.30	2,861,989
RB 501-700	0.60	2,624,500	0.38	2,794,625
RB 701-900	0.65	2,624,500	0.47	2,742,453
RB 901+	0.70	2,624,500	0.47	2,778,582
** Night MOU **	0.00	0	0.00	0
RB 1-10	0.10	122,324,700	0.02	152,974,449
RB 11-25	0.10	48,929,900	0.02	61,189,804
RB 26-50	0.10	24,464,900	0.02	32,381,798
RB 51-100	0.15	24,464,900	0.02	33,712,610
RB 101-150	0.20	24,464,900	0.02	34,782,419
RB 151-200	0.25	24,464,900	0.02	36,460,088
RB 201-300	0.35	7,311,400	0.02	11,101,807
RB 301-500	0.40	1,124,800	0.04	1,575,744
RB 501-700	0.45	1,124,800	0.04	1,599,159
RB 701-900	0.50	1,124,800	0.04	1,620,640
RB 901+	0.55	1,124,800	0.04	0
*	0.00	0	0.00	0
*	0.00	0	0.00	0

CURRENT 1993 UNCONSTRAINED PRICING STRUCTURE

LE 1,659,400,000

Product Description	Initial Price	Initial Quantity	Model Price	Model Quantity
** Flat Rate **	0.00	0	0.00	0
Domestic	45.00	1,473,659	18.22	1,672,467
Public Service	75.00	415,215	21.98	481,108
Non-domestic	75.00	0	0.00	0
Governmental	75.00	102,806	21.98	119,121
** Usage **	0.00	0	0.00	0
Calls Above Allowance	0.05	2,738,712,000	0.24	2,264,091,096
*	0.00	0	0.00	0
*	0.00	0	0.00	0
International	0.00	0	0.00	0
** Access **	0.00	0	0.00	0
Rate	250.00	39,684	250.00	39,684
** Usage **	0.00	0	0.00	0
Rate	2.56	313,027,000	2.52	316,642,022
*	0.00	0	0.00	0
*	0.00	0	0.00	0
*	0.00	0	0.00	0
Coin Telephone	0.00	0	0.00	0
** Day MOU Per 1 min	0.00	0	0.00	0
RB 1-50	0.05	141,512,000	0.02	155,540,630
RB 51-200	0.10	55,594,000	0.07	58,205,553
RB 201-300	0.15	2,779,700	0.07	30,615,816
RB 301-700	0.20	15,162,000	0.14	15,874,242
RB 701+	0.25	15,162,000	0.18	15,746,694
** NIGHT MOU **	0.00	0	0.00	0
RB 1-50	0.05	60,648,000	0.02	66,798,143
RB 51-200	0.10	23,826,000	0.02	28,617,243
RB 201-300	0.15	11,913,000	0.02	15,052,520
RB 301-700	0.15	6,498,000	0.02	8,210,465
RB 701+	0.15	6,498,000	0.02	8,210,465
*	0.00	0	0.00	0
Leased Trunk Lines	0.00	0	0.00	0
RB 25	544.00	4	485.95	4
RB 50	1,080.00	4	1,155.05	4
RB 75	1,620.00	4	1,616.59	4
RB 100	2,160.00	4	2,307.66	4
RB 125	2,700.00	4	2,998.74	4
RB 150	3,240.00	4	3,457.83	4
RB 175	3,780.00	4	4,148.91	4
RB 200	4,320.00	4	4,610.44	4
RB 250	5,400.00	4	5,992.60	4

