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THE ELECTRONICS INDUSTRY IN THE AFRICAN COUNTRIES: EGYPT*

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* The views expressed in this document are those of the author and do not necessarily reflect the views of the Secretariat of UNIDO. This document has not been edited.

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0.0 INTRODUCTION

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0.1.1 Background

Electronics industry, after World War II, has taken astonishing strides in terms of innovation, technology, output, employment, etc. In industrialised countries, its power and performance have been utilised in all areas of activity to great benefit. In households, offices, industries, governance, the spread effect of electronics has resulted in better information, accurate measurement, better control, lower waste, etc.

Power and sophistication of electronics seems to have no limits; so much so that in nation after nation it has become the driving force behind most activities. When to this we add its pertinance to security, defence,space, etc. it is no wonder it commands highest attention. As in case of energy consumption, electronics use per capita has become the measuring yardstick of national strength.

However, developing nations, having lagged behind in mastering this technology, are finding the gap widening not only in electronics but, as a consequence, in other activities too where the power of electronics enables other nations to forge ahead. Further, the knowledge-base, fast-change, high investments needed to enter electronics with sufficient force are high barriers which will have to be somehow surmounted if developing nations are to emerge as participants in world economy.

Recent examples abound of nations having used electronics as a lead industry to spark overall economic advancement including spread-effect on all other industies. Japan, Korea, Taiwan are long known examples. More interesting for our study are the recent efforts of Malaysia, Thailand, India, Indonesia.

0.1.2 Objectives

This work will address itself to the task of studying ways and means for less developed countries to participate in the electronics age. Main objectives being :

a) To appraise the history, status and growth of electronics industry in relation to the policies adopted.

b) To identify constraints regarding the judicious & beneficial use of this technology.

c) To evolve strategies for accelerated usage, increasing capability, enhancing added value.

d) To suggest improved institutional arrangements for implementation of these strategies.

e) To chalk out a role for software activities.

f) To find suitable niche markets (domestic & export).

The findings of this study will be part of the consultations between nations directed towards faster industrialization of developing countries and finding ways of increasing co-opeation between North-South and South-South to that end.

0.1.3 Study Treatment

Due to the highly visible and undoubtedly powerful position of "informatics" and "microelectronics" at the leading edge of electronics, there is a general tendency in discussions, conferences and literature to use these as essential requirements towards which strategies and policies for electronics should aim. In case of less developed countries, however, there is a lot of ground to be covered prior to that stage and many tasks at a more traditional level that can be achieved.

Based on the economic situation and overall policy structure, we will investigate what initiatives and changes are needed to accelerate electronics growth, create spread-effect through its use, progressively increase value added and play a useful role in the world trends in electronics.

Our attempts at analysis will focus on the key pacesetting segments of the electronics industry --- i.e. telecom, computers, industrial controls & television --- to determine how the country can benefit from accelerated development of these area.

0.1.4 Basis Of Information

Besides a review of published data available from various sources, the study is based on a visit to the country capital for meeting responsible officials, industrialists, academics, and others currently involved in the electronics industry. In Annexure 'A' we list the sources referred in the text.

The major limitations of this study are the compressed time available ; the limited and unreliable data maintained in developing countries and certain variations between various sources of data and interviews. The findings must thus be considered as a start of the process of analysis needing refinement and detailing by further concentrated study of the issues highlighted by this work.

0.2 Country Characteristics

0.2.1 Geographic (Ref. Ann.A 1,2)

Embracing an area of over one million square kilometers, Egypt is bounded to the North by the Mediterranean Sea, West by Libya, South by Sudan, East by Israel & Red Sea.

Terrain of the country is largely low lying arrid desert with a central strip around the river Nile and its Delta (being areas of maximum activity & development). Cultivated and settled land formed 3 to 3.5% of the land mass in early eighties but is expected to increase somewhat with development resulting from the Aswan Dam.

The climate is forbiddingly harsh and extreme in the desertified portion which generally inhibits all but the most essential extractive developmental activities. From Aswan Dam the Nile to the Delta and the areas abutting the Mediterranean and the Gulf of Suez have more acceptable climate. Electronics developments would mainly pertain to these areas and markets.

0.2.2 Regional (Ref. Ann.A 1,2,3)

Algeria, Egypt, Libya, Morocco, Sudan and Tunisia (population ; over 130 million ; GDP over $ 160 Billion) form a regional grouping of North African states due to proximity, cultural affinity, economic conditions, and inter-trade possibilities. Recently, discussions have been going on between Egypt, Iraq, Jordan and Yemen to form a second grouping involving preferential trade between these entities. Other oil producing Arab countries have not joined this second grouping. Programmes of long term interest which cannot be justified on the basis of one country alone may have better chance of success if regional co-operation could be arranged. Opportunities for these will be reviewed.

0.2.3 Demographic (Ref. Ann.A 1,2,3)

With a natural growth rate declining from 3% to 2%, the population in Egypt in 1988 passed the 50 million mark which is the largest among the North Afircan Group. Heavy concentration along the Nile and Delta results in a density of 1300 persons / sq.km. Cairo metropolitan area is expected to be among the densest urban agglomerations in the world.

Nearly half the population is in towns larger than 20,000 and most of the remaining are scattered in rural areas along the fertile strip; thus simplifying access to markets and manpower.

TABLE 1 : Demographic Statistics

	Units	1980	1986
Population	Million	42.29	49.61
Growth	%	2.70	2.22
Between 15-59 years	%	55.90	54.50
Urban	%	44.70	46.88
Economically active	%	27.10	24.87
Urbanisation	% PA	2.90	3.40
Family Size	Persons	N.A.	4.90

(Source : Ref. Ann.A 1,2,3,4)

1.0 OVERALL ECONOMIC SITUATION

1.1 Major Resources

1.1.1 Human (Ref. Ann.A 1,2,3,5)

Egypt has a literacy rate of 44.9% (1985). Primary education is compulsory between 6-12 years age. Students attending schools in 1986 were 6.12 Mill (42% female at primary and 3.7 Mill (39% female) at secondary levels. Educated females could be a source of operators needed for electronics production lines.

The 519 polytechnic/vocational courses attended by 765,000 trainees can be a pool from which skilled workers, mechanics, supervisors can be drawn who, with specific training, can man responsible jobs needed for maintaining & operating electronic activities.

With a tradition of higher education stretching back over the ages, Egypt's 12 Universities (supplemented by many impressive libraries) educate 739,000 graduates & postgraduates of all faculties from which the country can draw the cadre of scientists, engineers, marketers and managers. As an industry, electronics demands a multi-disciplinary staff stretching from high science to mundane marketing.

Economically active force at 12.1 million (17.6% female) is a rather low proportion of the population especially keeping in view the substantial concentration in urban areas of people of

working age 15-59 years. The reason could be the low female participation; electronics on the other hand needs a willing female labour force. Guarantee of jobs to graduates leads to situation of under-employment.

In 1983 major (42.7%) disposition of manpower was in Agriculture, Forestry & Fishery quite often as self-employed in subsistance activities. Services (including hotels, finance, trade, government etc.) constituted 31.1%. The remaining 26.2% being in various forms of industrial activity.

1.1.2 Energy (Ref.Ann.A 1,2,3,5)

Egypt has a rated installed capacity (1986) of 5.85 million KW and a production capacity of 51.3 trillion KWhr only half of which is utilised. Hydro-power contributes a respectable 42.4% of the capacity, the remaining being fossil fuels.

Reserves of petroleum at 4685 million barrels and of natural gas at 5527 trillion Cu. Meters are respectable resources though not quite as impressive as several even smaller Arab countries. While gas reserves seem to be largely flamed off, the production of petroleum at 328 million barrels (1987) enables half of it to be exported. However, in the depressed condition of the world market, this major source of foreign exchange is less beneficial than it used to be.

1.1.3 Extractive

Mining of petroleum and gas are major resources extracted from desertified areas and form a major constituent of Egypt's resources. The small proportion of cultivated land does not allow agricultural products (including forestry) to be much of a resource.

1.2 ECONOMIC STRUCTURE

1.2.1 National Product (Ref. Ann.A 1,2,3,5,6)

The level of US $ 37.7 billion (1986) and US $ 760 per capita puts the Egyptian economy in the range of such other nations as North Korea and Thailand. However, Egyptian national product depends substantially on services/tertiary sector and mining while manufacturing remains as yet a small contributor.

Value added through manufacturing (MVA) at current prices was US $ 8.27 billion (1985). The majority of this is in the basic areas of food, beverages, leather, textiles, etc. with only about a sixth being in the engineering sector.

Number of establishments (over 100 employees) in the manufacturing sector are reported at 3243 (1985) while establishments smaller than this are not fully reported. The manufacturing sector employes 26.2% of the active work force.

TABLE 2 : Domestic Economy (1985-86)

National Product (NP)	37.7	US $ billion
NP per capita	760.0	US $/person
Growth (1980-86)	7.1%	
Agriculture	19.2%	
Services (incl. govt.)	43.3%	
Mining (incl. petroleum)	15.7%	
Manufacturing (incl.utilities) Value Added	21.8%	US $ billion (current)
Income of top 10%	33.2%	
Consumption per capita	810.0	US $/person

(Sources : Ref. Ann.A 1,2,3,5,6)

1.2.2 Infrastructure (Ref. Ann.A 1,2,3,5)

Within the limited developed, cultivated and populated areas, the 31,600 kms. of road (half paved), 5,400 km of rail-track (mostly single), 3500 km of waterways are a relatively fair transport base compared to other developing nations.

