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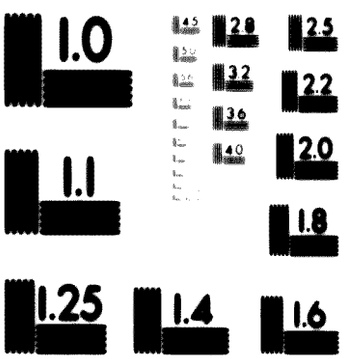

UNIDO REPORT TO

APPLIED SCIENTIFIC RESEARCH CORPORATION OF THAILAND
AND
BOARD OF INVESTMENT

ELECTRONIC INDUSTRY IN THAILAND
APPRAISAL, PROSPECTS AND POLICY

by S. SIROONAAL Dipl-Ing., M.I.E.E.E.,
UNIDO Industrial Consultant

June 1971

SUMMARY AND RECOMMENDATIONS

The study has shown that Thai electronic industry is in an embriological state. Of the total present demand of about US $ 70 million only a little over 20% is covered by Thai production. Contributing no more than some 40% in terms of value added, the nett contribution of the Thai industry towards the total demand is less than 10%. Although the majority of the factories are no more than assembly shops there are, however, one or two companies which show quite outstanding technical and management maturity and [redacted] in terms of value added performance, not in countries with far more developed economies.

On extrapolation of the present trends the demand is expected to more than double by 1976. If imports are going to be kept at an acceptable level it is estimated that the industry's nett contribution to the total demand will have to reach the 40% mark by that time. To this end the Thai production of the consumer electronic equipment will have to reach 80% of the demand and sufficient capacity of the component sector will have to be built so as to be able to supply 2/3 of the needed components. Also imports of telephone and radio communication equipment will have to be substantially curbed by 1976 by production of some selected classes of capital equipment. In order to achieve the necessary expansion it is estimated that investment totalling over US $ 45 million will be needed to create the needed manufacturing capacity.

Because of the high contribution which components make to the value of electronic equipment, development of the component sector is seen as the key factor of the expansion programme.

The component sector, however, is expected to meet with serious marketing difficulties in the early years. Therefore to create further additional opportunities it is proposed to encourage the secondary market in the country by inviting off-shore operations of assembly operations.

In order to ensure the high rate of investment needed to achieve the stated targets a drastic revision of the industrial promotion practices is proposed. A dynamic approach to the potential investors at home and abroad is needed as well as industrial estates to provide such basic facilities. Various additional incentives may have to be offered. Also quality standards have to be developed and a component industry engineering base created.

To ensure proper coordination of the diverse effort which is needed to implement the programme and to ensure sustained drive, a central agency equipped with the necessary executive means should be created.

The agency should be able to plan effectively business operations, to operate industrial estates, to possess an electronic laboratory and to handle all promotion activities needed for the growth of the Thai electronic industry. The agency would need full backing of the Government and would have to have a close working relationship with it. However, it must stand outside direct or indirect Government control.

To start the development programme the following steps are necessary:

1. Rate of investment in the consumer sector should be stepped up and investors for the component sector should be sought through the existing promotion channels with encreased intensity and in accordance with policies recommended in ~~sections 7 and 8~~ the report.

2. An electronic committee composed as per Appendix D should be immediately convened in order to define terms of reference of an Executive Agency to be solely in charge of the development of the Thai electronic industry. The agency is described in ~~Section 9~~ the report.

3. A study should be commissioned as soon as possible (probably by the ministry of Industry or the committee) to evaluate the Viability of the proposed agency and to explore possible ways of raising the necessary capital.

~~4. Should establishment of the executive agency prove impractical steps should be taken to implement the recommended policies through existing agencies best suited for the respective tasks.~~

4. In order not to waste valuable time before the Executive Agency can be set up some intermediate steps should be taken immediately and transfered later to the Agency. The recommended steps are listed in the report.

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CONTENTS

1. INTRODUCTION

When discussing "electronics" in the context of industrial policies of developing countries the term is almost invariably limited to domestic apparatus among which of course the most prominet are broadcasting and television receivers. The reason for the misleadingly narrow use of the concept is the fact that production of domestic (consumer) electronic equipment is usually brought into a developing country by assemblers of electrical household appliances as an additional product to be sold in their existing markets. From their point of view indeed there is hardly any difference between assembling an electrical fan or a radio receiver.

By associating consumer electronics with the home appliances an important fact tends to be overlooked, namely that consumer electronics are technologically a branch of much wider market served by common technology and that only on the basis of this broader concept can attempts to develop a national electronics industry beyond the basic assembly operation be economically justified. Therefore any study concerned with the development of electronic industry in a country must concern itself with:

Consumer electronics
- broadcasting and TV receivers
- recording and reproduction equipment
- electronic musical instruments

Broadcasting equipment
Telephony and line transmission equipment
Radio communication equipment
- single hop systems
- point to point systems

Radio navigation equipment
Industrial automation machinery
Data processing machinery
Electronic components
- passive
- active

Markets for all the above named classes of equipment exist in Thailand but not all of them are of significance as yet. In this report attention is concentrated on the consumer market as the single biggest and fastest growing sector and on the component field as the single biggest contributor to the value of electronic equipment.

However, special attention is paid to communication equipment since the acute need to improve communication facilities in Thailand is creating a very dynamic potential market which should justify an early establishment of appropriate manufacturing facilities in the country. Being technically more demanding and yet technologically simple, manufacture of this class of equipment could have a profound influence on the growing-up process of the Thai electronic industry by taking it, for the first time, beyond assembly operations and into the world of equipment and system engineering.

It was found during the present study that nuclei of electronic know-how exist in Thailand in many areas but so far have had little opportunity, and less encouragement, to blossom out. The establishment of a communication industry in the country should provide the needed base.

Throughout the report the home market is considered to be the main factor on which the Thai electronic industry must be built. If during the Third Five Year plan an adequate manufacturing capacity could be created to cover say 2/3 of the internal requirements for consumer and professional electronic equipment then realistic ambition will have been satisfied and a substantial contribution made towards the balance of foreign trade.

Not too much should be expected from the industry as an early, large-scale export earner. Export orders usually come to the developing countries in the form of sub-contracts for consumer equipment from expatriate assembly plants of foreign companies in the country. Without presence of expatriates in the country breaking into the intensly competitive world markets is extremely difficult. However some export prospects exist in the field of professional equipment where one company already has orders in hand.

Based on the projections of the consumer and telecommunication markets, recommendations are made in this report as to the size and nature of investments required to achieve a substantial independence from imports during the Third Five Year Plan period. Recommendations are also made as to the policies needed to allow the full potential of the Thai electronic industry to materialize. Also a possible way is outlined for the implementation of the recommendations.

2. CURRENT STATUS

Data in Table 1 show the Thai electronic industry on a comparable basis with electronic industries in other countries of interest.

2.1. Size

Thailand's electronic industry consists of eleven identifiable companies and a larger number (alleged to be around 20) of family workshops. Total output in 1970 is estimated at US $30 million which is about 0.45% of GDP and about US $83,000 sales per 100,000 population. Comparable figures for the U.S.A. and Japan are 3.3% and 3.5%, and $ 14 million and 6 million respectively. The Thai electronic industry is therefore very small.

2.2. Products

Seven out of the eleven identifiable manufacturers produce consumer equipment. In 1970 approximately 700,000 broadcasting receivers and about 20,000 TV sets were produced. At average factory sale prices in the region of US $ 10 for a broadcasting receiver and US $ 150 for a TV set the latter accounted for around 1/2 of the total value of output. A small percentage of the radios were in fact radiogram consols. There were no taperecorders or any other consumer products made.

About 60% of the manufactured radios were at the low end of the price range and almost all TV sets were monochrome.

The quality of the cheap sets seems adequate and the external designs suit the local tastes. The top-range products do not match the quality offered by imported sets. With one exception all TV receivers are mass assembled Japanese sets. The Thai-assembled units do not seem to differ in quality from the Japanese made ones.

Ex-factory prices are about 50% above world prices but are comparable with prices in neighbouring Malaysia.

With the exception of one manufacturer who has his own design staff all manufacturers rely on designs obtained from abroad.

Of the professional equipment there are HF communication transceivers, telephone instruments and a few unspecified communication devices manufactured in the country. The transceivers were designed in the manufacturer's own laboratory and are of professional quality. The prices seem reasonable but no direct comparison was made.

Inspite of the excellent prospects in the telecommunication field no telephone or transmission equipment is manufactured or assembled in Thailand, though ITT are preparing to start a moderate size

Table 2: LIST OF SIGNIFICANT COMPANIES

	COMPANY	ESTIMATED SALES (Million Baht)	EMPLOYEES	MANUFACTURED OUTPUT (1970)	CONTACT	
1.	[illegible] INDUSTRIES CO.LTD.,	73 1)	550	Radio: 140,000 TV : 3,500 Components: moderate quantities of coils, speakers and RF transformers	[illegible] Director and Factory Manager	1)
2.	[illegible] THAI Co.Ltd	45	90	Radio: 60,000 TV : 12,000	K. [illegible]ATA Managing Director	[illegible]
3.	[illegible] [illegible]RY Co.LTD.	26	110	Radio: 120,000 TV : nil	[illegible] Company Secretary	[illegible]
4.	[illegible]	15	n.a.	Radio: n.a. TV : 5,000	n.a.	
5.	[illegible]	75	n.a.	Radio: 24,000 TV : n.a	Refusal to cooperate.	
6.	[illegible] LTD.	6 1)	45 1)	Radio: nil TV : 2,000 2)	Mr. [illegible] Production Manager	1) 2)
7.	[illegible] CO.LTD,	5.5	37	Radio: 30,000 TV : 200 [illegible]'s		
8.	[illegible] ST LTD.	0.75 1)	n.a.	Telephone sets P[illegible]X boards	Mr. [illegible]	1)
9.	[illegible] LTD. 1)	n.a.	40	RF transceivers Audio amplifiers Emergency lighting	[illegible] President	1)
10.	[illegible] ELECTRONIC INDUSTRIES LTD. 1)	n.a.	n.a.	Miscellaneous communication equipments.	Maj. Gen. Chalerm Sudhirak, Chief Signal officer Royal Thai Army	1)
11.	[illegible] 1)	Not operational yet.	n.a.	Hallicrafter transceivers		1)