CURRENT 1993 UNCONSTRAINED PRICING STRUCTURE
LE 1,659,400,000

Product Description	Initial Price	Initial Quantity	Model Price	Model Quantity
RB 300	6,480.00	4	7,142.77	4
RB 350	7,560.00	4	8,292.93	4
RB 400	8,640.00	3	9,445.55	3
RB 500	10,800.00	3	11,977.87	3
RB 550	11,880.00	4	13,130.48	4
RB 600	12,960.00	3	14,280.65	3
RB 650	14,040.00	4	15,433.26	4
RB 700	15,120.00	3	16,583.43	3
RB 750	16,200.00	4	17,965.58	4
RB 800	17,280.00	3	19,115.75	3
RB 850	18,360.00	4	20,268.36	4
RB 900	19,440.00	3	21,418.53	3
RB 950	20,520.00	4	22,571.14	4
RB 1000	21,600.00	3	23,950.86	3
RB 1100	23,760.00	4	26,253.63	4
RB 1200	25,920.00	3	28,788.40	3
RB 1300	28,080.00	4	31,091.18	4
*	0.00	0	0.00	0
Local Telex	1,000.00	8,536	1,077.09	7,931
Local Telegraph	0.53	12,900,000	0.57	11,985,579
*	0.00	0	0.00	0
International Telex	0.10	30,100,000	0.11	27,966,350
International Telegraph	3.37	13,200,000	3.63	12,264,313
*	0.00	0	0.00	0
Cellular/Mobile	4,000.00	6,000	4,000.00	6,000
*	0.00	0	0.00	0
Telephone Sets	190.00	136,505	153.84	140,007

APPENDIX E
SUGGESTED 1993 SHORT TERM PRICING
STRUCTURE

SUGGESTED 1993 SHORT TERM PRICING STRUCTURE
LE 1,659,400,000

Product Description	Initial Price	Initial Quantity	Model Price	Model Quantity
Features				
Abbreviated	20.00	25,105	19.88	25,136
Follow-me	40.00	61,621	60.00	58,695
Hot line	30.00	20,540	40.00	19,843
Wake up	20.00	9,129	20.00	9,129
Call Waiting	40.00	77,597	60.00	73,912
Conference	40.00	15,975	60.00	15,216
No Noise	20.00	18,258	11.76	27,930
Hunt Group	20.00	138,500	99.00	114,313
Fax	575.00	6,260	575.00	6,260
Touch Tone	10.00	199,168	20.00	183,272
Voice Messaging	40.00	8,300	29.81	88,025
Long Distance	0.00	0	0.00	0
** Access**	0.00	0	0.00	0
Rate	10.00	210,000	10.00	210,000
** Day MOU **	0.00	0	0.00	0
RB 1-10	0.15	285,423,900	0.45	247,560,617
RB 11-25	0.15	114,169,600	0.48	98,201,351
RB 26-50	0.15	57,084,800	0.50	48,873,790
RB 51-100	0.20	57,084,800	0.52	50,141,976
RB 101-150	0.25	57,084,800	0.41	53,268,778
RB 151-200	0.35	57,084,800	0.53	53,892,298
RB 201-300	0.45	17,059,800	0.69	16,069,432
RB 301-500	0.55	2,624,500	1.00	2,414,043
RB 501-700	0.60	2,624,500	1.00	2,443,362
RB 701-900	0.65	2,624,500	1.00	2,470,896
RB 901+	0.70	2,624,500	1.00	2,496,665
** Night MOU **	0.00	0	0.00	0
RB 1-10	0.10	122,324,700	0.07	129,031,570
RB 11-25	0.10	48,929,900	0.07	51,612,649
RB 26-50	0.10	24,464,900	0.07	27,313,543
RB 51-100	0.15	24,464,900	0.07	28,436,063
RB 101-150	0.20	24,464,900	0.07	29,338,430
RB 151-200	0.25	24,464,900	0.07	30,753,517
RB 201-300	0.35	7,311,400	0.07	9,364,202
RB 301-500	0.40	1,124,800	0.14	1,329,115
RB 501-700	0.45	1,124,800	0.14	1,348,866
RB 701-900	0.50	1,124,800	0.14	1,366,985
RB 901+	0.55	1,124,800	0.14	0
*	0.00	0	0.00	0
*	0.00	0	0.00	0