International links by sea are substantial in view of the Mediterranean in the North and Gulf of Suez in the East. Three large ports are thoroughfares of considerable shipping traffic in view of the importance of Suez Canal. Air connections at 11 airports can funnel intenational traffic through Cairo which is well connected in all directions.

1.2.3 Communication (Ref. Ann.A 1,2,3,5)

The 8843 post offices (1986) handling 760 million pieces of mail are a major source of information flow along with 10.6 million telegraphs (7% international). About 1.4 million telephones serve 35 persons per telephone and handle 27.3 million international calls yearly. Serving 6081 subscribers, the telex traffic amounts to about 18 million mu meter/year half being international.

Broadcast programs are transmitted from 209 radio and 172 TV stations providing a coverage, to nearly 100% of the population. Radio receiver ownership is about 15 million (i.e. 3.9 persons per receiver) ; And TV ownership is 13 persons per receiver. In this respect Egypt is well ahead of the African average and also of most countries in South Asia.

1.2.4 Trade (Ref. Ann.A 1,2,3,5,7,8)

In 1986 imports (US $ 11.5 billion) far exceeded exports (US $ 2.9 billion) thus leading to an adverse trade balance. Main reason has been over dependence of exports on oil which of recent years has lost its prominent place as export earner.

To service various foreign debts incurred for its development & defence requirements (which stood at US $ 22.8 billion), the debt service ratio amounted in 1986 to 21.3%.

Major elements of import are manufactured goods in the form of Machinery, Equipment, and Miscellaneous Manufactures, Chemical, etc. constituting over 60%. The remaining imports being food related.

A World Bank Study on the Domestic Resource Costs of various items, identified certain products as competitive for exports (without undue subsidy). Topping the list are cotton based yarns, fabrics & clothing while consumer electronic items come at the tail.

UNIDO Industrial Development Review on Egypt 29 May 1986 speaks of : in May 1985 the Government introduced a new strategy which classified imports in to fours catagories : banned goods - those superfluous to the economy's needs : unnecessary goods - subject to tariffs between 250 percent and 400 percent : imports for which local substitutes are available - subject to tariffs between 100 percent and 125 percent : and essential imports for local manufacturing industries - subject to tariffs between 10 percent to 25 percent.

High levels of duty are a protective barrier encurraging poor performance and inefficiency in local manufacturing. What is more, high protection leaves ample margin which can tempt smuggling, under-invoicing and other mal-practices.

1.3 APPROACH TO INDUSTRIAL DEVELOPMENT

1.3.1 Industrial Structure (Ref. Ann.A 1,2)

During the period 1960-1973 the tendency was to rely for many aspects of the economy on the nationalised and public sectors. The vestiges of that policy continue to be visible in the form of about 200 large parastatals accounting in 1985 for 55% of employment and 68% of MVA. These units are mostly in the core industrial sectors, however, electronics is an area where parastatals also dominate.

Promulgation of Investment Law No. 43 of 1974 (for main points see Annex.B) has encouraged private enterprise. Increasing number of private companies are entering medium and small industries. Those employing 50-200 workers number about 700-800 while those employing 10-50 workers a few thousand. Many of these enterprises are of recent origin and have entered newer product areas with relatively modern plant & machinery. In 1981 private investment reached 30% of total.

Inflow of foreign capital is sought to be encouraged by gradual liberalisation of policies. Free Trade Zones are set up

to enable foreign investment aimed at exports to have more freedom of action. Reported foreign investment as of 1985 totalled $ 350 million. Government is keen in increasing the inflow.

1.3.2 Policy Emphasis (Ref. Ann.A 1,2,26)

Earlier tendency of public sector dominance and import substitution at any cost has, since 1974, gone through a transition to a mixed economy and conscious trend towards modernization. Expectation is that these steps will bring Egyptian economy closer to competitiveness and thus curb high local prices as also create a wider base of exports to catch up with rising imports.

Five-year Plans are being cast with increasing dose of liberalization and subsidy-reduction in non-sensitive areas. Some key objectives are :

a) Expanding agricultural inputs
b) Expanding inputs to housing
c) Increasing output of essential goods
d) Encouraging private & foreign investment towards import substitution, export orientation, technological upgradation, higher efficiencies.
e) Utilising indigenous technology developed at Centers of Applied Research.

Foreign investment is regulated through the General Authority for Investment & Free Zones (GAIFZ) with a liberal interpretation of Investment Law No. 43 (Annexure B). Gulf region, USA, Europe investments are flowing in. As of 1986, areas for these investment tended to be in Oil, Banking, and Consumer goods. Further encouragement is being given to projects considered worthwhile by extending the tax holiday, helping in plant location, concessions in labour laws, operating foreign currency accounts, private free zones, etc.

1.3.3 Institutional Framework (Ref. Ann.A 1,2,26)

Overall plans and policies for national economy are the responsibility of Ministry of Planning. In the area of Industrialization, the Ministry of Industry formulates the development and investment programs for private and public sectors. Under this Ministry, the General Organisation for Industrialization (GOFI) reviews specific investment plans of private enterprises and regulates and supervises their implementation.

To some extent, the role of Ministry of Industry in regard to public sector has been diliuted by transferring the subject of essential consumer goods to Ministry of Supply; agro-based industry to Ministry of Agriculture, etc. And of course the public factories primarily aimed at defence needs are under the Ministry of Defence even when they produce civil goods. For

each sub-sector of public sector, since 1983, there are Specialised Public Authorities to go in to details of production and finance of the parastatals to keep investments in tune with national objectives.

Provision of the requisite finance to public and private industries (besides Ministry of Finance) is looked after by National Investment Bank for Public Sector. Four Public Sector Commercial Banks ; Industrial Development Bank for Private Sector and Commercial Banks (local & foreign).

Other organisations concerned with development and industrialization are government Organs for Management & Development, Standards Organisation, Vocational Training Departments, Worker Training Centres.

Science & Technology is institutionalised in the Academy for Scientific Research & Technology, National Centre for Research, Industrial R & D Centres in main sub-sectors (under Ministry of Industry) and the 13 Universities.

Private Sector interest is handled by Federation of Egyptian Industries, General Chamber of Trade, and various Bilateral Chambers such as Egyptian-British, Egyptian-American, etc.

2.0 ROLE OF ELECTRONICS

2.1 Development of Electronics Industry

2.1.1 International Context (Ref. Ann.A 9,10)

The level of development of countries (measured by per capita GNP) & consumption of electronics per capita seem to have a fairly systematic correlation. Figure I demonstrate this relationship. On the one hand, a propserous nation affords the high electronics consumption & in response, the technical advantages of electronics helps enhance prosperity through modernisation, communication, efficiency, employment etc. More importantly, electronics spurs a number of scientific activities which pave the way for further innovation & development.

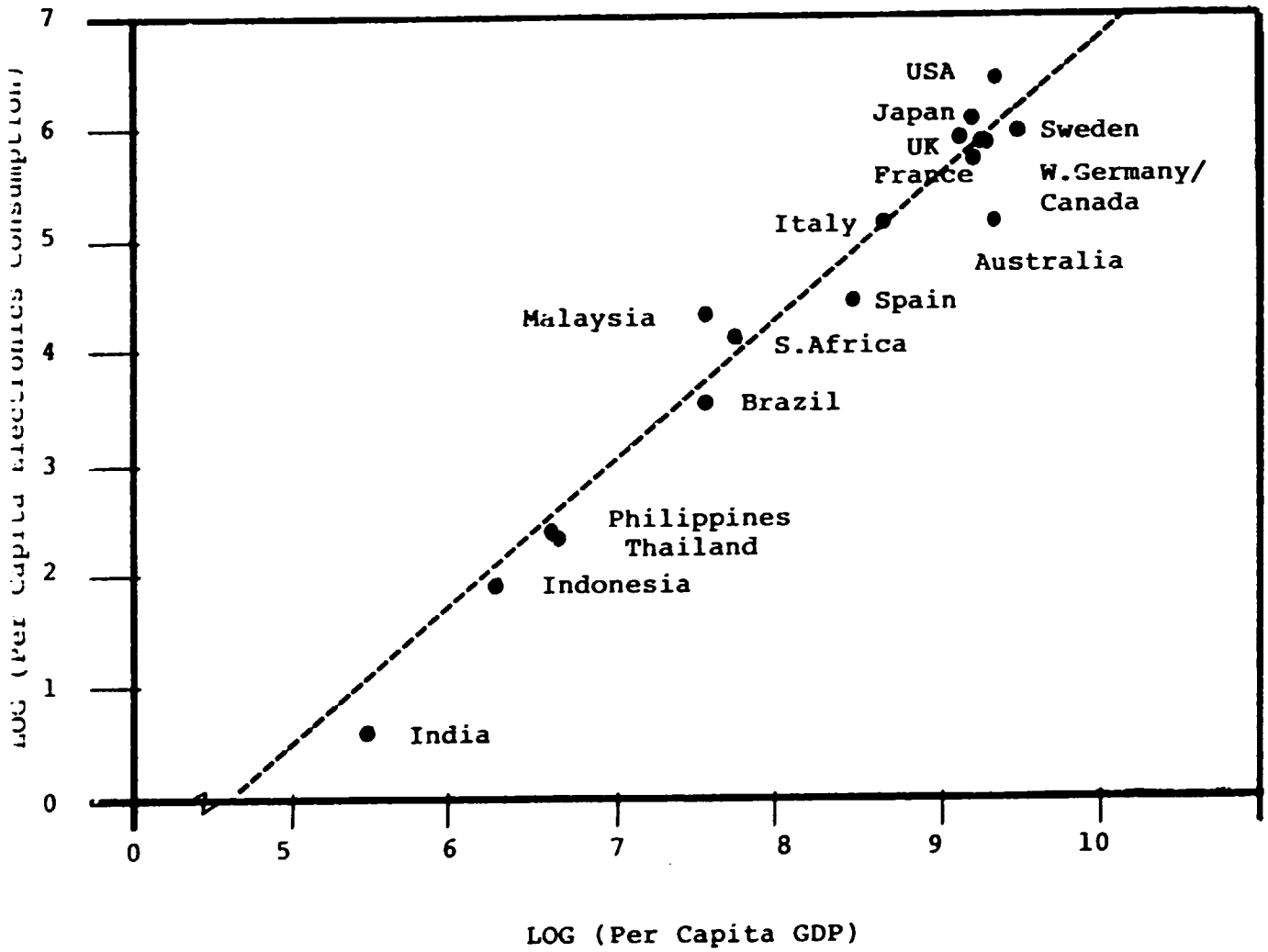
The order of progression along this curve range from recent arrivals (India, Indonesia etc.) at the lower end to the "old hands" (USA, Europe) at the upper end. To have an idea of the magnitude of the gap, out of the 1986 electronics consumption of US$ 388 million (omitting the east block), USA consumed 50.2%; Europe 27.5% Japan 14.2%. By contrast, all the Asiatic countries (except China & Japan) consumed only 4.5% & the rest of the World (except East Block) 3.6%.