SECTION 1

Table 2: LIST OF SIGNIFICANT COMPANIES

ESTIMATED SALES (Million Baht)	EMPLOYEES	MANUFACTURED OUTPUT (1970)	CONTACT	NOTES
75 1)	550	Radio: 140,000 TV : 3,500 Components: moderate quantities of coils, speakers and RF transformers	[illegible] Director and Factory Manager	1) Includes sales of imported equipment.
4[illegible]	90	Radio: 60,000 TV : 12,000	[illegible] LATA Managing Director	Sales and employee figures relate to electronic output only. National Thai also assembles electrical home appliances and dry cells.
	110	Radio: 120,000 TV : nil	[illegible] Company Secretary	Chanthapa also assembles domestic electrical appliances.
1[illegible]	n.a.	Radio: n.a. TV : 5,000	n.a.	
7[illegible]	n.a.	Radio: 24,000 TV : n.a	Refusal to cooperate.	
1)	45 1)	Radio: nil TV : 2,000 2)	Mr. [illegible]NAI Production Manager	1) Figures relate to TV assembly only. Main business is in home appliances. 2) Only 4 months figure; 1971 expected 11,000.
[illegible]	37	Radio: 30,000 TV : 200 CKD's		
[illegible] 1)	n.a.	Telephone sets PABX boards	Mr. [illegible]AZIAN	1) Production to start July 1971.
n.a.	40	HF transceivers Audio amplifiers Emergency lighting	[illegible]DDY President	1) Subsidiary of G. Simon Radio Ltd.,
n.a.	n.a.	Miscellaneous communication equipments.	Maj. Gen. Chalerm Sudhirak, Chief Signal officer Royal Thai Army	1) Operated by Royal Thai Signals.
[illegible]		[illegible]		1) Northrop Group in association [illegible]

SECTION 2

assembly of telephone instruments in July of this year. In addition a small quantity of private telephone systems are made locally by two manufacturers.

Hardly any components are manufactured in Thailand so far. A few coils and transformers are manufactured on a cottage industry basis but the activity does not represent any significant industrial potential. There is, however, a surprisingly large quantity of copper wire and cable produced in the country.

2.3. Companies

All significant companies have been listed in order of their sizes in Table 2.

The first seven companies operate in the consumer market and with the exception of Tanin are no more than equipment assembly shops. National and Sanyo import sets from their parent companies in Japan in a knocked down form while Chanthapa and Charay assemble foreign designs from imported components of their own choice. The value added by the assemblers is chiefly the value of cabinets and wages. It is around 25% of the factory prices. Significantly for this category of manufacturers production of electronic equipment is simply an extention of their domestic appliance business, cashing mainly on their experience in the assembly of electric fans, rice boilers, air-conditioners etc. and on their established chains of distribution outlets.

Tanin's approach to the receiver business is more subtle; it is reminiscent of the beginnings of the consumer industry in the smaller countries of Europe in the early 1930's relying in the first instance on its own technical inventiveness and only in second place on association with foreign partners and on imports of know-how. Tanin's factory contains apart from assembly lines a wide range of workshops fitted to manufacture various mechanical and electrical components and normally found only in the works of much larger manufacturers in developed countries. Tanin also relies on its own development laboratory for circuit and styling designs. Tanin's output per employee is considerably lower than that of its competitors who limit their activities to straight assembly operations but technologically it appears to be the most soundly based consumer equipment manufacturer in Thailand and comparison of value added per employee would bring it much closer to its competitors.

The last four companies in Table 2 are manufacturers of capital equipment. ITT Far East Ltd. is a subsidiary of a world corporation and the proposed Hellicrafter-Page operation will be a joint venture of the US Northrop Group with a local entrepreneur.

TRT Ltd. is a commercial venture of the Royal Thai Army operated by the Signals Department. In the early 1960's it produced the first commercially made broadcasting receivers in Thailand and more recently built small quantities of TV sets. It also built broadcasting transmitters in the past and currently assembles various communication devices for the armed forces from imported kits.

The most interesting of the capital equipment manufacturers appears to be Elcom Research Ltd. The Company is currently offering a family of modular high frequency (HF) single sideband (SSB) transceivers of its own design. Although the products are evidently in the early stages of commercial exploitation the company has already secured several export orders. High power audio amplifiers, loadhalers and battery driven lighting systems for fixed and mobile applications complete Elcom's range. The company although rather small at present is conspicuous by the quality of its technical know-how and entrepreneurial outlook.

Apart from the significant companies discussed above there are nearly 200 dealers and radio repair shops listed in the Bangkok tel phone directory. An unknown number of these engage in manufacture radio sets on a cottage industry basis. They hold between them about 1/3 of the cheap radio market or say some US $3 million worth of the consumer business. Their products are usually exact copies of well selling models of the better known makers. With overheads and wages lower than a full scale manufacturer needs to pay and with no interest in the quality of performance these pirate products can and do undersell the original products by a considerable margin. This in turn has adverse effect on product innovation and acts as a brake on the development of the industry.

Apart from the honourable and illicit manufacturers notice should be taken of the role of importers of electronic equipment who through their business competence and knowledge of the local and world markets represent a potential from which a successful new manufacturer is likely to come. In fact both of the more interesting companies discussed at some length above seem to have served their apprenticeship as importers and agents prior to becoming manufacturers themselves. Some of the more significant importers are listed in Table 3.

Table 3: List of Significant Importers

NAME	AGENTS FOR	COMMENT
1. ANGLO-THAI ENGINEERING LTD.	GEC-ELLIOTT Signal Company Ltd.	Major importers of road traffic control equipment and manufacturers of signal lights.
2. BORNEO COMPANY LTD.	SIERRA, Subsidiery of Philips	Importers of Sierra radio receivers. Some interest in possibility to manufacture in Thailand.
3. CHAIYARONG AMPORN	NIPPON ELECTRIC COMPANY	Importers of Japanese telephone equipment. Obtained "promoted" status a few years ago to manufacture telephone equipment locally but gave it up for lack of support.
4. ERICSSON TELEPHONE CORP.	L.M. ERICSSON	Assembles some PBX equipment. Obtained "promoted" status a few years ago to manufacture telephone equipment locally but gave it up for lack of local support.
5. GRIH and Co.	SIEMENS	Importers of PBX telephone and industrial electronic equipment.
6. PHILIPS Co. LTD.	PHILIPS	Importers of PBX telephone equipment, radio receivers and road traffic control equipment. Interested to manufacture receivers locally.

2.4. Production

Production facilities and practices in the visited plants seemed neither better nor worse than in the plants visited elsewhere in S.E. Asia. The productivity of assembly lines in the Japan-oriented plants was approaching the Japanese figures. Elsewhere the efficiency was lower because of, it would seem, a less single-minded outlook of the management.

In common with practices observed in other countries in the area, in most of the visited plants the methods used to ensure the quality of products appeared to lack rigour and thoroughness normally found in the equivalent factories in the Western countries. Only one of the visited manufacturers of TV sets had reference frequency equipment on the premises. Since absence of frequency standard equipment seemed to coincide with absence of high quality of test equipment on the production line impression was gained that considerations of costs were overriding the concern for quality of products.

2.5. Know-how

Successful industrial operation requires three types of know-how, namely knowledge of production management, business management and of technology.

It was observed that in most electronic companies in Thailand any specialist know-how was limited to the knowledge of production management. This knowledge seemed to have been obtained from experts sent by the licensors at the start of a particular assembly operation. It was further observed that introduction of an electronic product does not generally necessitate acquisition of any new business knowledge on the part of the licensee since marketing can be carried out through the same distribution channels as the distribution of other products already manufactured by the company prior to venturing in the electronic field. In addition procurement of materials and components is settled usually within the licensing agreement thus removing the need for the licensee management to acquire additional knowledge of new business environment and practices. Knowledge of electronic technology does not come into the picture at this level at all.

Only Telcom Research and Tanin present a different picture. These companies by virtue of their independant approach to the electronic business seem to have achieved the right kind of balance of management and technical knowledge which allows the term "industry" to be applied to them in its full meaning while the term "assembly shops"

is more appropriate for the rest of the Thai electronic equipment manufacturers. Dicom and Tanin represent about 10% of the total Thai electronic production capacity.

2.6. Manpower

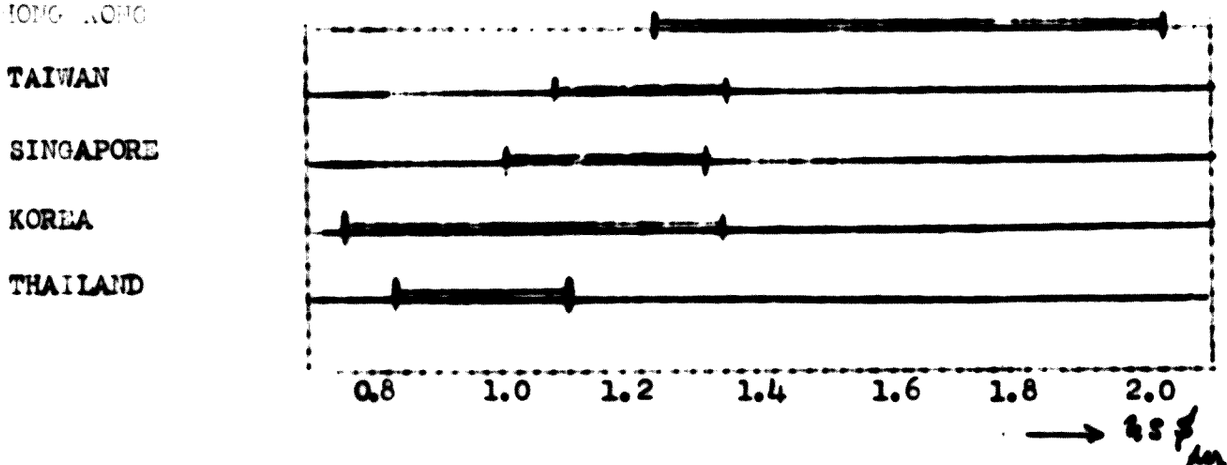
(i) Trainable Labour

The backbone of a mass-production assembly line is unskilled but trainable female labour. In the consumer electronic and telecommunication sectors in the developed western countries this type of labour accounts for 55% and 45% respectively of the total labour force employed. In the developing countries the percentage can be as high as 90% because of the dominance of the assembly operation in the total activity.