SUGGESTED 1993 SHORT TERM PRICING STRUCTURE
LE 1,659,400,000

Product Description	Initial Price	Initial Quantity	Model Price	Model Quantity
** Flat Rate **	0.00	0	0.00	0
Domestic	45.00	1,473,659	45.00	1,473,659
Public Service	75.00	415,215	75.00	415,215
Non-domestic	75.00	0	0.00	0
Governmental	75.00	102,806	75.00	102,806
** Usage **	0.00	0	0.00	0
Calls Above Allowance	0.05	2,738,712,000	0.05	2,738,712,000
*	0.00	0	0.00	0
*	0.00	0	0.00	0
International	0.00	0	0.00	0
** Access **	0.00	0	0.00	0
Rate	250.00	39,684	250.00	39,684
** Usage **	0.00	0	0.00	0
Rate	2.56	313,027,000	2.60	309,168,396
*	0.00	0	0.00	0
*	0.00	0	0.00	0
*	0.00	0	0.00	0
Coin Telephone	0.00	0	0.00	0
** Day MOU Per 1 min	0.00	0	0.00	0
RB 1-50	0.05	141,512,000	0.23	116,863,664
RB 51-200	0.10	55,594,000	0.68	43,732,073
RB 201-300	0.15	2,779,700	0.68	23,002,841
RB 301-700	0.20	15,162,000	1.36	11,926,929
RB 701+	0.25	15,162,000	1.82	11,831,098
** NIGHT MOU **	0.00	0	0.00	0
RB 1-50	0.05	60,648,000	0.23	50,188,017
RB 51-200	0.10	23,826,000	0.23	21,501,237
RB 201-300	0.15	11,913,000	0.23	11,309,538
RB 301-700	0.15	6,498,000	0.23	6,168,839
RB 701+	0.15	6,498,000	0.23	6,168,839
*	0.00	0	0.00	0
Leased Trunk Lines	0.00	0	0.00	0
RB 25	544.00	4	816.00	4
RB 50	1,080.00	4	1,620.00	4
RB 75	1,620.00	4	2,430.00	4
RB 100	2,160.00	4	3,240.00	4
RB 125	2,700.00	4	4,050.00	4
RB 150	3,240.00	4	4,860.00	4
RB 175	3,780.00	4	5,670.00	4
RB 200	4,320.00	4	6,480.00	4
RB 250	5,400.00	4	8,100.00	4

SUGGESTED 1993 SHORT TERM PRICING STRUCTURE
LE 1,659,400,000

Product Description	Initial Price	Initial Quantity	Model Price	Model Quantity
RB 300	6,480.00	4	9,720.00	4
RB 350	7,560.00	4	11,340.00	4
RB 400	8,640.00	3	12,960.00	3
RB 500	10,800.00	3	16,200.00	3
RB 550	11,880.00	4	17,820.00	4
RB 600	12,960.00	3	19,440.00	3
RB 650	14,040.00	4	21,060.00	4
RB 700	15,120.00	3	22,680.00	3
RB 750	16,200.00	4	24,300.00	4
RB 800	17,280.00	3	25,920.00	3
RB 850	18,360.00	4	27,540.00	4
RB 900	19,440.00	3	29,160.00	3
RB 950	20,520.00	4	30,780.00	4
RB 1000	21,600.00	3	32,400.00	3
RB 1100	23,760.00	4	35,640.00	4
RB 1200	25,920.00	3	38,880.00	3
RB 1300	28,080.00	4	42,120.00	4
*	0.00	0	0.00	0
Local Telex	1,000.00	8,536	1,137.28	7,515
Local Telegraph	0.53	12,900,000	0.60	11,357,454
*	0.00	0	0.00	0
International Telex	0.10	30,100,000	0.11	26,500,726
International Telegraph	3.37	13,200,000	3.83	11,621,581
*	0.00	0	0.00	0
Cellular/Mobile	4,000.00	6,000	4,000.00	6,000
*	0.00	0	0.00	0
Telephone Sets	190.00	136,505	200.00	135,667