The above speaks of enormous ground yet to be covered by a large part of the world which in fact covers about 80% of the population which is yet to benefit from electronics use. In

FIGURE : I

PER CAPITA ELECTRONICS CONSUMPTION vs PER CAPITA GDP

17 Selected Countries, 1983



(Source : Ann. A:9)

terms of production, there is even a more severe gap is in shown in Table 3 :

TABLE 3 : ELECTRONICS PRODUCTION COMPARISION (1983)

(Unit : US$ Billion)

COUNTRY	MVA	ELEX. PROD.	ELEX. AS % MVA	ELEX. AS % WORLD ELEX.
USA	747.31	148.60	19.88	44.3
Japan	488.46	74.13	15.20	22.1
S.Korea	27.48	4.26	15.48	1.3
Malaysia	7.67	0.65	8.51	0.2
Brazil	71.74	4.05	5.65	1.2
Egypt	7.00	0.35	5.00	0.1
Indonesia	12.12	0.50	4.13	0.1
India	34.17	1.32	3.86	0.4
Thailand	9.89	0.16	1.62	Neg.

(Sources : Ann.A 9. Egypt estimated from interviews)

Due perhaps to its generally low level of MVA & local assembly of consumer electronic goods (with wholly imported components), electronics proportion to MVA in Egypt seems higher than if would otherwise.

2.1.2 . Historical (Ref. Ann.A 10,11,12,13,26)

Egypt began its electronics activities with radio broadcast & telephon·/telegraph as far back as 1935. However, progress was slow until around 1960 when Government intervened in a big way to take direct participation in the development of the economy in many areas. As far as electronics is concerned, telecom systems & broadcasting received support for expansion. Active steps to assemble military electronics were initiated at the Benha Factory. These activities were however, based on considerable imported inputs, largely from East Block countries.

With growth of broadcasting, consumer electronics in the form of Radio, then Monochrome TV & later Colour TV became a market of some size and the Benha Factory started to undertake their production with Tesla collaboration. Investments were made not only in the assembly of the sets but also to produce some of the passive components & later valves and transistors. Emphasis was on import substitution and substantial investments were made to this effect.

The Nasr TV Factory in 1961 at Dar EL Salaam began with RCA knowhow to produce monochrome & then Colour TV and also added transreceivers, carrier sets, amplifiers, regulators etc.

Investments were made for large production and also for import substitution of metal and later plastic parts. Monochrome picture tube production was started to increase local added value.

Arab Company for Transistor Radio began in 1966 for producing transistorised radios & later added Television. Emphasis remained on import substitution wherever possible using the items made by other factories.

Philips electrical & electronics factory began as a joint venture (50;50) with Egyptian Government. While it assembled radios & TV, the production of electric lamps was its other important activity.

Meanwhile in telecom a factory to assemble dial telephone sets & also cross bar exchange equipment was set up with Ericsson collaboration at Helwan. Substantial facilities to produce metal & plastic parts as also various coils, relays and transformers were set up along with manual assembly and test lines.

The above production base remained during 60's & 70's but did not modernise to keep up with changing & rising expectations. Electronic industry grew slowly during that period & began to fall behind times. The late 70's & early 80's saw transition to increasingly liberal policy not only in electronics but in other economic sectors. Imports were liberalised & the Government took on an increasing promotional role & Policy veered away from import substitution at any cost to modernisation-through-imports.

With passage of time, changing models & advancement of component technology, all these factories had to move over to assemble sets made with kits imported from Japan (Sanyo,NEC,etc.). The production of traditional electronic components was given up as these components were unable to meet the new requirements.

In Broadcasting, expansion of service was undertaken with further imports of latest equipments. Number of transmitters, channel options & quality of services continued to improve. The position as of end 1988 is shown below :

Radio Transmitters	
Medium Wave (AM)	158
Short Wave (AM)	22
F.M.Stations	29
Television	
Total Stations	169
No. of Channels	3

The Broadcasting Research Centre of the Ministry of Information assists in specification of requirement, replacement & expansion. Installation, operation & maintenance are the main engineering activities handled by the National Broadcast Union.

In telecom, while exchange capacity increased from 170,630 line in 1960 to 405,030 in 1978 (increased of 234,400 in 18 years), in the next 10 years the increase was 1,238,102 lines. Further more, the technology moved on from the electro-mechanical cross bar to electronic (both analog & digital). Hence imports at considerable expenditure Foreign Exchange had to come in. The dial instruments produce at Helwah being limited in number & performance, the import of modern telephone sets has been opened out as also the import of other terminals such as Telex, Fax, EPABX, etc.

2.2 PROMOTIONAL STEPS

2.2.1 Administrative Structure For Electronics (Ref. Ann.A 14,26)

Different segments of electronic indusry are handled through varying channels as follows : -

a. Communication requirements within the Ministry of Transport & Communications.

b Broadcast requirements through Ministry of Information upon request from National Broadcast Union.

c. Defence & security needs are within the folds of the Ministry of Military Production.

d. Civilian parastatals in electronics are guided by the Engineering Industries Organisation which is a body under the Ministry Of Industries.

e. Import and use of electronic apparatus by other industrial sectors are guided by their own organisations -- for example Control Systems needs of processes by the Chemical Industries Organisation.

f. Products & Services proposed by the Private Sector are handled & guided by the General Organisation for Industries (GOFI) which covers investments in all sectors (electronics being only one of them).

It is clear that the administrative structure (except item (f) above) is heavily oriented towards user sectors & by and large dominated by Government Organisation. When combined with the trend towards liberalization,this spells import dependence & a hesitation by private sector to propose manufacturing projects of need further upstream, especially in case of electronics.

Government seems keen at the highest level, however, to ease the path towards greater entrepreneurhip. Instructions have recently been given to process each case within a month & to serve only as a guide to the enterpreneur who has to take his own

risks in setting up projects.

Thereafter, the enterpreneur approaches a bank of his choice for local & as weil as foreign currency requirements. Project location is handled through local "Governorates" if located in muncipal area. However, to disperse industry into less populated areas the Ministry of new Communities offers cheap land, development assistance & 15 years tax holiday (earlier it was 5 years) to get industries to relocate. For small start-ups, (as in electronics) an "Incubator" scheme providing premises with service facilities on low rent is implimented by a special committee in the Ministry of Industry.

The present structure of handling various segements of electronics activities in different ministries, does not permit a co-ordinated handling of this multi-level industry. Policies & decisions taken at one level (say at use level) would have ripple effect on other aspect of electronics such as software facilities, components requirements, technical skills, etc. Further, the different disciplines in electronics are becoming congruent as more & more digitalization & miniaturization takes place. There could be reason to consider endowing a single body to guide the destiny of electronics co-ordinating end use, assembly, components, materials, software, etc.

2.2.2 Trade Policies (Ref. Ann.A 15.26)

Trade policy generally indicated in section 1.2.4 as applied to electronics sector shows some variations worth noting. By and large electronic items are on Open General Licence not requiring individual permission either by a user or a trader.

In the area of Comsumer Electronics a graded policy prevails. End equipment such as CTV, VCR etc. is dutied at 85 - 90%, a level adequate for protection of local assemblers but not high enough to encourage smuggling. For items of more recent origin like VCR, CD, etc. imports of SKD kits are dutied at 20-25% (though not for traditional items like TV). Individual components are in general dutied at 5 - 10% & hence can be freely & cheaply imported.

The same situation, however, does not apply to Professional Electronics systems which are considered as Plant & Machinery and can be imported at a low duty of 5 - 10%. As will be seen later, this is bound to have a deleterious effect on motivation to integrate certain important areas such as Informatics, Control Systems, even Telecommunication Network. With this low duty & liberal import policy, it is all too tempting to resort to foreign supplies of not only the hardware but whole package including System Engineering, Software Programes and even Installation.

There may therefore,be a case for introducing intermediate levels of duty for selected Professional Electronics areas --- for example 40 - 45 % for individual equipments & 60 - 65% for

complete systems. This differential can leave room for local contribution towards systems engineering, testing, programming, installation, upgradition , etc.

Brief picture of regulations sketched above indicates an open approach to trading & a liberal approach to encourage end-use.The limitation is however felt in the area of Foreign Exchange. Foreign Exchange has to be arranged through banks and availability as well as price can vary from time to time depending on other economic & political factors. This introduces an additional uncertainty in predicting the market available to local suppliers.