It appears that enough of this type of labour is available in Thailand and that in quality it is not materially different to the quality found in the other countries in the area. However, in some quarters outside Thailand, Chinese operatives in Hong Kong, Taiwan and Singapore (and also the Koreans) are considered steadier employees than workers from Thailand, Malaysia and Indonesia. Comparative study of absenteeism and labour turnover should substantiate or deny the allegation.

Thai labour rates for assembly line workers are by and large in line with the rates of the other "electronic" countries of the region as shown in Table 3.

Table 3: Comparative Daily Rates for Female Assembly Workers



No undue significance should be attached to the fact that Thailand occupies bottom place in league. This fact by itself will neither affect competitiveness of Thai electronic products nor cause foreign investment to come rushing into the country.

(ii) Craftsmen

The ratio of unskilled to skilled workers in the Thai electronic industry is estimated to be around 6:1 (compared with 3:1 in the developed countries). If the industry were to grow six times during the Third Five Year Plan as is assumed to be possible (see Section 3), then allowing for lower productivity in the component sector provisions must be made for the labour force to grow from the estimated present figure of 1,200 to some 10,000 of whom say 1,700 to 2,000 workers should be skilled craftsmen. It was not established in the course of this study to what extent the educational system of the country is capable of meeting the need.

(iii) Engineers and Technicians

In the electronic industries of the developed countries qualified engineers form about 5% and technicians (test room and lower grade design laboratory personnel, draughtsmen etc) about 10 % of the total labour force.

As pointed out earlier only one tenth (in terms of output) of the Thai electronic industry has any engineering capability at present. Making an assumption that one fifth of the industry should have engineering capability by 1976 some 100-150 engineers and 200-300 technicians should enter the industry during the next 5 years. Here again the capacity of the educational system was not investigated.

(iv) Management

Some of the Thai electronic companies are managed by outstanding individuals. To what extend this is an exception or an indication that exceptional management talents are relatively abundant in the country is hard to say. However, it could be that decades of operations of the great trading companies created business standards in the country way about the level normally found in a developing country. If that were the case, further talents would be likely to come forward with emergence of opportunities in the electronic industry.

2.7 Business Performance

To obtain reliable da ta on the profitability of the industry, productivity of its labour etc. proved rather difficult for obvious reasons. However, on the strength of the author's experience in the area and discussions with all but two Thai manufactures a tentative picture has emerged

In common with other S.E. Asian countries the chief characteristics of the Thai electronic industry are low investment and quick turnover. Fixed assets of only between 1/2 and 2/3 of the value required in a developed country is needed here to give a comparable output; the working capital can be turned over 4 to 6 times a year. On this basis gross manufacturing profit of up to 40 % can be made to give nett earnings on total capital in the region of some 20 to 25 %.

High profitability in the consumer sector can be considerably reduced if the manufacturer sells directly to the dealers. The capital involved in the distribution operation needs more than 12 months to turn over and bad debts cause considerable losses. Overall profitability can then be reduced to 15 % or less.

In terms of sales per employee productivity of the Thai assembly plants at US $33,000 per employee per annum compares favourably with the figure of US $39,000 in the USA. In the case of companies engaged in more complex operations the Thai productivity of US $ 6000 needs to be compared US $ 19,000 in the USA. The difference in the two ratios would seem to indicate that while good standards of management of an assembly line can be achieved in Thailand the management performance is considerably reduced when it comes to management of more complex tasks.

3. MARKETS

3.1 Summary

In the course of the present study five distinct markets for electronic equipment were identified in Thailand each being dealt with in some detail in the following sub-sections. It was found that at present the total annual consumption of electronic equipment is in the region of US$ 70 million of which some $30 million is in broadcasting receivers and TV sets. Thai production and assembly operations amount in value to approximately 1/2 of the consumer market; all capital equipment and almost all components are imported. Since some 45 % of the value of the Thai produced consumer equipment is in imported components the value of the domestic contribution to the market is down to US $ 7 million or just around 10 %. Therefor about 90 % of the Thai electronic market is covered by imports amounting at present to over US $ 60 million annually.

Consumption is expected to grow to some US$ 100 million in two years time and to say US $ 150 million by 1976. By that time, unless new dynamic policies are adopted the local production may only reach the US $ 40 million mark and US $ 110 million worth of equipment will have to be imported. If on the other hand active steps were taken to encourage (a) the consumner industry to grow to some 80 % of the market, (b) the component industry to come and to set up manufacturing capacity to meet some 2/3 of the local demand and (c) capital equipment manufacturers to produce all needed equipment locally, then the domestic consumption to imports ratio could be reversed. Domestic production could then contribute some US $ 110 million of the total leaving a more US $ 40 million to be imported. The investments required to achieve these results are detailed in Section 5 and the necessary policies in Section 7.

3.2 Consumer Equipment

At present the consumer market consists mainly of broadcasting receivers and monochrome television sets. Figs 2 and 3 show that in 1970 about 1 million radios and 120,000 TV sets were sold representing in terms of wholesale prices some US $ 11 and 18 million respectively. A little over 30 % of radios and some 85 % of TV sets were imported accounting together for about 50 % of the total consumer market (at wholesale prices).

Only the single and two-band radio receivers and 17 and 20 inch monochrome TV sets, some HI-FI radio equipment, small quantities of radiograms and few colour TV sets were produced in the country. Better class sound reproducing products as well as larger screen TV sets were imported. In addition all tape equipment was imported.

As shown in Figs 2 and 3 it is expected that by 1976 the demand for radios and the TV sets should more than double and that a worth while demand for colour TV, tape equipment and various equipment combinations is likely to materialise.* The projection formulae and some supporting information is given in Appendix A.

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* The projections are based on the expected increase of population, change of its purchasing power and on other factors. No account was taken either of the substantial difference in the per capita income between Bangkok and the rest of country or of the known tendency towards buying more expensive equipment when replacement purchases are made.

3.3 Line Communications

This is a very important market since much of the heralded economic growth and the closure of the income gap between Bangkok and the rest of the country will depend on the progress of improving telephone communications within the country. Thailand's position in the league of the "electronic" countries of S.E. Asia is shown in Table 5 below.

Table 5: Density of Telephone Facilities

	Telephones per 100 population	Investment as % of GDP
Thailand	0.34	0.13
Hong Kong	10.74	n.a.
Korea	1.60	0.97
Malaysia	1.50	0.50
Singapore	2.00	0.37
Taiwan	2.05	n.a.

Comparison of Tables 1 and 5 should underline the connection between the density of telephone facilities and the degree of industrialisation.

Viewed in this light the present programme of the Telephone Organisation of Thailand (TOT) to invest US$ 120 million in telephone switching plant and further $ 30 million in transmission in the 1972-76 period appears barely adequate since at this rate Thailand's telephone density will be no more than more 1.25 by 1976. Therefore the market estimates discussed below which are based on the present T.O.T. investment plans should be regarded as being on the conservative side. Also not included in the estimates is the additional demand from smaller users of switching and transmission equipment such as P and T Department of Ministry of Communications (telex), the railways (way-side telephone) and the military. The projections, however, include a conservative estimate of private branch exchange (PBX) equipment.

On this basis it is expected that at least 360,000 lines of public exchange and some 60,000 lines of PBX equipment of the total value of some US$45 million will be purchased during the Third Five Year Plan period and that further say US$ 30 million will be spent on transmission equipment (carrier channelling with associated microwave terminals). The expansion will further create demand for around 600,000 telephone sets of a total value say US$ 7-8 million. None of this equipment can be manufactured in the country at present. This means that annual expenditure on imports between say US $ 11 and 18 million will be incurred apart from the loss of business for the component market (say US$ 4 to 7 million) and loss of employment for 300-400 people.

3.4 Radio Communications

There are over 100 private radio communication systems in use in Thailand using a great diversity of equipment and representing a very confused market. The reason for the confusion seems to be the lack of authority either by TOT or the P and T Department to control the proliferation of systems. Some blame the situation on poor reliability of TOT or P and T facilities others blame it on vested interests. Be it as it may the situation proved too complex to obtain any reliable picture of this market within available time beyond the realisation that provided some standardisation could be achieved this market might well be big enough to justify setting up of local production.

While in the past this market was solely confined to civilian applications, all military equipment being obtained under various forms of foreign aid, the military authorities feel that in the future they will be increasingly dependant on Thai resources for procurement of new equipment and for the needed replacement components and spare parts. In these circumstances considerations of national security may become the decisive element in shaping the government policy towards the radio communication equipment market.

3.5 Transmitting Equipment

The current annual market for high power transmitting equipment and associated studio equipment is estimated at US$ 1-2 million. Most of the equipment is assembled in the country from imported parts by the users themselves.

3.6 Components and Parts

Electronic apparatus is assembled from circuit components such as resistors, capacitors, transistors etc. which perform electrical functions and from parts such as cabinets, mounting racks, control knobs, brackets etc. which generally are of mechanical nature. Both the components and the parts are major contributors to the cost of the final product. This is particularly so with the products manufactured in the developing countries where the cost of labour is low and contribution of components and parts to the ex-factory prices may be as high as 60 % (See Appendix B, Table B.2).

In order to appreciate fully the component market four possible conditions were considered in Fig. 4.

(i) Actual market; created by the present level of equipment assembly activity in the country (Projection of present trend.).