APPENDIX F
PLANNED 1997 POLICY-CONSTRAINED PRICING
STRUCTURE

PLANNED 1997 POLICY-CONSTRAINED PRICING STRUCTURE

Revenues: LE 2,635,212,000

Product Description	Initial Price	Initial Quantity	Model Price	Model Quantity
Features				
Abbreviated	20.00	40,375	49.05	36,254
Follow-me	40.00	99,101	24.53	105,092
Hot line	30.00	33,033	24.53	33,841
Wake up	20.00	14,682	18.40	14,830
Call Waiting	40.00	124,795	18.40	136,987
Conference	40.00	25,693	79.71	23,653
No Noise	20.00	29,364	4.57	95,584
Hunt Group	20.00	241,800	12.26	256,417
Fax	575.00	8,175	122.63	9,840
Touch Tone	10.00	367,042	6.13	389,229
Voice Messaging	40.00	16,760	24.10	185,468
Long Distance	0.00	0	0.00	0
** Access**	0.00	0	0.00	0
Rate	10.00	39,000	10.00	39,000
** Day MOU **	0.00	0	0.00	0
RB 1-10	0.15	479,469,100	0.16	475,794,050
RB 11-25	0.15	191,787,600	0.17	188,735,967
RB 26-50	0.15	95,893,800	0.20	92,531,372
RB 51-100	0.20	95,893,800	0.20	96,092,347
RB 101-150	0.25	95,893,800	0.24	96,712,120
RB 151-200	0.35	95,893,800	0.27	99,263,304
RB 201-300	0.45	28,653,900	0.36	29,593,907
RB 301-500	0.55	4,408,900	0.52	4,446,524
RB 501-700	0.60	4,408,900	0.67	4,341,865
RB 701-900	0.65	4,408,900	0.83	4,260,808
RB 901+	0.70	4,408,900	0.83	4,305,244
** Night MOU **	0.00	0	0.00	0
RB 1-10	0.10	205,486,735	0.04	237,660,821
RB 11-25	0.10	82,194,694	0.04	95,064,329
RB 26-50	0.10	41,097,347	0.04	50,308,384
RB 51-100	0.15	41,097,347	0.04	52,375,935
RB 101-150	0.20	41,097,347	0.04	54,037,991
RB 151-200	0.25	41,097,347	0.04	56,644,418
RB 201-300	0.35	12,281,965	0.04	17,247,655
RB 301-500	0.40	1,889,533	0.07	2,448,126
RB 501-700	0.45	1,889,533	0.07	2,484,505
RB 701-900	0.50	1,889,533	0.07	2,517,879
RB 901+	0.55	1,889,533	0.07	0
*	0.00	0	0.00	0
*	0.00	0	0.00	0

PLANNED 1997 POLICY-CONSTRAINED PRICING STRUCTURE

Revenues: LE 2,635,212,000

Product Description	Initial Price	Initial Quantity	Model Price	Model Quantity
** Flat Rate **	0.00	0	0.00	0
Domestic	45.00	2,703,112	31.84	2,837,224
Public Service	75.00	837,964	55.19	869,388
Non-domestic	75.00	0	0.00	0
Governmental	75.00	129,346	55.19	134,197
** Usage **	0.00	0	0.00	0
Calls Above Allowance	0.05	9,250,481,500	0.06	9,026,735,587
*	0.00	0	0.00	0
*	0.00	0	0.00	0
International	0.00	0	0.00	0
** Access **	0.00	0	0.00	0
Rate	250.00	56,000	250.00	56,000
** Usage **	0.00	0	0.00	0
Rate	2.56	557,571,200	2.60	550,698,162
*	0.00	0	0.00	0
*	0.00	0	0.00	0
*	0.00	0	0.00	0
Coin Telephone	0.00	0	0.00	0
** Day MOU Per 1 min	0.00	0	0.00	0
RB 1-50	0.05	187,768,000	0.05	186,974,806
RB 51-200	0.10	73,766,000	0.13	71,311,823
RB 201-300	0.15	36,883,000	0.17	36,276,486
RB 301-700	0.20	20,118,000	0.32	18,963,834
RB 701+	0.25	20,118,000	0.40	18,983,977
** NIGHT MOU **	0.00	0	0.00	0
RB 1-50	0.05	80,472,000	0.05	80,297,797
RB 51-200	0.10	31,614,000	0.05	34,400,680
RB 201-300	0.15	15,800,000	0.05	18,086,564
RB 301-700	0.15	8,622,000	0.05	9,869,769
RB 701+	0.15	8,622,000	0.05	9,869,769
*	0.00	0	0.00	0
Leased Trunk Lines	0.00	0	0.00	0
RB 25	544.00	6	816.00	6
RB 50	1,080.00	6	1,620.00	6
RB 75	1,620.00	6	2,430.00	6
RB 100	2,160.00	6	3,240.00	6
RB 125	2,700.00	6	4,050.00	6
RB 150	3,240.00	6	4,860.00	6
RB 175	3,780.00	6	5,670.00	6
RB 200	4,320.00	6	6,480.00	6
RB 250	5,400.00	6	8,100.00	6