For those assembling electronic equipments,the avaliability and price of Foreign Exchange to import components, parts, & raw materials greatly influences the operation of the factory. We are informed that during the difficult years (when petroleum exports dipped), even the public sector units for Consumer Electronics faced instabilities in input as well as costing leading to a difficult time in the market.

The general direction of liberal policy can encourage entrepreneurship which is so important to the dynamic field of electronics. What seems needed is a balancing & rationalizing of policy which is discussed in a later section.

2.2.3 Value Added

Policy requires manufacturing projects to ensure that 40% of direct costs constitute value added. Where projects could economically use inputs of locally available materials & consumables such as aluminium, steel, certain plastic material,fuel, etc. this condition could be reasonably fulfilled. However, in case of electronics & some other industries,this has proved difficult to achieve since, in such cases, only limited inputs are locally available. This requirement is recently re-interpreted to mean 40% of total cost. This may enliven more interest in investing in electronics.

2.2.4 Local Taxation

A "consumption tax" of 20% is levied on all non-essential items bought for individual use. Consumer electronics of course falls within this net. However, lower cost items are exempted to bring them within reach of lesser income groups -- Radios, Monochrome TV (all sizes), 14" CTV.

3.0 SPREAD OF USE

3.1 Key Sectors

3.1.1 Communication (Ref. Ann.A 10,16,17)

Instant & distance-unlimited communication of text & speech through telex & telephone has been developing & improving over

many decades. During the last two decades however, the advent of micro-electronics along with perfection of digital signal processing techniques (many originating in the space program) have weaned telecom away from the electro-mechanical stage into totally electronic systems capable of performance unimagined before.

Studies have shown that improving electronic communication reduces the load on other infrastructural facilities --- (Post, Roadways, Railways, Airways etc.) --- with lesser investment, lower running cost, lesser energy consumption & free of pollution effects. Nations which are still developing their infrastructure may need to give much higher priority to the development of telecommunication than they usually do.

A correlation has already been shown in Figure II between per capita GDP & percent ownership of telephones. The progression of various nations along with graph could be a clue to the multiplier effect between good communication & national advacement. Compared to several other developing nations, the growth of telephone service in Egypt, since early eighties has been impressive. Figure III shows the improvements in the network since 1982. A more detailed picture is shown in Annexure C.

An average growth of 15% and an improved "exchange fill" were the result of import of considerable equipment to supplement the limited output of the cross-bar production line at Helwan. Annual imports varied from year to year according to availability of Foreign Exchange and actual installation plans in hand. All the long-distance transmissions and the overseas communication relied on imported equipment and,in recent years, between 100,000 to 150,000 lines of exchange and even telephone instruments had to be imported.

Imports have led to a varied mix of equipment. As of now, cross-bar accounts for 36.6%, electronic analog 46% & electronic digital the rest. Government tendering procedure and recourse to bilateral aid has also led to a variety of brands. Ericsson, Alcatel, NEC, Siemens, GEC, etc.

Meanwhile, the self generating effect of better communications keeps the waiting list ever expanding. While telephone density has nearly tripled in this decade to the level of 3.2 per 100 (1988), the waiting list has increased parallely so that availability of connections is seldom far from 50. Considering that upto 75% of the telephones are non-residential, it is clear that business benefits from and wants improved communication and has yet a long way to go for satisfactory service. Repeted dialing, misconnection, outage, etc are common place --- an indication of aging equipment and maintainance problems.

The dense localization of economic & social activity around the Nile & the relatively even terrain simplify a lot of transmission problems as compared to larger countries with

Figure II The relationship between telephone density and gross domestic product, 1978.

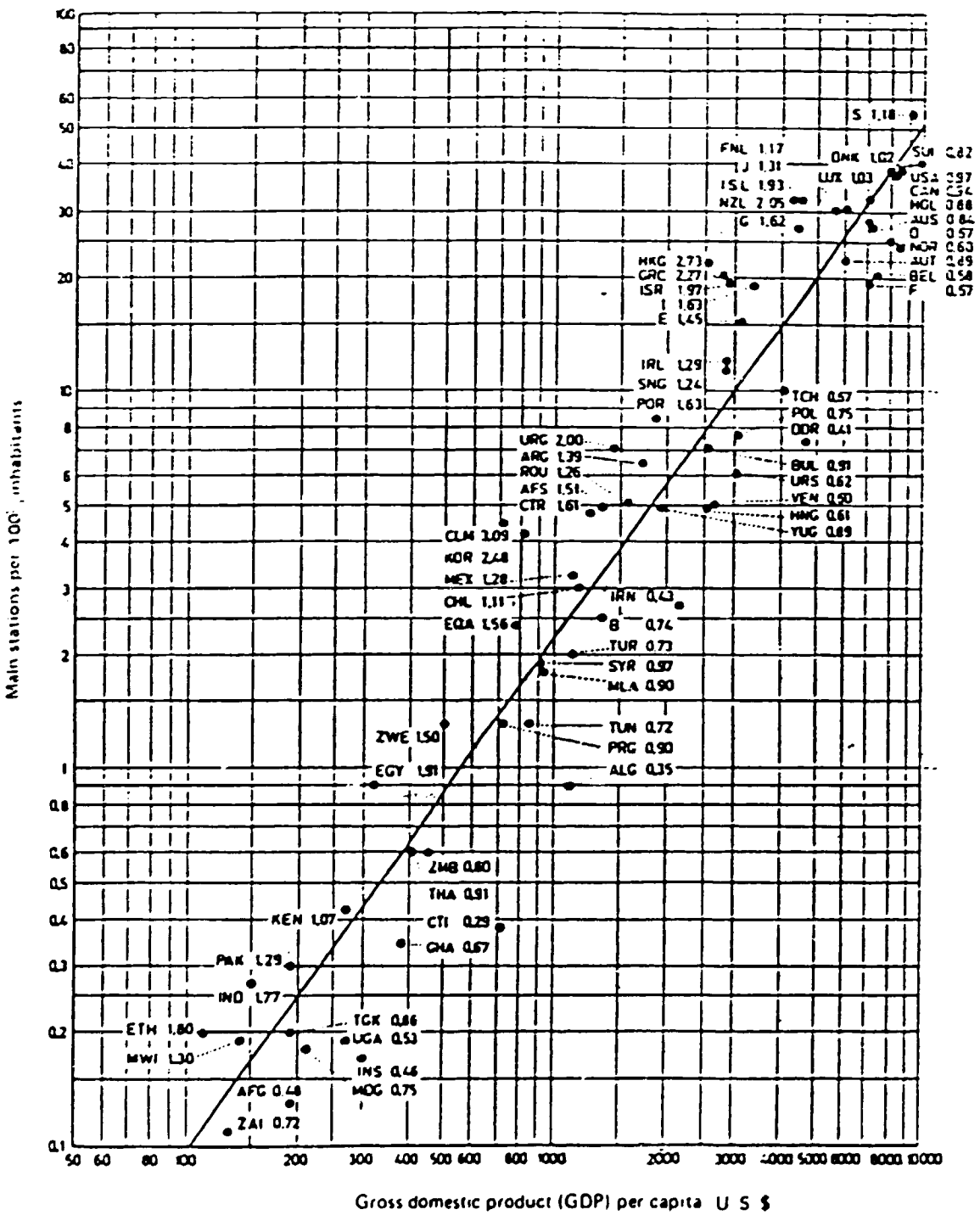


Figure II Contd.. Names of countries or geographical areas corresponding to the abbreviations used

AFG	Afghanistan	ISR	Israel
AFS	South Africa	J	Japan
ALG	Algeria	JMC	Jamaica
ARG	Argentina	KEN	Kenya
AUS	Australia	KOR	Republic of Korea
AUT	Austria	KWT	Kuwait
B	Brazil	LBY	Libyan Arab Jamahiriya
BEL	Belgium	LUX	Luxembourg
BRM	Burma	MDG	Madagascar
BUL	Bulgaria	MEX	Mexico
CAN	Canada	MLA	Malaysia
CHL	Chile	MLT	Malta
CLM	Colombia	MWI	Malawi
CTI	Ivory Coast	NOR	Norway
CTR	Costa Rica	NZL	New Zealand
CYP	Cyprus	PAK	Pakistan
D	Germany (Federal Republic of)	PHL	Philippines
DDR	German Democratic Republic	POL	Poland
DNK	Denmark	POR	Portugal
E	Spain	PRG	Paraguay
EGY	Egypt	ROU	Romania
EQA	Ecuador	S	Sweden
ETH	Ethiopia	SNG	Singapore
F	France	SUI	Switzerland
FJI	Fiji	SYR	Syria
FNL	Finland	TCH	Czechoslovakia
G	United Kingdom	TGK	United Republic of Tanzania
GHA	Ghana	THA	Thailand
GRC	Greece	TUN	Tunisia
HKG	Hongkong	TUR	Turkey
HNG	Hungary	UGA	Uganda
HOL	Netherlands	URG	Uruguay
HVO	Burkina Faso	URS	USSR
I	Italy	USA	United States
IND	India	VEN	Venezuela
INS	Indonesia	YUG	Yugoslavia
IRL	Ireland	ZAI	Zaire
IRN	Iran	ZMB	Zambia
IRQ	Iraq	ZWE	Zimbabwe
ISL	Iceland		

FIGURE III : TELECOM PROGRESS FROM 1982 TO 1988

	30/6/82	30/6/88
1. Total Telephone Capacity	540,000	1,550,000
2. No. Of Exchanges Automatic & Semi-Auto.	154	375
3. No. Of Cities connected to Automatic National Trunk	15	125
4. No. Of Telephone Coin Boxes	300	1,600
5. Total Telex Capacity	3,520	9,340
6. Long Distance Network (Channels)	8,880	24,360
7. Total International Circuits (Submarine Cable - Satellite - Micro Wave - troposcatter)	1,030	4,660
8. Automatic International Exchange Circuits	800	3,680
9. No. Of Countries connected with Egypt	4	65
10. No. Of Countries which are communicated with Egypt.	25	163
11. Total Capacity of Mobile Telephone System	400	3,100
12. No. Of Satellite earth stations.	1	3

(Source : Mimeo Ann. A 13)

hostile terrian like Indonesia, India, Nigeria, etc. Co-ax & microwave provide 25,000 channels each (1988). Overseas traffic is readily handled through submarine cable as well as satellite. Egypt can communicate with 169 countries but incoming call suffer from "the last mile problem".