(ii) Possible market, should all demand for consumer equipment be met by equipment manufactured or assembled in the country. (Based on "Consummer" curve in Fig. 1.).

(iii) Possible market, should all electronic and allied equipment used in the country be manufactured or assembled locally. (Based on "Total" curve in Fig. 1.).

(iv) Probable demand, should 80 % of the consumer industry be manufactured in the country. (Based on the "Assumed" curve in Fig.1.).

The potential market for equipment parts is shown in Fig. 5. The interesting factor in this market is the contribution which the components could make. It is generally reckoned that some 30 % of the component market can be subcontracted to the supporting industries.

4. MORE ABOUT COMPONENT MARKET

4.1 Composition

Overall estimates of expected consumption of components were made in the previous section. In order to be able to study the market further some idea with respect to the quantities of individual components is essential. Since at present only the manufacturers of consumer equipment are actual users of components in Thailand and since the consumer market could amount to as much as 75 %

Table 6

Expected Annual Demand for Components in US $ Million by Thai Consumer Equipment Manufacturers

	1972	73	74	75	76	1980
Assumed sales of Thai made consumer equipment	20	26	34	45	67	120
Resistors: fixed	0.28	0.37	0.48	0.63	0.94	1.68
variable	0.08	0.11	0.14	0.18	0.27	0.48
Capacitors: fixed	0.42	0.63	0.82	1.08	1.60	2.88
variable	0.78	1.00	1.32	1.76	2.60	4.71
Coils	0.93	1.21	1.58	2.09	3.12	5.61
Transformers	2.56	3.35	4.38	5.71	8.40	15.40
Speakers and Earphones	0.77	1.00	1.31	1.73	2.58	4.64
Printed boards	0.16	0.21	0.27	0.36	0.54	0.96
Receiving values	0.21	0.24	0.21	0.12	0.06	nil
Transistors and Diodes	1.24	1.61	2.11	2.79	4.16	7.42
Cathode ray tubes	1.08	1.40	1.84	2.43	3.61	6.49
Miscellaneous	0.46	0.60	0.78	1.04	1.54	2.76
Total	9.00	11.70	15.30	20.00	30.00	54.00

Table 7

Expected Annual Demand for Components in Million Units by Thai Consumer Equipment Manufacturers

	1972	73	74	75	76	1980
Resistors: fixed	40	53	69	90	134	240
variable	1.14	1.57	2.00	2.58	3.87	6.68
Capacitors: fixed	30	39	51	67	100	180
variable	3.90	5.00	6.63	8.83	13	24
Coils	9	12	16	21	31	56
Transformers	1.75	2.14	2.92	3.82	5.61	10
Speakers and Earphones	0.86	1.11	1.46	1.93	2.88	5.13
Printed boards (000 m.sq.)	16	21	27	36	54	96
Receiving valves	1.05	1.20	1.05	0.6	0.3	nil
Transistors and Diodes	12	16	21	28	42	74
Cathode ray tubes	0.09	0.12	0.15	0.20	0.30	0.54

Table 8

(Units)

Minimum Quantities and Thai Demand

		Minimum practical annual manufacturing quantities	Smallest estimated annual demand in Thailand	Employment per $ 10,000 invested
Resistors:	fixed	10^7	10^7	4
	variable	2×10^5	8×10^5	17
Capacitors:	fixed	8×10^6	9×10^5	13
	variable	2×10^5	1×10^6	19
Coils		2×10^5	2×10^6	17
Transformers		5×10^4	4×10^5	16
Speakers and Earphones		10^5	2×10^5	11
Printed boards		5×10^2 m.sq.	4×10^3	5
Receiving valves		n.a.	3×10^5	36
Transistors		2×10^6	10^7	45
Diodes		4×10^6		19
Cathode ray tubes		6×10^4	6×10^4	2

of the total component consumption (Fig. 4 curve (ii) we shall base our considerations of the business prospects in the component sector on this market alone.

For the purpose of our analysis it will be assumed that the local manufacturers of consumer equipment will increase their share of the domestic market from 50% at present to 80% in 1976. Then using the assumed sales curve of Thai made equipment in Fig. 1 and the percentage parameters from Table B.1 Appendix B the expected sales volumes of individual components can be calculated. The results were compiled in Table 6 and drawn out for quick orientation in Fig. 6. Corresponding quantities of components derived from the sales volumes and unit prices are shown in Table 7.

4.2 Prospects

In order to give some indication of the practicability of setting up manufacture of components in Thailand Table 8 was compiled. The data were collected during the interviews with manufacturers in several Far Eastern countries and should be considered fairly representative for the Thai conditions. Rough estimates of the needed levels of investment are given in Section 5 and details concerning individual components were compiled in Appendix C. However, pre-investment studies will be required when planning individual ventures in order to determine more exactly the ammounts of required capital and the optimum size of the production unit.

Table 8 reveals that on the strength of expected demand, leaving aside the marketing problems discussed in the next section, local manufacture of all major classes of components should be practicable. The table also shows that from the point of view of employment opportunities active components are more attractive than the passive ones and that among the passive components the variable types give more employment than their fixed counterparts. Since however, the active components are technologically too demanding and commercially too dangerous a middle-of-the-road solution makes capacitors and inductors (coils and transformers) the most likely candidates for early local manufacture with resistors and speakers forming the next category.

Having established a de facto case for local manufacture, the marketing problems connected with breaking into established trading patterns have to be considered.

4.3 Marketing Problems

While comparison of data in the first and second column of Table 8 gives encouraging information to potential investors it must not be overlooked that at the time the local manufacturer would enter the market all demand would be covered by current arrangements with non-Thai suppliers. Since change of component supplier may often necessitate modifications of equipment design it is not an easy matter to sell a new component into an equipment in production, even to a manufacturer who is fully equiped to carry out such modifications. Few Thai manufacturers have any capability in this respect as was pointed out in Section 2. (Normally new components will be sold to the equipment designer who incorporates it in the equipment right at the beginning of its life.)

Furthermore in the majority of cases the connection between the Thai manufacturer and his foreign supplier of components is more complicated than just a straight component supply link. The component supplier often is the licensor of the design made by the Thai manufacturer or even substantial partner in the Thai factory. Since in all these cases export of components to Thailand must obviously have played a role in the decision to make an investment in the country the difficulty of establishing markets for locally made components must not be underestimated.

It goes without saying that the locally made components must be cheaper than their imported equivalents and that they must be of at least equal quality. Assuming that equal quality can be achieved a price problem is bound to be harder to solve. Apart from the initial inefficiency of any new venture the small size of the national market is not going to help in this respect. Furthermore the local manufacturer may be forced into far too great diversification of products in order to counteract the technical inflexibility of his potential clients.

It could well be that the key to the component business lies with manufacturers who as yet have to set up their equipment manufacturing plants in Thailand. There is 1/2 of the present market available to them and 2/3 of the expected 1976 volume. These newcomers could be forced to agree to use a stipulated amount of Thai made components (assuming acceptable prices and quality) as a part of the bargain of obtaining the promoted status.

The question, of course, arises of synchronising the arrivals of the new equipment manufacturers and the component manufacturers, on the Thai electronic stage. Since this is unlikely to happen it seems that the component industry may have to be set up on a somewhat speculative basis and on the premiss of recovering its possible initial losses in the later years. If this were the case it could be that some form of special government assistance might be necessary during the initial years of the component industry's existence.

Although it is hoped that the resistance of the established manufacturers to the local components would not be as hard as anticipated for the purpose of the discussion the problem nevertheless is real and must be taken into consideration in any pre-investment feasibility study.

An alternative way of setting up component manufacture is by securing a sub-contract from a large component manufacturer abroad. It is the way how many manufacturers in Hong Kong, Singapore and to a lesser degree in Taiwan and Korea started. Unfortunately, for reasons discussed in Section 6 Thailand does not enjoy the same rating in the eyes of foreigners as the above-named countries do and therefore chances in this respect are not so bright. However, a capable individual particularly if supported by a bold Government action should succeed if acting with sufficient determination.

4.4 Role of Expatriates

The marketing problems discussed in the previous section could be alleviated by creating alternative markets. The line and radio communication markets, could have a marginal effect by adding some 20% to 25% to the total demand. By far the greatest additional demand could be created by inducing expatriate assemblers)of equipment and subassemblies to set up their off-shore operations in Thailand. In fact in the long run this market could prove to be bigger than anything the domestic consumption will be able to offer since by the very nature of their operation the expatriates in fact are bring the component world markets to the front door of the local component manufacturers.

) Expatriate assembler is usually 100% owned off-shore plant of a foreign manufacturer using bonded warehouse facilities in a host country. It is usually barred from selling in the host country.

How much contribution expatriates could make to the development of the Thai component industry will depend on the degree of success the country is likely to achieve in attracting their patronage. Competition for the patronage is intense, and as pointed out in the previous section, Thailand's rating as a potential host country is not very high at least at present. Some suggestions to improve the situation are made in Section 7.

5. INVESTMENT OPPORTUNITIES

5.1 Summary

Investment opportunities totalling US $47 million exist for local and foreign capital in consumer equipment, components, capital equipment and in the supporting industries. There are also opportunities for expatriate enterprises on a 100% foreign ownership basis. The investment requirements are summarised in Table 9 with details for individual sectors given in the following sub-sections.

Table 9: Additional Investments in US $ million

	1972	73	74	75	76	Total
Consumer Equipment	1.75	2.65	3.50	4.85	6.45	19.20
Components	-	0.84	1.98	2.65	5.24	10.71
Line Communications	To be related to T.O.T. investment plans. (2.50)(2.50)(2.50)					7.50
Radio Communications	Market yet to be analysed					?
Parts	1.00	1.50	1.50	2.00	3.50	9.50
Expatriates	100% foreign investment					
Total	2.75	4.99	9.98	12.00	17.69	46.91

5.2 Consumer Equipment

Assuming that by 1976 domestic production should reach 80% of the total demand additional investment and job opportunities will be as in the table below.