PLANNED 1997 POLICY-CONSTRAINED PRICING STRUCTURE
Revenues: LE 2,635,212,000

Product Description	Initial Price	Initial Quantity	Model Price	Model Quantity
RB 300	6,480.00	6	9,720.00	6
RB 350	7,560.00	6	11,340.00	6
RB 400	8,640.00	5	12,960.00	5
RB 500	10,800.00	5	16,200.00	5
RB 550	11,880.00	6	17,820.00	6
RB 600	12,960.00	5	19,440.00	5
RB 650	14,040.00	6	21,060.00	6
RB 700	15,120.00	5	22,680.00	5
RB 750	16,200.00	6	24,300.00	6
RB 800	17,280.00	5	25,920.00	5
RB 850	18,360.00	6	27,540.00	6
RB 900	19,440.00	5	29,160.00	5
RB 950	20,520.00	6	30,780.00	6
RB 1000	21,600.00	5	32,400.00	5
RB 1100	23,760.00	6	35,640.00	6
RB 1200	25,920.00	5	38,880.00	5
RB 1300	28,080.00	6	42,120.00	6
*	0.00	0	0.00	0
Local Telex	1,000.00	8,536	1,112.90	7,678
Local Telegraph	0.53	12,900,000	0.59	11,603,776
*	0.00	0	0.00	0
International Telex	0.10	30,100,000	0.11	27,075,478
International Telegrap	3.37	13,200,000	3.75	11,873,632
*	0.00	0	0.00	0
Cellular/Mobile	4,000.00	7,950	2,410.36	8,798
*	0.00	0	0.00	0
Telephone Sets	190.00	384,133	200.00	381,776

APPENDIX G
SUGGESTED 1997 LONG-TERM PRICING
STRUCTURE

**SUGGESTED 1997 LONG-TERM PRICING STRUCTURE
WITH USAGE SENSITIVE LOCAL SERVICE
Revenues: LE 3,097,736,000**

Product Description	Initial Price	Initial Quantity	Model Price	Model Quantity
Features				
Abbreviated	20.00	40,375	45.47	36,586
Follow-me	40.00	99,101	22.73	106,053
Hot line	30.00	33,033	22.73	34,151
Wake up	20.00	14,682	17.05	14,966
Call Waiting	40.00	124,795	17.05	138,240
Conference	40.00	25,693	73.89	23,869
No Noise	20.00	29,364	4.56	95,752
Hunt Group	20.00	241,800	11.37	258,762
Fax	575.00	8,175	113.67	9,930
Touch Tone	10.00	367,042	5.68	392,790
Voice Messaging	40.00	16,760	23.74	186,040
Long Distance	0.00	0	0.00	0
** Access**	0.00	0	0.00	0
Rate	10.00	39,000	10.00	39,000
** Day MOU **	0.00	0	0.00	0
RB 1-10	0.15	479,469,100	0.15	478,950,569
RB 11-25	0.15	191,787,600	0.16	189,988,082
RB 26-50	0.15	95,893,800	0.19	93,145,245
RB 51-100	0.20	95,893,800	0.19	96,608,330
RB 101-150	0.25	95,893,800	0.23	97,231,430
RB 151-200	0.35	95,893,800	0.26	99,796,314
RB 201-300	0.45	28,653,900	0.34	29,752,816
RB 301-500	0.55	4,408,900	0.50	4,470,400
RB 501-700	0.60	4,408,900	0.64	4,365,179
RB 701-900	0.65	4,408,900	0.80	4,283,687
RB 901+	0.70	4,408,900	0.80	4,328,362
** Night MOU **	0.00	0	0.00	0
RB 1-10	0.10	205,486,735	0.03	238,936,978
RB 11-25	0.10	82,194,694	0.03	95,574,791
RB 26-50	0.10	41,097,347	0.03	50,578,522
RB 51-100	0.15	41,097,347	0.03	52,657,176
RB 101-150	0.20	41,097,347	0.03	54,328,156
RB 151-200	0.25	41,097,347	0.03	56,948,578
RB 201-300	0.35	12,281,965	0.03	17,340,269
RB 301-500	0.40	1,889,533	0.07	2,461,272
RB 501-700	0.45	1,889,533	0.07	2,497,846
RB 701-900	0.50	1,889,533	0.07	2,531,399
RB 901+	0.55	1,889,533	0.07	0
*	0.00	0	0.00	0