Egypt has not yet taken to computers in big way (see next section) & hence data communication problems & issues have not yet been faced. However, the country must prepare the internal competece to face these issues in near future. Informatics or the congruent use of Telecommunication & Data Processing to enhance efficiencies in all sectors of the economy, will need corresponding improvements in the tele-communication network if it is to be used to maximal benefit.

A study by A.D. Little (refered to by John Besant in his p_per UNIDO/IS 438) indicates a world telecom (1987) equipments market of over US$ 65 Billion. The biggest part of this at 42% is the fast changing North Amercian use; Asia with its newly industralised giants & populous emerging nations form 28%; European community requires 25% & the rest all put together only 5%. However, these new markets are expected to increase their spending on telecom equipments at 8% each year & the tempo of growth will accelerate as these lesser developed countries modernise.

3.1.2 Professional Electronics (Ref. Ann.A 18,19,20)

Under this term we cover the variety of electronic apparatus & applications which serve other economic sectors such as business, industry, transport etc. This term exclude certain specific areas such as Defence, Telecom & Consumer which are large enough in their own right.

Many of these applications involve the sensing of the concerned industrial & business parameters, registering & tracking them, processing & manipulating them & adjusting the application to maximise the performance as desired by the operator. Use of the digital techniques has greatly enhanced the power of these application & also made them amenable to exquisite miniaturisation into relatively standardlised but programmable microcircuits.

Increasing power & reliability of these circuits is acompanied by reduction in cost & size so that they can be used in the support of minor applications (say a rice cooker) or in increasing combination to small control systems, to personal small computers or super systems for nuclear plant control. No area of application is immune from their beneficial use.

The important point to note , is their appliciability in even the simpler needs of a developing economy through microprocessor based circuitry. Such specific needs are different in different countries & those imported from advanced economies may be less than optimal. Local development & implementation using standard and cheap IC's is less difficult than is usually immagined.

Manufacturing sectors of importance in Egypt which could benefit from wider use of professional electronics are ;

	% MVA (1986)
Food & Beverages	39.5
Textile & Leather	26.5 (Cotton based products Exportable)
Chemicals & paper	18.4 (Especially Petrochemical)
Engineering Goods	15.5
Power & Energy	25.0 Million KWH

Partly due to the age of most of these plants, partly due to employment-complusion & partly due to fear of over-sophistication, electronic controls are not common in Egypt. These hesitations have to be overcome and new & updated plants with systems for quality, productivity, pollution control, harzard-protection, need to be mandated. New installations in the chemicals field are now required to include such monitoring & control systems while erecting the plants. However, smaller units in the private sector may find it difficult to avail of implement the benefits of electronic controls even of the simpler

type since many of them opsrate of on manual basis.

Wherever used, the control systems (and accompaning software) are imported, often as part of a total package. Since the main interest of the user is in the plant & its performance, the absorption of control technology is limited to operation & maintenance. With increasing sophication & software content of such controls abroad, there is a real possibility of the user over-spending when a simpler locally prepared system would do a better job.

Upto 1983, Egypt had 78 mini and large computers. Of recent years, the ubiquitous Personal Computer (PC) has, thanks to world wide acclaim, also made an entry into the more organised sectors of business & industry. It is estimated that about 10,000 computers were imported in 1988 ; of which about 200 were of the mini & higher capability. The population of computers in 1988 is pegged at about 40,000 & knowlegable observers except 100,000 will be installed by 1992.

However, use of these computers presently emphasises simpler commercial and record-keeping tasks of which word processing is the most popular. Availability of these computers at a low duty (5% - 10%) is creating the need for associated local services --- installation, programming, training, maintenance etc. In some cases these services are offered by the Branches/Agents of the foreign computer suppliers. It has however, become an attractive business for small techno-crats who can provide these services more economically & also tailored to local needs.

. Keeping of social, economic & industrial records in various government departments is an important element in governance. Manual record keeping tends to be lax, dispersed, delayed and uncoordinated. Large services such as Railways, Irrigation, Power, etc. that cover large areas & population need to enhance operational efficiencіy through use of computers. Clearly there can be enormous scope for computerization & modernization which will lead to efficient & improved management of the economy in all its sectors.

3.1.3 Consumer Electronics (Ref. Ann.A 5.26)

National Broadcasting Union, under the Ministry of Broadcasting operates the entire network (described earlier in Sec. 2.2.1.) which spreads numerous programs to nearly 100% of the population of Egypt and , in addition, to other countries, in various languages. The television network is also able to reach all the population as it is linked through microwave all along the populated areas. The variety & range of programms is impressive & covers diverse subjects. Another singular advantage is the common Arabic language which makes the task of communication easier.

As of 1985, ownership reached 256 radios per 1000 and 82 TV's per thousand. Based on UNESCO statistics, the growth of ownership had been stagnant during the 70's but has sharply risen

in the 80's --- resulting, undoubtedly, from the increase in transmetters, emission power, broadcast hours and improvements in programming as Egypt broadcasting facilties expanded and modernise.

Other media such as audio & video recorders generally accompany radio and TV among the range of entertainment apparatus. The technology involved in radio, TV, recorders etc. is not excessively sophisticated in its basic sense & is readily available at low cost from many sources. This large volume of business and ease of absorbing technology makes consumer apparatus an easy point of entry into electronics for developing countries.

In the meanwhile, Television Receive Only (TVRO) transmissions in one proliferating in Europe. It appears that North Africa can fall within the secondary footprint of emissions aimed at Southern Europe. Activity to exploit this opportunity seems to have begun at Nasr Television. Undoubtedly this can become a substantial new use of consumer electronics for Urban upper class families and groups and co-operatives.

3.2 TECHNOLOGY STATUS

3.2.1 In Communication Field (Ref. Ann.A 5,13,20)

The telecom network has been developed over nearly 30 years, it is inevitable that it would contain succeeding generations of technology. The oldest generation in Egypt is the combination of dial telephone, low-count coax and crossbar switch. All this is locally manufactured for several years and, being electro-mechanical, is substantially local in content. Today's network is about 35% comprised of such earlier technology equipment.

Analog Electronic Exchangs along with higher count coax and Analog Microwave Links have been imported in substantial quantity in intervening years and today constitute about 45% of the network. This is however a transitional technology and is being overtake by digital. Already, certain heavily-loaded areas are installed with imported digital equipments and this has helped ease the peak overload in dense Urban locations. About 20% of the network can be considered digitalised.

Despite steps to modernise an expand, expressed demand (2.38 million) is well in excess of installed telephones (1.3 million). As a result, the quality of service leaves something to be desired --- especially in distant locations where older equipment remains. Telecom equipment requirements will continue to grow rapidly and will call for continued substantial investments in future.

3.2.2 In Professional Electronics

Mastery of technology for professional electronics (including microprocessors and computers) is conditioned by a

number of new factors as compared to mastery of telecom:

a. Telecom is a unified field handled in its entirity by a single user... the Telecommunications Authority. By contrast, Professional Electronics has a large number of disparate users. In fact the list of users is unlimited... it could be a poultry farm controlling the chicken-feed to a fertiliser plant controlling various chemical inputs.

b. Telecom Authority as end user is also knowledgeable in electronics and informatics. By contrast, the user of professional electronics is involved in his own field (say, chemicals) and treats electronics as a tool.

c. For professional electronics an intermediary expert is needed between the user and the supplier of the equipment to define the system, prepare the software, debug and prove the working, maintain the system etc.

Industrial, business and governmental users have made a beginning in the use of professional and informatic items. Supply of systems from abroad enables the buyer to purchase the latest technology. However, this needs to be supplemented by local expertise to tailor the system (especially the software) to local needs. Though there is some activity (aimed at commercial uses)in the form of a few qualified professionals and some of the better representatives of well known suppliers, there remains considerable gap to be covered as far as absorption of information technology is concerned.

Numerous problems can be identified, in areas which could do with improvement and modernization... from agriculture to dairying to food-processing to textiles and so on and on. Tackling them is not forbiddingly difficult. The cost of imported (and now increasingly standardized) hardware and components is but a small part of the total system's worth. As much as half of a system cost is generally added in terms of conceptualising, engineering, "softwaring" and testing the system. At local rates, this cost element can be reduced and locally contributed, if information technology is fostered and encouraged.

3.2.3 In Consumer Use

Consumer apparatus are of course designed to be used by all and sundry; even the latest developments (like CD) are simplified for the users's convenience. The need for understanding the technology comes at the servicing level --- especially in remote areas. It would seem that upto the level of TV, the servicing knowledge has been widely dispersed by now and problems would be minimal.

As new devices (such as VCR, CD, TVRO etc.) are introduced by way of imports, their field service will face

problems. Due to hostile environment and careless use there is substantial wear and tear so that repair and re-adjustment are frequently needed. Due to import depedence the problem is amplified :

a. Spare parts would be scarce and expensive.
b. Knowledge of internals of the device even at factory would be limited.
c. Training of service centres non-existent.