Table 10: (US $ million)

	1972	73	74	75	76
Additional Output	4	6	8	11	15
Additional Fixed Assets	1	1.5	2	2.75	3.75
Additional Working Capital [1]	0.5/1.0		1.0/2.0		1.8/3.6
		0.8/1.5		1.4/2.8	
Additional Jobs (units)	320	470	650	900	1200

5.3 Components

An overall picture is given in Table 11 below. Corresponding information related to individual components and pertinent comments will be found in Appendix C. The analysis assumes that 2/3 of the component demand generated by the Thai production of consumer equipment will be met from Thai component sources by 1976. The additional potential demand generated by possible production of professional equipment and the possible demand of expatriates were not taken into account.

Table 11: (US $ million)

	1973	74	75	76
Additional output	1.65	3.44	4.87	10.02
Required Fixed Assets	0.47	1.10	1.47	2.95
Required Working Capital	0.37	0.88	1.18	2.29
Additional Jobs (units)	630	1080	1600	3090

[1] Rate of turnover between 3 and 6 assumed

5.4 Line Communications

It would be impractical to make investment estimates on a yearly basis here since any investment would be geared to the T.O.T. investment programme. On the basis of the discussion in Section 3.3 it would appear, however, that a telecommunication equipment plant with an annual capacity of some 100,000 lines and 80,000 channel ends would be required if Thailand were to become independant of imports. An investment of say US $ 6 million would probably be required.

Additional investment of say US $ 1.5 million could be made in a manufacturing plant to produce some 60,000 telephone sets annually.

5.5 Radio Communications

No estimates can be made here until this market is analysed.

5.6 Parts

Assuming that the investment programmes for consumer equipment and for components are fulfilled, the demand for mechanical parts etc. will develop along the "Probable Demand" curve in Fig. 5. To meet the demand, additional output and investments will be necessary as detailed in Table 12 below.

Table 12: (US $ million)

	1972	73	74	75	76
Additional output	2	3	3	4	7
Additional Investment	1	1.5	1.5	2	3.5

5.7 Expatriates

Since the purpose of inviting expatriates to Thailand should be to enlarge the in-the-country component market and to create early opportunities for export earnings, 100% foreign ownership is assumed. Therefore, no need to mobilise local investment arises. Some 10 to 20 companies should be recruited with no particular regard to size. The bigger, the better.

6. FACTORS IMPEDING FOREIGN INTEREST

In order to achieve the degree of expansion and the necessary levels of investment envisaged in Section 5 foreign know-how and capital will need to be sought at a rate far exceeding past performance. With that end in mind vigourous steps will have to be taken to remedy at least some of the shortcomings currently hindering greater foreign interest in Thailand.

6.1 Competition from other Countries

Thailand is the only country in the area not actively selling its investment potential to the capital exporting countries. This is in sharp contrast with activities of other countries in the area.

Singapore:

Six Investment Centres staffed by full time officials of the Economic Development Board and their supporting staff and five Centres attached to several Embassies sell investment openings in Singapore to the US, England, Japan, Germany, Australia, Thailand, Switzerland and Hong Kong. The promotion budget runs around US $ 1.3 million p.a.

Malaysia:

Federal Industrial Development Authority engages in selective mailing of prospective investors followed up by visits of a hired consultant. It also maintains promotion office attached to the Malaysian Trade Commission in New York.

Hong Kong:

Chinese Manufacturers Association of Hong Kong organises exhibitions of Hong Kong products at home and abroad, with an appropriate follow up of enquiries.

Taiwan:

China Central Trust through several offices in the US and in Europe engages in active promotion of investment opportunities in Taiwan as an adjunct to its normal commercial activities. Taiwan also uses the community of Overseas Chinese to this end. Also the administration of Kaoshiung Export Processing Zone engages in promotion within its own budget.

Korea:

Korean Electronic Industries Promotion Organisation maintains offices in New York and Tokyo and mails selected prospective investors directly from Seoul. Its annual budget is approximately US $ 0.5 million.

Thailand:

Board of Investment is the sole agency in Thailand responsible for promotion of foreign investment. Apart from its running costs it has an annual budget of US $ 28,000 with which to promote Thailand world-wide in all sectors of industry. It is not therefore surprising that with an increasing competition from the other countries in the area the rate of foreign applications has appreciably slowed down in the recent years.

6.2 Lack of Favourable Image

Slow response to enquiries of potential overseas investors, multiplicity of authorities involved in the licencing procedure and ponderous immigration procedure contrast unfavourably with the ways the competing countries handle their investment business. Investment enquiries addressed to Singapore and Malaysia are promptly followed by personal calls of the nearest representative equipped with wining and dining facilities etc. Parties setting up business in Korea or Taiwan need to deal with only a single authority empowered to take decisions on behalf all other government departments involved in the procedure. Entry visas to Hong Kong and Singapore are not required and Korea and Taiwan grant them with minimum delay.

Enquiries have shown that Thailand's image among the business community abroad is of a country controlled through outmoded administrative practices, riddled with red tape and muddling along rather than following its industrial programme with clarity of purpose and single-minded determination. Since potential investors are bound to look at several countries when contemplating a new venture, direct comparision of Thai and other countries practices is inevitable. It is probable that by the time the Thai surface-mailed promotional literature reaches the enquirer he has already decided to invest elsewhere.

6.3 Inferior Incentives

Broadly speaking the incentives which Thailand offers compare with incentives offered by other countries only on points of lesser importance such as the tax exemption and cheap labour. On other points Thailand compares rather unfavourably with the competing countries.

(i) Exemption from Income Tax

The value of this concession is considerably diminished by the fact that no taxable profits are frequently made in the first 2 or 3 years of a new business venture.

(ii) Cheap Labour

Advantage of cheap labour is considerably offset by the greater quantity of labour used in a developing country for a comparable operation (up to 40%), small volume of production, need to hold greater stocks (up to four times), high costs of expatriate management personnel (cost of one expatriate manager equals the cost of some 75 local workers) etc. There is not all that much left in the end.

(iii) Lack of Industrial Estates

Absence of ready made industrial accommodation makes Thailand unattractive to a foreign investor particularly if the image of red tape ridden administration makes the unwelcomed prospect of land/ accommodation hunting even more forbidding.

(iv) Lack of Bonded Warehouse Facilities

Bonded warehouses are an essential facility for an expatriate operation. This omission might not have had serious repercussions in the past but in the light of importance of expatriate activities for the success of component businesses, the situation would have serious consequences in the futher.

(v) Foreign Ownership

100% ownership though permitted in Thailand is not encouraged. While this would seem a sound policy with respect to companies primarily oriented towards the home market it is discouraging for the companies wishing to come on an expatriate basis.

(vi) Company By-laws

By-laws controlling formation of companies seem more complicated than elsewhere.

(vii) Ports

Access to Thailand is congested in comparission with other countries. Ships are reputed to lie for weeks in the Port of Bangkok before being able to unload and then it takes several weeks to push goods through the wharfs.

7. RECOMMENDED POLICIES

7.1 Results to Achieve

It was pointed out previously that plans for expansion of the electronic industry in Thailand to be realistic must be based in the first instance on the domestic market. Thailand has a big enough population and area for the domestic market to constitute an adequate base for development of a reasonably self-contained electronic industry. To this end the following steps should be taken:

(i) Expand the manufacturing base of the consumer sector.

(ii) Create the component sector

(iii) Create a secondary market for components through encouragement of expatriate activities in the country

(iv) Encourage establishment of manufacturing facilities in the capital equipment sector in order to

- reduce imports of communication equipment
- create equipment and systems engineering base for the Thai electronic industry
- further enlarge the component base.

(v) Improve investment promotion practices and facilities so as to attract foreign investment in sufficient volume to sustain the rate of development of the consumer and component sectors.

(vi) Set up an electronic laboratory in order to:-

- create a technological base for the industry
- set up quality standards for Thai products
- maintain an information bank on products of potential investors.

(vii) Set up an executive agency to carry out in a coordinated manner all policies set out below and other which may be formulated during the course of action.

The order of listing does not signify the relative importance of individual steps. Their implementation should proceed simultaneously though some phasing will be necessary. Thus for example improvement of the investment climate Step (iv) must be achieved before any expatriate operations can be attracted and the executive agency (Step (vii)) should ideally be set up first so that all other steps are persued in a coordinated manner and with vigour and determination.

7.2 Consumer Sector

Policy 1:

Expansion of manufacturing facilities of consumer goods should not exceed the rate of expansion of the market. Thai manufacture of consumer equipment should achieve 60% by 1974 and 80% by 1976 of the total demand in order to create an adequate base for the component industry.

Policy 2:

Considering the problem of marketing locally made components to the established assemblers of equipment, policies should be adopted to stimulate the use of Thai made components. For example business tax could be charged on a sliding scale according to the proportion of Thai made components used.

Policy 3:

For local components becoming available granting of promoted status should be made additional on the obligatory use of a stipulated percentage of Thai made components (provided that the components satisfy the quality standards).

Policy 4:

Accommodation of an industrial estate should be made available as one of the incentives. (See Section 8.1)

7.3. Component Sector

Policy 1:

Manufacture of electronic components in Thailand should be encouraged bearing in mind that special measures may be necessary to allow the component manufacturers to survive the first two or three years if the marketing problems prove difficult. For example it could be made possible for component manufacturers to offset trading losses of the first few years of the operations against taxable income after expiration of the promoted status. Alternatively the period of status could be extended to say seven years.

Policy 2:

A campaign should be launched to attract activities of export oriented operations in order to create a secondary market for components in the country. (See Section 7.4.)

olicy 3:

Manufacturers of equipment should be encouraged, perhaps by tax incentives, to use locally made components. Free technical service where design modifications might become necessary to accommodate the local components might be provided by the laboratory recommended in Section 7.7.

licy 4:

Manufacturers of line and radio communication equipment should be invited to participate in setting up local equipment plants to finish or enlarge the demand for components. (See Section 7.5.)

licy 5:

Considering the limited size of the Thai component market fragmentation should be avoided. Initially only two manufacturers, each of adequate size, should be licenced for every component.

licy 6:

Decentralization on an industrial estate should be offered as one of the incentives. (See section 6.1)

7.4. Supporting Component Manufacturing

olicy 1:

Foreign assemblers manufacturing exclusively for foreign markets should be actively encouraged to set up plants in Thailand in order to develop secondary industry for the component and spare service industries. Ten to fifteen companies should be the initial target.

licy 2.