**SUGGESTED 1997 LONG-TERM PRICING STRUCTURE
WITH USAGE SENSITIVE LOCAL SERVICE**

Revenues: LE 3,097,736,000

Product Description	Initial Price	Initial Quantity	Model Price	Model Quantity
*	0.00	0	0.00	0
** Flat Rate **	0.00	0	0.00	0
Domestic	45.00	2,703,112	30.65	2,852,459
Public Service	75.00	837,964	51.15	877,341
Non-domestic	75.00	0	0.00	0
Governmental	75.00	129,346	51.15	135,424
** Usage **	0.00	0	0.00	0
Calls Above Allowance	0.05	18,500,960,000	0.06	18,218,625,270
*	0.00	0	0.00	0
*	0.00	0	0.00	0
International	0.00	0	0.00	0
** Access **	0.00	0	0.00	0
Rate	250.00	56,000	250.00	56,000
** Usage **	0.00	0	0.00	0
Rate	2.56	557,571,200	2.60	550,698,162
*	0.00	0	0.00	0
*	0.00	0	0.00	0
*	0.00	0	0.00	0
Coin Telephone	0.00	0	0.00	0
** Day MOU Per 1 min	0.00	0	0.00	0
RB 1-50	0.05	187,768,000	0.05	188,403,704
RB 51-200	0.10	73,766,000	0.12	71,856,802
RB 201-300	0.15	36,883,000	0.16	36,553,718
RB 301-700	0.20	20,118,000	0.30	19,108,760
RB 701+	0.25	20,118,000	0.37	19,129,056
** NIGHT MOU **	0.00	0	0.00	0
RB 1-50	0.05	80,472,000	0.05	80,911,448
RB 51-200	0.10	31,614,000	0.05	34,663,577
RB 201-300	0.15	15,800,000	0.05	18,224,785
RB 301-700	0.15	8,622,000	0.05	9,945,196
RB 701+	0.15	8,622,000	0.05	9,945,196
*	0.00	0	0.00	0
Leased Trunk Lines	0.00	0	0.00	0
RB 25	544.00	6	816.00	6
RB 50	1,080.00	6	1,620.00	6
RB 75	1,620.00	6	2,430.00	6
RB 100	2,160.00	6	3,240.00	6
RB 125	2,700.00	6	4,050.00	6
RB 150	3,240.00	6	4,860.00	6
RB 175	3,780.00	6	5,670.00	6

**SUGGESTED 1997 LONG-TERM PRICING STRUCTURE
WITH USAGE SENSITIVE LOCAL SERVICE
Revenues: LE 3,097,736,000**

Product Description	Initial Price	Initial Quantity	Model Price	Model Quantity
RB 200	4,320.00	6	6,480.00	6
RB 250	5,400.00	6	8,100.00	6
RB 300	6,480.00	6	9,720.00	6
RB 350	7,560.00	6	11,340.00	6
RB 400	8,640.00	5	12,960.00	5
RB 500	10,800.00	5	16,200.00	5
RB 550	11,880.00	6	17,820.00	6
RB 600	12,960.00	5	19,440.00	5
RB 650	14,040.00	6	21,060.00	6
RB 700	15,120.00	5	22,680.00	5
RB 750	16,200.00	6	24,300.00	6
RB 800	17,280.00	5	25,920.00	5
RB 850	18,360.00	6	27,540.00	6
RB 900	19,440.00	5	29,160.00	5
RB 950	20,520.00	6	30,780.00	6
RB 1000	21,600.00	5	32,400.00	5
RB 1100	23,760.00	6	35,640.00	6
RB 1200	25,920.00	5	38,880.00	5
RB 1300	28,080.00	6	42,120.00	6
*	0.00	0	0.00	0
Local Telex	1,000.00	8,536	1,110.97	7,691
Local Telegraph	0.53	12,900,000	0.59	11,623,702
*	0.00	0	0.00	0
International Telex	0.10	30,100,000	0.11	27,121,971
International Telegraph	3.37	13,200,000	3.74	11,894,020
*	0.00	0	0.00	0
Cellular/Mobile	4,000.00	7,950	2,373.58	8,825
*	0.00	0	0.00	0
Telephone Sets	190.00	384,133	200.00	381,776