It is likely that government may initially discourage the inflow of such apparatus. However, there is no denying that, wide spread use of such apparatus assist in creating a higher technological platform leading to increased competence in electronics as a whole.

3.2:4 Overall View

A great deal of usage of electronics in Egypt is dependent on imported equipment. Where local assembly is carried out, it is by way of imported kits. This is likely to continue since imports at low customs duty are possible. The following disadvantages of such a situation should be kept in mind :

a. Imported equipment is available from many sources in many countries. Different brands will proliferate in use. Serious thinking on limiting to a few brands would be advisable while at the same time allowing some element of competition.

b. Internationally, designs and features of equipment keep improving rapidly as their technology advances. The temptation will thus be for users to keep acquiring newer and better models even before enough advantage is gained from previous designs.

c. Differences among suppliers will often be in the software --- especially for professional equipment. The software is not so easily "transportable" between systems and the user may thus be "locked in" with one supplier.

It is true that in cases like Egypt, where the usage of advanced Professional Electronics is still developing, such problems as above are bound to occur. It is suggested for consideration that :-

a. Imports should be selective and standardised even if it means tolerating a previous generation of equipment for a while.

b. Importers willing to develop the corresponding system engineering and software LOCALLY (with agents, representatives, or partner firms) could be given preference.

c. A phased program of increasing local value should be worked out with such parties.

3.3 ADDING VALUE AT USE LEVEL THROUGH SOFTWARE

3.3.1 Opportunity Created By Digitalization (Ref.Ann.A 20,21,22)

The movement of Electronic Apparatus from analog to digital has shifted the cost emphsis from hardware to software. While the digital hardware is of lower cost than analog (often with better performance in the same use), digital technology brings about the need for system analysis, programming, debugging, etc. For earlier versions of analog apparatus, this was at a much lower level.

This provides an opportunity for value to be contributed in the recepient country even when the hardware is imported. Some of the indicators of advantages are :

a. In many cases, the hardware is reasonably standard and low cost --- for example, well known Personal Computers, well established "add-on" cards, certain mass-produced chips, etc.

b. Depending on the complexity of the application, these can be put together in various innovative ways without having to go to the step of manufacturing.

c. There is quite a large complement of system engineering, custom programming, etc. to be done based on user need.

d. To do all this does not call for a forbiddingly large set up. The main component being "brainpower".

e. So called readymade solutions through import may be less than optimal for local needs.

f. Cost of imported software is high and rising fast.

3.3.2 Developing Software Need (Ref. Ann.A 21,23)

A UNIDO country brief : "Regenerating African Industry" says "considerable inefficiencies are found in the manufacturing sector" and calls for "physical rehabilitation of obsolete plants & equipment". Observations even in highly developed industrial areas of Cairo leave the clear impression of the need for upgradation of plant as well as methods of working which can make enormous improvements in efficiency, productivity, waste-reduction, quality improvement, etc.

The government has recognised this in many ways. It is already pressing public sector units to ensure in new expansions

that up-to-date monitoring and control systems are included. It is making the import of such systems easy and at low duty.

Not only large PSU plants but also the more competent of the smaller private units in Food & Bevarage, Textiles, Engineering, will need to improve. In the urban service sector, where introduction of office electronics is easier, thousands of computer systems along with software (see Section 3.1.2) are flowing in.

A UNIDO paper "Informatics for Industrial Development" rightly pointed out the urgent need to establish an informatics base in developing countries in important sectors and at the national level (social data, industrial data, economic analysis, irrigation controls,railway wagons handling, and so on) There may be no option but to move towards modernization. In today's context, manual handling of such information is too little too late (often 2 to 3 years behind), is error prone, and makes analysis laborious. With increasing tempo of development such slow and unprecise methods are unable to keep up with the load and become major impediments to advancement.

3.3.3 Possible Approaches

An approach to achieve added value could be "system house" concept where consulting groups (or representatives of foreign suppliers) are able to locally add the "brainware" value to imported systems. The motivating factor could be the sale of hardware and source codes from which the local system is developed and supplied. The motivation could be further emphasised by raising import duty on the application software component and on site installation, testing and debugging.

Large public sector plants in other industries (not electronics) may need to insist on the plant supplier to perform maximum of the downstream activities (system integration, software, installation, debugging) in local currency. This could be one of the factors in evaluation of tenders for large plants.

In case of informatics requirements of the government itself (telecom,socio-economic database, railways, etc.) the more difficult option of building up internal expert team or missions may have to be taken. The requirements would be continous and substantial; the savings in foreign exchange and real costs could be impressive; building up of internal expertise would lead to long term benefits.

We understand that there is a special Organisation for Informatics just being set up in the government. UNIDO/IS415 of 25 NOV 83 has useful suggestions which are reproduced in Annexure D.

3.3.4 Manpower (Ref. Ann.A 1,2,3,4)

Clearly, the undertaking of the above approach will call for rather special manpower requirements. An important

aspect to understand is that such systems are meant for serving other industries and businesses. To develop a system for chemicals, reasonable understanding of the concerned process will be involved; for mechanical shops, of machining steps; for businessses, the managerial procedure; for setting up of electronic hardware; the circuit engineering. Hence, depending on the market that is to be served, an appropriate mix of manpower will be needed.

Egyptian Universities put out about 5000 technical graduates each year (a figure which has surprisingly declined in the past few years). A begining needs to be made in offering practical computer software training which is wide enough to provide computer-competence to all types of engineers & business graduates. For practicing young engineers, evening courses over a spread period would have to be organised.

In India, for example, there are part and full time courses available from government supported Universities, private colleges, and even small training classes by individual entrepreneurs. While this results in varying quality of training, the large volume of output yields the base from which competent systems people are emerging to undertake a variety of software activites from operator level to rather competent analysts. Actual field experience in systems houses would round off the practical aspects.

4.0 MANUFACTURING PROSPECTS

4.1 Market Size

4.1.1 Consumer Apparatus (Ref. Ann.A 5,11)

Trend of ownership of radios & TV is shown in Figure IV. In all countries where basic needs of a household are taken care of, the desire to own entertainment apparatus finds a high place in the order of priority. This need is fanned by heavy advertising as well as by continuous innovation of products. This can lead to markets of substantial size. By 1995, urban households (typically 4 members) may well average 2 radios and 1 TV while rural households (typically 6 members) average half that ownership.

Keeping in mind the growing urbanization and rising population, a crude analysis shows that in the decade between 1985 & 1995, 7 million radios and 5.75 million TV could well be added to the 1985 ownership of 12 million radios and 3.75 million TV. Thus over the decade 1985 to 1995 the average annual consumption of 700,000 radios and 575,000 TV would take place. To this must be added the replenishment of discarded radios and BW TV which become obsolete for defective or out-of-fashion.

It is important to understand that the above will be the need of the market to consume. If legislation or tariff or other restrictions prevent this from being supplied locally, smuggling

FIGURE IV

TREND OF OWNERSHIP OF RADIO AND TELEVISION IN EGYPT

YEAR	RADIO		TELEVISION	
	NO OF SETS IN USE (000 NOS.)	NO OF SETS PER 1000 PERSONS	NO OF SETS IN USE (000 NOS.)	NO OF SETS PER 1000 PERSONS
1971	4,500	132	584	17
1973	5,100	143	600	17
1975	5,120	138	620	17
1977	5,275	136	1,000	26
1979	5,400	132	1,300	32
1981	6,500	150	1,750	40
1983	8,000	174	2,000	44
1985	12,000	256	3,860	82

(Source : Ann.A 3)

and fraud will speedily move in to fulfil it (at higher cost to the nation). At normal international prices, the 10 year outflow of foreign exchange would be in range of US $ 2500 million if normally imported. If brought in by smugglers, the flight of money could be more than twice that.

Additionally, there are other types of consumer apparatus (Cassette recorders, VCR, CD, TVRO, etc.) which constitute additional demand in the upper stratae of society. These are generally costly items and can also lead to considerable outflow of foreign exchange.

It seems evident then that strategy has to be worked out to prevent this market from going to the hands of smugglers and to enable increasing local value to be added through manufacturing activity.

4.1.2 Professional Electronics (Ref. Ann.A 11,13)

A major professional market emerges from the rapid growth of Telecom. With a typical growth of 200,000 lines per year, this sector represents growing markets in two main directions :

a. Subscriber-end equipments --- telephone sets, extension phones, intercoms, small private exchanges, computer interfaces for communication (modems), telex/fax attachments to computer, eventually FAX machines.

b. Accessories needed for the main telephone network --- multiplexing and channelling equipments, transmission equipment, like Power Line Carrier, Radio Communication Links, Satellite Links, etc., uninterruptible power panels, Repeaters, Cables & Cableware, LANs, Base Band Equipments, Protection Equipments, etc.

Separately, there is a wide range of lower technology commercial products based on microprocessors (so closely allied to computers) --- cash registers; taxi meters; weighing scales (for shops & homes); alarm systems; standard programmable controllers, etc. aimed at smaller applications but larger quantities.

An enormous market is one for standardised and compatible personal computers which can be used in many flexible ways to help small & large industry, commercial firms, education, etc. Substantial software market is automatically created as computer awareness, familiarity and use spreads. Like the CTV is for this generation, the computer will be addictive for the next generation.

Clearly, the professional market is wide in scope but with an underlying connection to microprocessor and memory

applications forming the basic competence which every developing country must eventually acquire on its way to modernity.

The end use (consumption) of professional electronics equipment (i.e. non-consumer) is in a way a measure of advancement of the electronics sector of a country. The 1986 market data for selected countries is instructive.