100 foreign ownership of expatriate factories should be permissible in the case of expatriate operations.

licy 3:

Bonded warehouse facilities must be offered to the expatriates.

olicy 4:

Special industrial estate should be set aside for the expatriates. Duty free access to the estate must be offered. (See Section 6.1.)

7.5. Capital Equipment Sector

Policy 1:

Manufacture of capital equipment should be established in the country in order to create indigenous electronic engineering know-how and to give the military a secure source of communication equipment. Important savings on imports would also result.

Policy 2:

Production of telephone switching and transmission equipment should be established either as a fully-owned subsidiary of a foreign company or as a joint venture basis. In the latter case the Telephone Organisation of Thailand could be the local partner.

Policy 3:

Procurement policies of the Government and its agencies (including P.O.T.) should be revised. (See section 6.2.)

Policy 4:

Stricter control over proliferation of private communication systems should be introduced.

Policy 5:

A study should be undertaken of all communication systems operating in the country at present with the view of defining a family of communication equipments that could be economically used in Thailand.

7.6. Public Investment Promotion

Policy 1:

A good image of Thailand in the industrial circles abroad should be created. (See section 6.2.)

Policy 2:

Speculative studies to assess viability of manufacture of new products should be undertaken in order to guide choices.

Policy 3:

Opportunities in the electronic industry should be brought to the notice of investors both here and abroad. Selected companies and individuals should be mailed, visited and exposed to other public promotion methods.

Policy 4:

A "marriage bureau" should be set up to bring together local investors and foreign know-how.

7.7. Electronic Laboratory

Policy 1:

An electronic laboratory must be set up. (See Section 9.)

Policy 2:

Information bank containing data on products of potential investors should be set up and maintained.

Policy 3:

Quality standards for Thai products must be set and promoted. Products meeting the required standards should be entitled to carry "Quality Label".

Policy 4:

The concept of Quality Label should be promoted.

Policy 5:

Design modifications should be carried out when necessary in order to induce Thai assemblers of foreign designed equipment to increase Thai made components. (See Section 7.3.)

Policy 6:

Circuits and equipment should be designed on a contract basis for Thai equipment manufacturers.

Policy 7:

Engineering and management consultancy should be made available to the industry.

7.8. Executive Agency

Policy 1:

Implementation of the previously listed policies should become the responsibility of a single agency. Organisation and method of operation of such an organisation are outlined in Section 9.

8. OTHER RECOMMENDED POLICIES

8.1. Industrial estates and Bonded Warehouses

Effectivness of industrial estates as means of speeding up industrialisation has now been proved in many countries. Two estates should be set up for the benefit of the Thai electronic industry; one for the companies exporting in compliance with established customs procedures and the other for export ors enjoying bonded warehouse privileges. Both estates should offer ready made accommodation. Primarily companies engaged in manufacture of electronic equipment and parts therefor should be housed in the estates but small support industries with broader commercial interests should also be admitted partly for the convenience of the electronic companies and partly in order to bring the estates to sizes which are economic to operate. Both estates should be managed by the National Corporation described in Section 9.

8.2. Government Procurement Policy

In all developed countries government orders significantly contribute to the degree of excellence achieved by the country's electronic industry. This is because government contracts ensure by their size continuity of business and in turn justify substantial investments which are necessary if efficiency of production and quality of design are to be achieved.

In the course of enquiries connected with the present study criticism of the Thai Government procurement policies was heard in many countries. The repeatedly-stated complaint concerned the hitherto practiced policy by the Government to buy the cheapest, regardless whether the cheapest price is a fair price and regardless of the conditions under which equivalent Thai products have to compete.

It is essential that this policy should be changed if any line of telecommunication equipment were to be manufactured in the country. Since the Government is the single largest if even the only client buying this equipment, the Government procurement policies must be such as to give the local manufacturers some guarantee of business.

Of course the question of efficiency of protected industries arises and to some extend Government's trust in the integrity of the people running the so protected enterprises is an essential ingredient of the bargain. However, it should not be beyond the capabilities of

the Government procuring agencies to judge whether inefficiency or illegitimate local conditions are affecting the price. For example the purchasing Government agency could follow the practices of the British Post Office and demand a detailed break-down of the price structures and a right to carry out investigations in the 'protected' factories to establish justification of the demanded prices.

6.3. Manufacturers Association

A serious weakness of the Thai electronic industry at present is the absence of an organized coherence. There appears to be no platform where representatives of individual companies could meet to discuss matters of common interest; there is no voice to give to the Government, the industry's point of view. Instead it would seem that each company communicates with the Government by virtue of personal contacts of its directors who are frequently remote from the problems at working level and accordingly can perform only as an imperfect channel of communications. To remedy the situation an Association of Electronic Manufacturers should be formed, (alternatively it could be formed as a Division of the already existing Thai Industries Association) with the declared purpose to create contacts at the working level between the manufacturers and to provide voice and ear through which the industry would communicate with the Government. The Association should have a seat on any policy-making body likely to take decisions concerning the industry.

Internally the Association should function through activities of Working Parties set up to consider topics of common interest and to formulate the Association's views.

9. EXECUTIVE AGENCY

9.1. Purpose

It was shown in Section 3 that if the present trends persist the total demand for electronic products in Thailand will reach by 1976 the US $150 million mark. In Sections 4 and 5 we established that investments totalling some US $ 47 million will be needed between now and 1976 if imports of electronic equipment were to be kept at approximately their present level. Finally in Sections 7 and 8 we listed policies which will have to be followed if the envisaged investment programme were to be achieved.

Execution of the programme will be a formidable task. It will require a multitude of coordinated actions to be launched in diverse directions sometimes simultaneously and sometimes in well timed sequences. Negotiating skills, practical knowledge of planning in the electronic industry and realistic appreciation of electronic world markets will frequently be needed to solve problems arising from actions. Above all, however, a centre is needed capable to keep the whole operation in its grasp and to supply single-minded drive towards achieving the objective. For this reason a single executive agency should be given the task and the powers to implement the policies listed above and bring about the required benefits.

9.2. Concept

It is proposed that the executive agency be set up and run as a business. It should be at least self-financing and if possible profit-making. It should derive income from selling other people, Thai and foreign alike, in electronic business in Thailand. Accordingly, it could be called "National Corporation for Development of the Electronic Industry" and will be referred to further in this report as the "Corporation".

The Corporation should have full backing of the Government; yet as a business corporation it must be free of Government's direct control or control of any of its agencies.

The Corporation also must have a direct and effective channel of communications with the Government. This should be accomplished through an Electronic Committee who's chairman should have a seat on the Corporation's board. The Committee would also provide a link with the established electronic manufacturers and the principal users of electronic equipment in the country. For this purpose the armed forces, Industries Association, the T.O.T. etc. should have seats on the Committee. See Appendix D for a complete list of members and for listing of its functions.

9.3. Method of Operation

(i) Management

The Corporation will be run by a managing director (M.D.) responsible to a board. Composition of the board will be determined by the owners of the operating capital. The organisation is outlined in a chart in Fig. 7.

The managing director will be supported on the administrative side by a Secretariat and Accounts Department and will delegate his executive responsiblity to four or possibly five divisions, namely the

- Promotion Office
- Economic Evaluation Division
- Industrial Estates Division
- Electronic Laboratory

and possibly

- Manufacturing Division.

(ii) Promotion Office

P.O. would perform largely a public relations function. Its main task would be to create a public image of the Corporation as a dynamic management organisation who "has all the answers" as far as investment in the electronic industry in Thailand is concerned and who can do "all the running" for a client to set him up in business in the country.

(iii) Economic Evaluation Division

This division would be providing all facts and figures needed to determine the direction of the Corporation's policies and for planning of new enterprises. It also would need to hold a comprehensive bank of information on important electronic manufacturers worldwide and on potential local investors in order to act as a "marriage bureau" between Thai and foreign interested parties. The division also would be asked to prepare marketing briefs on the proposed products.

(iv) Industrial Estates Division

In order to facilitate the setting up of new production units the Corporation should run two industrial estates where ready-made accommodation would be available. Two buildings would be required for the purpose, one to house standard promoted companies and the other to serve expatriate users enjoying bonded warehouse facilities.

NOTE: Assuming that the whole of the new consumer and component manufactuing capacity would be accomodated on the 'standard' estate, two 5-storey buildings each 20 meters wide and 60 meters long would be required. Similar 3-storey building would be needed to accommodate a suitable number of expatriate.

(v) Electronic Laboratory

The laboratory would supply technical information on products and would communicate to match the marketing information gathered by the E.E.Division.

No less important task for the laboratory would be to set up quality standards for Thai electronic products and by way of promoting commercial value of its "Quality Label" it should win general acceptance of these standards by the industry.

The laboratory would also engage in original engineering design and applied research work on a speculative basis. The choice of projects should be guided by commercial information supplied by the Economic Evaluation Division and the results offered to potential investors for commercial exploitation.

The laboratory should also provide engineering consulting service to any Thai company requiring it.

(vi) Manufacturing Dividion

This division, if established at all, would come about only later in the Corporation's life. It would come into being only if private interests failed to take up an opportunity of a particular investment. Establishment of a radio communication factory might be a case in point. For example if on the strength of a commercial analysis investment prospects looked unattractive but say for reasons of state security (armed forces) it were advisable to establish a manufacture in the country, the Corporation should negotiate special terms with Government on the basis of which it eventually would set up a factory.

9.4. Method of Financing

It was said earlier that the Corporation should be at least self-financing and if possible profit-making. The Corporation would derive its income from activities of all its divisions. Each division should be operated as a profit centre.