	1986 Prof.Elx.Eqpt/ All Elx.Eqpt.
Industrialised Countries	86.23%
ASEAN Countries (w/o Singapore)	74.17%
Brazil	70.35%
India	60.69%
Egypt (estimated between Brazil & India)	66.66%

Thus consumption of professional electronics equipment would come to twice the consumption of consumer electronics equipment (US $ 2500 in para 3, section 4.1.1) or US $ 5000 making a total value for electronics as $ 7500 at international prices over 1985-1995,

4.2 MANUFACTURE OF EQUIPMENT

4.2.1 Assembly

Facilities exists in Egyptian parastatals for assembly of electronics equipment. In case of consumer electronics capacity is very substantial and is presently utilised below 20%. The estimated output of local industry in recent years is :

	(000 Nos.) 1984	1986	1988
Radio / Cassettes (incl. small scale)	600	550	500
BW TV (incl.small scale)	225	175	135
CTV (mainly parastatals)	590	490	400
VCR (SKD only)	60	90	150
Dial Telephones	70	70	70
Cross-bar lines	30	30	30

There is a certain amount of assembly of radios and small consumer apparatus by small private industry. The major constraints to higher production appears to be :

a. Users are able to import their needs. Duty is low in case of non consumer apparatus.

b. Local producers are tied to specific foregin brands and designs (ie. kit purchase). Cost of purchase is artificially high.

c. Despite announcement of liberal import policy, there are delays and limitations to the import of components.

d. Adverse and fluctuating foreign exchange rate.

e. Lax discipline and pressure on worker efficiency.

f. Low volume of output raises all elements of costs.

g. Higher pricing has suppressed legitimate markets and encourragad clandestine supply.

The antidote to the above constraints lies in finding all possible ways to bring down consumer price to revive offtake and raise volumes.

4.2.2 Attempts at Manufacturing

In the telecom factory and in consumer parastatals capacity also exists to produce mechanical and electro-mechanical parts (including plating, hot foil stamping, etc.). In fact, each factory has very substantial equipment for stamping, pressing, moulding,finishing, etc. Further, the specific tools and moulds for each model have been imported at considerable cost.

These are large investments and once again volume determines the cost of the parts produced. There is a clear need to raise offtake to ensure utilization of these large investments.

4.2.3 Product Re-engineering

To make optimum use of these capacities, local engineering efforts will be required to commonise and minimise variety. A product engineering team (common to parastatals and jointly supported by them) should revive all the models in hand with the view to standardise the stying, internal structure and components as much as possible. This would also encourrage local design capability and decision making. With increasing common and re-design, the units would be liberated from procuring components in kit form from particular foreign set makers. Aggressive and volume purchase of components (preferrably with cooperation among parastatals) should substantially lower the outflow of foreign exchange. It is only by such effective cooperation that the nexus of volume and cost can be broken.

4.3 Component Strategy

4.3.1 Consumption Picture (Ref. Ann.A 24)

The problem of components production has been under active consideration in Egypt for sometime and omnibus study (not shown to us) was completed a while ago (with German assistance) which is being reviewed but considered to optimistic. And internal paper on consumption of components provides useful informatiion on components usage in recent years. A summary is drawn in Figure V.

FIGURE V : ESTIMATED REQUIREMENTS OF SELECTED COMPONENTS

	UNIT	1980	1986	1987	1988	1989	1990	EST 1995	EST 2000
1. Electro-mechanical	'000	7,570	9,654	12,339	16,184	21,070	23,108		
2. Condensors	'000	151,450	154,858	170,774	192,726	204,238	223,770		
3. Resistors	'000	212,250	207,087	206,114	207,976	211,728	203,600		
4. Discrete Semicon.	'000	66,405	70,259	82,945	94,408	110,511	110,924		
5. Integrated Circuits	'000	10,255	10,846	12,037	17,350	20,467	19,974		
Import Value	Mio DM.	209	220	254	306	358	372	596	980

NOTES : 1. Source : Internal paper by Mr. Ashraf Hamdy, Chairman Nasr TV.

2. Each catagory includes a variety of types & ratings.

3. Estimates are based on major applications of which the most important are : Colour TV : Telecom Switching : VCR : Electrical Household Appliances.

4. Professional apparatus is not expected in large quantum.

This represents the needs of components in the second half of the 80's when, as covered earlier the output in physical terms was dropping.

4.3.2 Selecting Components for Manufacture

In Figure VI a normative approach is taken for the 90's to see what is needed for a target (admittedly optimistic) product mix of 1995.

Components can be considered in groups according to their technology/plant intensiveness and according to manpower contribution :-

a. Components that cannot be made of required quality and cost without high investment in technology/plant. In this group we put IC's, Picture Tubes, Connectors, Small Signal Transistors, Diodes.

b. Components that can be managed in quality & cost with medium investment provided the process is not integrated too far upstream --- medium power semiconductors assembled from chip stage, Elcaps from pre-etched foil.

c. Components whose automated plants are of medium investment --- Cercaps, CFR/MFR, FBT,Potentiometers, etc.

d. Components which can be made of adequate quality & cost using modest level of semi-automation --- PCB, Audio Cassettes, Cabinets, Plastic Capacitors, DY, Coils, Wire Wound Resistors, Loudspeakers, etc.

The objective should be to make those components which have best prospects of being competitive with landed cost of imports. It would be appropriate to consider investing in the order (d), (c), (b), and for the moment not consider (a) at all.

Production of Cabinets has existed for quite some time and the facilities should be pushed to the full by <u>standardising cabinets</u> where possible (with styling difference taking place in the finishing process).

Given these guiding principles, the choice of specific families and types of components should on economic considerations as well as national objectives. Some adjustment to policies (as discussed in next section) will create a self regulating and balanced situation for decision making by private as well as public bodies.

FIGURE VI : NORMATIVE REQUIREMENT OF COMPONENTS 1995

	AM/FM Radios 1000K	Mono Taperec 300K	14' BWTV 250K	20" CTV 500K	VCR 250K	MAIN EXCH 200K	EPABX LINES 40K	TEL INST 350K	PCXT 30K	TOTALS	UNIT
PCB (Sq.M)	15	3	23	50	22	20	3	1	7	147	000 Sq.Mtr.
Loudspeakers	1000	375	250	750	-	-	-	-	-	2375	000 Nos.
Coils .	3000	600	7500	17500	8750	600	80	-	-	90	000 Nos.
DY & FBT	-	-	250	500	-	-	-	-	30	780	000 Sets
El.Caps.	5000	3900	7250	21500	28750	1000	20	350	210	67980	000 NOs.
Cer.Caps.	10000	2400	12500	20000	46250	2000	280	1750	1200	96380	000 Nos.
Plas.Caps.	8000	4500	5500	1000	10000	600	80	-	150	38830	000 Nos.
W/W.Resistor	-	-	500	1000	1250	1000	2	-	60	3812	000 Nos.
CFR/MFR	25000	11100	27500	85000	75000	8000	1200	1750	4200	238750	000 Nos.
SSD	5000	2100	10500	22500	44250	3000	720	1050	1500	90620	000 Nos.
MSD	2000	1200	2500	6000	5000	1400	160	-	1500	19760	000 Nos.
IC's	1000	300	750	2500	5750	5000	560	350	3000	19210	000 Nos.
Pic.Tubes	-	-	250	500	-	-	-	-	30	780	000 Nos.
Plas.Cabinets	1000	300	250	375	-	-	-	350	30	2305	000 Nos.

Looking to the list in Figure VI, and keeping in mind appropriate scale, and illustrative of choices is as below :

TABLE 4 : SELECTING COMPONENTS TO MANUFACTURE

Sr. No.	Item	Unit	1995 Demand	Appropriate Scale	No.of Units	Notes
1.	PCB	000 Sq.Mtr.	147	20,000 Sq.Mtr.	7-8	
2.	Loudspeaker	Mill.No.	2.37	1 Mill.No.	2-3	2
3.	Coils	Mill.No.	38.12	10 Mill.No.	3-4	
4.	DY & FBT	000 Sets	780	0.5 Mill.No.	1-2	
5.	AL Caps.	Mill.No.	67.98	25 Mill.No.	2-3	3
6.	Cer.Caps.	Mill.No.	96.38	50 Mill.No.	1-2	
7.	Plas.Caps.	Mill.No.	38.83	20 Mill.No.	1-2	
8.	W/W Resistors	Mill.No.	3.81	1 Mill.No.	3-4	
9.	CFR / MFR	Mill.No.	238.75	100 Mill.No.	2-3	
10.	SSD	Mill.No.	90.62	}		
11.	MSD	Mill.NO.	19.76	} 50 Mill.No.	2-3	4
12.	IC's	Mill.No.	19.21	}		
13.	Pic.Tubes	Mill.No.	0.78	0.5 Mill.No.	1-2	5
14.	Plas.Cabnites	Mill.No.	2.31	0.5 Mill.No.	4-5	

NOTES : 1. Appropriate scales are based on the analysis of scale and cost benefits for Indian Elex.Industy.

2. Assembly of Loudspeakers only.

3. Assembly of AL Caps. from formed Aluminium Foils and other parts.

4. Only assembly of semi. devices is recommended.

5. Colour picture tube assembly only.

6. Source (Ann.A 25)

4.4 GOVERNMENT ROLE

4.4.1 Rationalising Protection

To create a motivational pressure towards indeginization and import substitution, a declining scale of protective duties is advisable. The earlier trend to open out imports of all items not made locally (at low duties) gives the wrong signals to investors who will then be satisfied to remain at trading level as much as possible. A scale such as the indicative one in Table 5 along with other policy steps should change the direction of thinking :

TABLE 5 : INDICATIVE GRADED PROTECTIVE DUTIES

Consumer apparatus & accessories	85-90%
Packaged electronic systems (hardware & software)	60-65%
Unbundled hardware equipments	40-45%
SKD kits of Professional Equipments	30-35%
Electronic & Electrical Components; application Software	20-25%
Preprocessed materials & parts	10-15%
Special electronic materials & parts	5-10%
Software source codes (not application programs)	0-5%

With this kind of graduated scale of duties (but no physical protection), decisions for import substitutional projects will be possible on economic basis and private as well as public investors will guide their steps automatically.

4.4.2 Licensing

Electronics industry is multidisciplinary and thrives on a mix of strengths. Given a rational and stable policy structure, each investor, with his own mix of strengths, should be able to find his profitable place from the wide range that electronics offers.

As such, artificial restrictions based on private and public; small or large size; reservations of certain items; and so on need be kept at a minimum so that the essential element of competition and risk taking is maintained.

Locational choices should be guided mainly by incentives (such as benefits for locating in new territories). Of course, considerations of pollution, excessive overcrowding, climatic conditions will have their role to play. The investor must make his own trade-offs to optimise his competitive position..

Licensing of foreign technology through well balanced agreements is an important role which government can play. While

the door must be kept wide open for the investor to make proper choice. a basic set of guidelines are needed from government to ensure adherence to main national objectives. Completeness of technology, obligation to prove its workability, reasonable range technical fees, absence of unreasonable restrictions, etc. are the areas where government can establish yardsticks to measure by.

4.4.3 Institutional Suggestions

As Egypt needs to go deeper into electronic industry, there will be a variety of considerations to be taken into account for setting policies and guidelines and seeing that they are implemented or adjusted as needs arise. These considerations will be substantially lifferent than what applies in more traditional industtries. At present (see Section 2.2.1) six different bodies, mostly user departments (Communications, Broadcast, Defence, etc.) are working in their own directions (which are use oriented).

We feel there could be a body looking at the whole picture of electronics in a co-ordinated way. Interests of user or manufacturer; private or public; equipment assembler or component maker; etc. need to be balanced out by a body which must of course include technical expertise along with administtrative strength. Such a body must of course gather and make readily available the essential data of electronic industry as it grows from year to year.

As electronic industry grows, an Association of Electronics Manufacturers (including private and public) could be formed outside government. Such an organization will be able to coordinate the views, ideas and problems of its members and give them public airing. The ex-officio office bearers could be part of the body mentioned in above paragraph thus making it more broad based.

Study shows (with low cost labour, high cost capital) that so long as only assembly is done, the modest benfits of scale can be quickly offset and in fact become counter productive if capacities are under-utilised. Cost of components purchased is really the major cost element and this is where the solution has to be found for developing countries.

5.0 CONSTRAINTS AND PROSPCET FOR DEVELOPMENT

In the recent move towards liberalisation of policies and the opening out of the Egyptian economy, electronics has been given a lower level of priority than other more basic sectors. The industry still remains dominated by parastatals and the role of private enterprise is largely limited and trading.

It is not recognised in the process of modernisation of the economy as a whole, electronics has a major role to play especially in essential areas such as tele-communication, computers, consumer durables. As usage spreads , substantial outflow of foreign exchange may take place unwittingly. A crude estimate of USD 7500 million over the decade from 1985 to 1995 has been worked out.

It is, therefore, in the interest of the Egyptian economy that ways and means should be found out to increase local added value and local competence in the field of electronics and software.

The administrative structure for electronics is dispersed among numerous bodies. This is not conducive to a well-rounded and coordinated handling of such a complex multi-level industry. A single-window for handling the various issues related to electronics would be advisable.

In the area of professional electronics, the increasing use of digital techniques provides the opportunity to enforce local value addition in the form of software and systems engineering even when the hardware apparatus is imported. Such addition to local value can save substantial foreign exchange since software constitutes a considerable part of the import cost of the total system. This is especially worthwhile in the case of very large systems --- i.e. Socio-economic data intelligence systems; proposed future digital telecom systems; control systems for major plants; etc.

Local assembly of equipments suffers from the following constraints :

a. Very substantial capacities which have been set-up in parastatals are heavily under-utilised at present due to dificulties in procuring imported kits for assembly. There is immediate need for increasing local design effort to liberate the existing units from procuring components at high cost from specific collaborators in CKD form

b. The past regime of import of kits has led to wide variety of models of electronics appratus. Low volume per model leads to high cost structure and corresponding depression of market. It is worthwhile to minimise and indigenise certain

basic models so that volumes per model can be increased. Policy should be modified to protect and reward such efforts through exemption from local consumption tax, etc.

c. Such standardisation will enable competitive and aggressive purchases in world markets of components thus leading for substantial cost reduction.

d. The present import policy does not provide adequate differential tariff benefit between various levels of electronic activity --- i.e. professional over consumer; components over equipments; software over hardware. A regime of graded tariff structure is suggested in Section 4.4.1 which can create motivation for local entrepreneurs to undertake more local activity.

During the last few years, local assembly of electronic equipments has remained depressed due to lower availability of foreign exchange. Accordingly, the volumes of equipment production have not been sufficiently large to justify undertaking more and more local manufacture of selected components. Given the right policy regime, it is felt that there would be adequate volume of demand by 1995 to enable advance planning of local production of selected components. A broad picture in this connection has been cast in section 4.3.2.

Technological competence will only be built-up if Egypt takes conscious steps to increase participation not only as a user but also as parts-manufacturer of electronics & software.

The above prospects are, however, dependent upon the proper education and training of the required manpower. Egypt has a well-established education system with universities, colleges & polytechnics covering all faculties. Closer co-operation betwen academic institutions and electronics industry will enable the formulation of more up-to-date curriculae suitable for electronics and software activities. However,, academic training needs to be accompanied by on-job experience in specific skills which only the industry can provide. Co-operation in training between industry and academia needs to be more firmly established in order to constantly upgrade knowledge and skills as needed in a fast moving field like electronics.

Perhaps due to the present low utilisation of capacity, the productivity of labour in electronics seems to be at a low ebb. It seems necessary to undertake programmes to improve eficiencies on the production floor as better capacity utilisation comes on stream.

Prospects of export on a world-wide competitive basis appear dim due to the high cost structure. However, there is room for regional co-operation to expand markets and share production responsibility. All of this is of course subject to continuing effort as mentioned in this study to improve efficiency and cost at all stages of the industry.

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ANNEXURE B : MAIN PROVISIONS OF INVESTMENT LAW NO.43 OF 1974

Projects may not be nationalized or confiscated. Approved projects are deemed to be in the private sector even it co-owned by an Egyptian public company, and are exempt from laes applicable to the public sector.

Investments outside free zones must be with some (unspecified) Egyptain participation, except when approved for full foreign ownership by the Board of Directors of the Investment Authority.

Egyptian law requiring labour representation on boards of directors is not applicable. Arrangemenets for sharing profits with employees diluted.

Approved projects may maintain & operate foreign exchange accounts in banks registered in Egypt without special permit.

Imports without licensing, subject to routine customs inspection.

Projects which are self-sufficient in their foreign exchange needs may transfer their annual net profits within the limits of the proceeds of the projects exports.

Exemption of five years (extendable in special cases to eight years) from :

Company profits, tax, stamp duty on shares, capital gans. tax on dividend.

Foreign experters and employees are permitted to transfer abroad upto 50% of their gross earnings.

ANNEXURE C : GROWTH OF LOCAL TELEPHONE SYSTEM - 1960-88

YEAR	EXCHANGE EQUIPPED CAPACITY (000 NOS.)	TELEPHONES (000 NOS.)	TELEPHONE DENSITY	EXCHANGE FILL (%)	REGISTERED WAITING LIST (000 NOS.)	TOTAL DEMAND (000 NOS.)	TELEPHONE AVAILABILITY (%)
1960	170.6	203.1	0.78	84.3	N.A.	N.A.	N.A.
1965	270.6	321.3	1.05	84.5	N.A.	N.A.	N.A.
1970	342.4	404.3	1.21	84.0	66.5	354.3	61.2
1975	373.2	497.2	1.36	92.5	231.1	576.4	59.9
1980	460.3	554.8	1.13	89.3	452.7	863.6	47.6
1985	1115.7	982.6	2.38	68.0	796.4	1556.1	48.8
1986	1351.6	1226.6	2.80	70.1	819.7	1767.6	53.6
1987	1484.0	1453.9	2.93	75.0	1137.3	2255.6	49.6
1988	1643.1	1684.9	3.18	78.9	1085.3	2381.4	54.4

NOTES : 1. Telephone density indicates number of telephones per 100 population.

2. Exchange fill indicates % capacity utilised.

3. Source : (Ref. Ann.A sineo 13)

ANNEXURE D : CHECKLIST FOR NATIONAL SELF-RELIANCE IN INFORMATICS

1. A high level committee to promote the need for awarness of informatics, concept of social intelligence and associated infrastructure.

2. Consultations with international bodies on development of policy with access to other country models.

3. A policy report to be preapred.

4. Carry out national surveys of resources in equipment, manpower, and administrative, managerial and entrepreneurial skills.

5. Investigate financial resources, nationally & internationally.

6. Plan industrial and technological infrastructures including R & D, industrial extension services, information centres, technology transfer centres, national information network.

7. An integrated national plan for education and training in all aspect of informatics and documentation.

8. Stimulate development of industry related services including engineering and industrial consultancy.

9. Special legislation for the regulation of inflow of informatics technology, licensing arrangements, etc.

10. Strategy for the development of information systems and data bases in government departments and public utilities.

11. Development of applications in e.g. agriculture, transport, energy, etc.

12. Promote informatic applications in the private sector.