(i) Economic Evaluation Division

The Economic Evaluation Division would derive its income from its marriage bureau. For example the Government could be brought to agree (on the strength of saved imports) that a certain part of the business tax payable by the enterprise fathered by the Corporation should go to the Division. The level would be fixed on the strength of the expected number of successful marriages and the expected running cost of the Division.

In the course of its activities as a "go-between agent" the Division also should be able to find opportunities for obtaining sub-contracts from foreign manufacturers for Thai firms. Commission charged for the service should be another important source of Division's income.

(ii) Industrial Estates Division

The Division's income would come from the rents for the lot premises.

(iii) Electronic Laboratory

The Laboratory's task to find its own financing might be difficult in the early years; that is until the industry has matured sufficiently to find it desirable and profitable to place development contracts. (AIST in Korea even now relies for a part of its income on the yield of the trust capital.) However, certification of quality of products should yield some income and the laboratory could undertake educational activities such as publication of technical magazines, text books etc. and it should organise seminars and exhibitions.

Designing of Thai made components into equipment currently assembled from foreign parts would be an important early source of income. Later income from the patent rights, licencing agreements and even business partnerships based on the results of its original engineering and research work should prove adequate to give the laboratory financial independence.

(iv) Promotion Office

A lot of the public relations work of the Promotion Office would be propaganda applicable to all branches of industry. The office could therefore sell its services to the Board of Investment, to trade and industrial associations and even to private companies wanting to advertise themselves abroad.

9.5. Staff

The Corporation would have to be staffed by professionally qualified people of the highest calibre. It would have to offer remuneration comparable to the incomes attainable among the practising professionals i.e. consultants, accountants, solicitors etc. The managing director would need to be an experienced businessman preferably possessing an engineering (electronic if possible) background.

As for the availability of people of the required calibre the author's experience in Thailand convinced him that these people can be found in the country if properly remunerated; see as the example the case of KIST

9.6. Costs

(i) Operating

It is estimated that during the first 12-18 months of its operations the Corporation would need US $ 450,000 to 650,000 to cover its running costs. Of this sum about 40% should go on salaries and facilities (buildings etc) and 60% on promotion activities and on accumulation of information in the EE Division and the Laboratory.

By 1976 the running costs could reach about US $ 800,000 annually but by that time the corporation should be financing itself. As propaganda aims were achieved the expenditure on activities would shift towards the technical activities of the laboratory.

(ii) Capital

Capital expenditure would be needed to buy office equipment to equip the laboratory and to acquire the buildings for the industrial estates. To equip the offices and laboratory about US $ 200,000 would be needed. An estimate of the costs of the estate buildings should not be difficult to obtain from proper sources.

To obtain the initial capital several possibilities should be considered. Grant or interest-free loan from the Government or an international aid agency would be a simple solution but the possibility of a private investment should not be dismissed without exploring it throughly first. Another possibility might be found in a consortium of one or two finance houses, private subscriptions and perhaps the Government. Whatever the case may be an early feasibility study of the viability of the proposed Corporation and the chances of finding the finance should be carried out. UNIDO assistance might be requested for this task. Job Description is attached in Appendix 2.

10. Terms of Reference

1. Assess the present status of electronic industry in Thailand.
2. Evaluate the markets.
3. Examine present Government policy towards electronic industry and recommend changes if deemed necessary.
4. Make recommendations on improvement and expansion of Thai electronic industry.
5. Point out investment opportunities.
6. Formulate steps to be taken to implement recommendations.
7. Assist in conducting feasibility studies both from technical and economic point of view in support of recommendations.

No work was done on Point 7. The study has established that there is a need for new production units to be set up. They may be new companies or they may be extentions of companies already in business in Thailand. In either case before new investment is connected a feasibility study to determine the optimum size of the plant, the exact amount of investment and the marketing strategy needs to be carried out. Since these studies to be meaningful can be done only in context of a particular proposition there would have been little point in attempting it in general terms. In any case available time did not permit any further work.

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APPENDIX A

NOTE ON METHOD OF ESTIMATING MARKET DEMAND FOR RADIO AND TELEVISION RECEIVERS IN THAILAND

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A.1. Demand for Radio Receivers

The estimated demand for radio receivers is based on projections of per capita income, population growth, price changes, and replacement demand. Since domestic production data is not available and only two observations on total radio receivers in use in Thailand have been made, the derivation of price and income effects on the demand for radio has been obtained by using import data. The replacement demand estimates are based on the fragmentary data on total radio receivers in use in Thailand in the 1958-70 period. The resultant series is the unadjusted annual demand for radio receivers. Finally, the required estimates are obtained by applying a five-year moving average to the unadjusted demand for receivers.

A.1.1. Estimate of Radio Receivers in Use during 1965-70 Period

According to the existing data, the number of radio receivers in use was 238,81[illegible] at the end of 1958, 1,815,550 in 1963,[2] and 2,554,503 in 1968.[3] With these data, interpolation of in-use radio receivers in 1958-70 are calculated by assuming that the

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Thanks are due to Mr. Veera Sritharanon and his friends for computing the equations used in this note.

1/ This was the total number of receivers registered with the Department of Public Relations at the beginning of 1959. See UNESCO, Report of Survey Mission on the Production and Marketing of Low Cost Radio Receivers in Asia, Part II-1: Thailand(1964?),p.7

2/ Ibid., p.9

3/ See Thailand, National Statistical Office, Preliminary Report on Nationwide Radio and Television Survey, 1968/69 (Bangkok:1970),p.1

number of receivers per capita increased at a declining rate[2] or alternatively speaking, the number of persons per in-use receiver during the period decreased with a declining rate.) It is found that the best equation to approximate such change is:

$$(1) \quad Y_t = 13.9 + 92.1\,(0.5076)^t, \quad t = 0,1,2,\ldots 12.$$

where Y_t is the number of persons per in-use receivers in the tth year, and $t = 0$ at 1958. Dividing the total number of population with respective Y_t, estimates of in-use receivers prior to 1971 can be obtained (see series I in Table 1)[4]. On the other hand, one may assume that the rate of growth of the number of sets per capita increased rapidly in the beginning before gradually declining with a saturation level finally being approached. The equation for illustrating such a phenomenon can be stated as follows:

$$(2) \quad X_t = 0.07(1 + 10^{0,8\ -0,36})^{-1}$$

where X_t is the number of receivers per capita in the tth year. Multiplying X_t with number of population, estimates II of in-use receivers prior to 1971 as listed in Table 1 are derived.

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[4] For data on population see Pradit Charsombuti and Melvin H. Wagner, Estimates of the Thai Population, 1947-1976, and Some Agricultural Implications (Kasetsart Economic Report No. 31) (Bangkok: Faculty of Economics and Business Administration, Kasetsart University, 1969), p. 22

A.1.2. Estimate of Radio Receivers in Use during 1971-80 Period

The formula for estimating radio receivers in use in 1971-80 is:

$$(3) \quad Q_t = Q_0[(1+n)(1+e_p r_p)(1+e_y r_y)]^t,$$

$$t = 0, 1, 2, \ldots, 10.$$

$$t_0 = 1970$$

where Q_t is the radio receivers in use in the tth year,

Q_0 is the radio receivers in use in 1970,

n is the rate of population growth,

r_y is the rate of growth of per capita income in terms of 1962 prices,

e_p is the price elasticity,

e_y is the income elasticity, and

r_p is the rate of deduction in the prices of radio receivers.

The value of Q_0 can be obtained from the estimates mentioned in Section 1,1. The rate of population growth in 1970-80 is assumed to be 3.3% 5/, whereas the rate of growth of per capita income is assumed to continue the same performance as the recent past which is 4.6% 6/. The rate is derived by deducting the rate dividing

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5/ The rate of population growth is taken from Thailand, National Economic Development Board, Institute of Population Studies of Chulalongkorn University, and Ministry of Public Health, Population Growth in Thailand (Bangkok: 1970), p.7. The rate is slightly higher than the estimates given in Charsombuti and Wagner, op. cit., p. 24. Their estimates indicate that the growth rates in 1971-76 would range between 3.14% and 3.22%.

6/ The rate seems to be too high in view of the present economic situation especially when there is a substantial decline in American military spending and a slacking Thai export market. But since there is no better estimate of income growth, 4.6% is used here.

of population growth from the average annual growth rate of gross national product at 1962 prices in 1967-69[7]. Note that constant prices of 1962 are used in order to eleminate inflationary effect on the income growth[8].

Since there is no data on price and income elasticities of radio receivers, estimation of the two parameters are done by utilizing import statistics with the assumption that the imported radio receivers would reflect some of the demand features. According to the foreign trade statistics of Thailand[9], imports of radio receivers are classified into two categories, one with special apparatus such as record players and sound recorders attached to them, and the other without. To establish the relationships between receivers, income and prices which are the essential parts of demand pattern, regression analysis is applied to both categories of imports. Significant results, however, are found only in case of receivers with special apparatus. The reason for not being able to obtain any meaningful results from the imports of receivers without special apparatus could be that the demand pattern for such imports has been interrupted by the rising domestic production of the

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7/ For the sake of consistency, both the rate of population growth and the growth rate of gross national product are from the same source. See Thailand, National Economic Development Board, Statistical Tables [of National Income, 1969] (Bangkok:1970), pp. 113 and 115.

8/ In 1967-69, the inflationary effect, measured by the difference of the growth rates of constant and current prices was only 0.9%.

9/ See Thailand, Department of Customs, Annual Statements of Foreign Trade of Thailand, various issues.

similar types of receivers. The receivers with special apparatus are not commonly produced in Thailand, hence the relationships between quantity imported, prices and income are more stable and may be used for forcasting purpose.

The income and price elasticities derived from the 1960-69 import data of receivers with special apparatus are respectively 3.2 and 3.0. The two parameters are estimated from the following equations.

$$(4)\quad \ln Q_t = \underset{(15.9186)}{-41.0303} + \underset{(.0283)}{3.2368}\ \ln GNP_t \qquad R^2 = .88$$

$$(5)\quad \ln Q_t = \underset{(11.2321)}{29.5564} - \underset{(.0768)}{3.0054}\ \ln P_t \qquad R^2 = .90$$

where Q is the quantity imported,

GNP is the gross national product at 1962 prices, and

P is the unit value obtained by dividing the c.i.f. import value with quantity imported.

One reservation, however, should be made in using the two parameters, that is the estimates may be upward biased. Radio receivers with special apparatus are usually more expensive and take up a larger proportion of consumers' total expenditure than the average radio receivers, the estimated price and income elasticities, therefore, are probably higher than those for the less sophisticated models.

As for the rate of change in the price of radio receivers, it is calculated that the average rate of decrease is 3.3 . The formula for such computation is:

$$(6)\quad r_p = \text{anti-log}\left(\sum_i \ln P_t / 82.5 - \sum \ln P_t / 165\right)^{7^{-t}} - 1$$

$$i = -4, -3, \ldots, 0, 1, \ldots, 4, 5$$

$$t = 1, 2, \ldots, 10$$

$$t_0 = 1960$$

Substituting the parameters derived from (4), (5), (6) and the rate of population growth into (3), it can be shown that :

$$(7)\quad Q_t = Q_0 (1.30)^t$$

or the rate of growth of radio receivers in use is approximately 30%. Surprisingly such growth rate differs from the actual annual growth rate between 1958 and 1968 by only 3 .

In projecting in-use radio receivers in 1971-80, prices are assumed to be constant throughout the period, consequently formula (3) is reduced to:

$$(8) \quad Q_t = Q_0 [(1 + n)(1 + e_y r_y)]^t$$

The growth rate of radio receivers in use, therefore, is approximately 18%. From this growth rate, the number of in-use radio receivers as shown in Table 1 can be derived.

A.1.3. Estimate of Demand for Radio Receivers

Assuming that 1/3 of the radio receivers in use in year t-4 are obsolete in year t[10], the number of replacement receivers can be found for each year. Adding the annual increments of radio receivers in use to the number of replacements, the annual demand for radio receivers can be obtained. As mentioned earlier, the final stage of estimating demand for radio receivers is to apply a five-year moving average to the annual demand. The results are shown in Table 1.

A.2. Demand for Television Receivers

The same procedure as that applied to estimating the annual demand for radio receivers is used for television receivers. The income and price elasticities of television receivers are also estimated from import statistics. Since the quantity imported of television receivers with special apparatus is quite small, the estimates of all the necessary parameters are from the import statistics of television receivers without special apparatus. From the import statistics, it can be established that the rate of reduction in prices is 3.7%. The income and price elasticities are 2.7 and 3.7. The two elasticities are obtained from equations

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10/ This is the same assumption made by UNESCO. See UNESCO, op. cit., p. 7.

(9) and (10) :

$$(9)\quad \ln Q_t = -20.0570 + 2.7117 \ln GNP_t \qquad R^2 = .99$$
$$\qquad\qquad\quad (7.1508) \quad (.0127)$$

$$(10)\quad \ln Q_t = -16.6551 - 3.7230 \ln P_t \qquad R^2 = .66$$
$$\qquad\qquad\quad (117.9905) \quad (.2875)$$

With the above estimates, the growth rate of in-use television receivers in 1965-70 can be established at 32%. The rate includes the effects of population growth, income changes and prices deduction as illustrated by formula (3). For 1971-80, no change in prices is assumed, hence according to (8), the growth rate reduces to 16%. Knowing the number of television receivers in-use was 241,375 in 1968[11], the number of in-use television receivers in 1965-80 can be obtained.

To derive the total demand for television receivers, the same assumption about obsolescence as in the case of radio receivers is made. The results of the estimation of demand for television receivers are presented in Table 2.

11/ See Thailand, National Statistical Office, op. cit., p. 1

TABLE 1

Market Demand for Radio Receivers in Thailand

1965 - 1980

Series I

	In-Use Receiver	Increment of In-Use Receiver	Replacement Demand	Total Demand
1965	2,176,678	173,434	359,712	561,501
1966	2,306,853	130,175	482,961	620,761
1967	2,442,630	135,777	588,104	688,307
1968	2,529,505	86,875	667,748	753,237
1969	2,620,696	91,191	725,559	890,996
1970	2,709,540	88,844	768,951	1,029,053
1971	3,197,257	487,717	814,210	1,189,561
1972	3,772,763	575,506	843,168	1,367,114
1973	4,451,860	679,097	873,565	1,597,821
1974	5,253,195	801,335	903,180	1,812,109
1975	6,198,770	945,575	1,065,752	2,088,488
1976	7,314,549	1,115,779	1,257,588	2,438,891
1977	8,631,168	1,316,619	1,483,953	2,877,891
1978	10,184,778	1,553,610	1,751,065	3,395,912
1979	12,018,038	1,833,260	2,066,257	4,077,176
1980	14,181,284	2,163,246	2,438,183	4,728,467

Series II

	In-Use Receiver	Increment of In-Use Receiver	Replacement Demand	Total Demand
1965	2,134,400	162,800	330,400	539,877
1966	2,253,900	119,500	484,300	601,117
1967	2,363,220	109,320	584,000	668,693
1968	2,456,880	93,660	657,200	738,798
1969	2,547,700	90,820	711,467	870,630
1970	2,640,123	92,423	751,300	1,007,391
1971	3,115,345	475,222	787,740	1,159,925
1972	3,676,107	560,762	818,960	1,331,637
1973	4,337,806	661,699	849,233	1,548,620
1974	5,118,611	780,805	880,041	1,764,772
1975	6,039,961	921,350	1,038,448	2,034,592
1976	7,127,154	1,087,193	1,225,369	2,376,408
1977	8,410,041	1,282,887	1,445,935	2,804,161
1978	9,923,848	1,513,807	1,706,203	3,308,910
1979	11,710,140	1,786,292	2,013,320	3,904,514
1980	13,817,965	2,107,825	2,375,718	4,607,326

TABLE 2

Market Demand for Television Receivers in Thailand

1965 - 1980

	In-Use Receiver	Increment of In-Use Receiver	Replacement Demand	Total Demand
1965	104,947	25,442	11,522	33,792
1966	138,530	33,583	15,210	46,553
1967	182,860	44,330	20,077	63,337
1968	241,375	58,515	26,502	85,630
1969	318,615	77,240	34,982	107,605
1970	420,572	101,957	46,177	126,426
1971	487,864	67,292	60,553	148,774
1972	565,922	78,058	80,458	175,374
1973	656,470	90,548	106,205	202,610
1974	761,505	105,035	140,101	242,986
1975	883,346	121,841	162,621	287,837
1976	1,024,681	141,335	188,641	337,290
1977	1,188,630	163,949	218,823	391,257
1978	1,378,811	190,181	253,835	447,858
1979	1,599,421	220,610	294,440	520,475
1980	1,855,328	255,907	341,560	604,711

APPENDIX B

EXPERIMENTAL METHOD FOR CALCULATION OF COMPONENT VOLUMES

In order to obtain means for direct calculation of dollar values of components from wholesale or ex-factory price coefficients listed in Table B.1. were experimentally developed from data contained in Tables B.2., B.3. and B.4.

All data used in these calculations are based on information obtained during numerous interviews with equipment manufacturers in Thailand and in other "electronic" countries in the Far East. Due notice was taken of the low labour rates, minimum overheads, special sales conditions and other factors characteristic for the area.

Table B.1.

Values of Components as Percentages of ex-Factory Prices of Equipment

Component	Consumer Equipment	Line Transmission	Line Switching	Radio Communications
Resistors fixed	1.40	2.00	0.60	1.38
variable	0.38	0.75	0.25	0.52
Capacitors fixed	2.36	3.80	0.70	2.92
variable	3.87	2.80	0.35	1.90
Coils	4.65	5.46	1.20	4.40
Transformers	12.30	12.00	1.90	10.80
Speakers & Earphone	3.81	-	-	1.00
Printed boards	0.73	1.40	-	1.00
Receiving valves	1.05	0.49	-	0.52
Transistors & Diodes	6.20	8.80	-	8.10
C.R.T's	5.40	-	-	-
Relays & Switches	-	-	35.00	0.46
Miscellaneous	2.30	2.50	-	2.00
Component Share	45 %	40 %	40 %	35 %

Table B.2.

Contributions of Component Values to ex-Factory Prices. (%)				
Type of Equipment	Passive Components	Active Components	Relays and El-mech. switches	Mechanical Parts
Consumer	30	15	-	15
transmission	25	15	ng.	10
Switching	5	ng.	35	10
Radio Comm.	30	15	ng.	12

Table B.3.

Average Prices per Component in US ¢										
Fixed Resistor	Variable Resistor	Fixed Capacitor	Variable Capacitor	Coil	Transformer	Speaker	Receiving Valve	Semiconductor	Cathod Ray Tube	Printed Board
0.7	7	1.6	20	10	150	20	20	10	1200	1000 m.sq.

Table B.4.

Typical Quantities of Components in Consumer Equipment (units)			
Component	Broadcasting Receiver	Monochrome TV Set	Colour TV Set
Resistor fixed	24	92	300
variable	1	4	5
Capacitor fixed	27	115	350
variable	1	10	30
Coil	9	34	90
Transformer	2	3	10
Receiving valve	-	6.3	-
Transistor/Diode	13	12.6	70
CRT	-	1	1
Speaker	1	2	3
Printed board (m.sq.)	0.014	0.06	0.12

One third of TV sets were considered to use receiving valves and two thirds transistors only.

APPENDIX C

DETAILS OF INVESTMENT OPPORTUNITIES IN COMPONENTS

In order to achieve a reasonably graduated progression annual production targets were set as percentages of the total annual demand as follows:

1973 ..... 1/6
1974 ..... 1/3
1975 ..... 1/2
1976 ..... 2/3

C.1. Fixed Resistors

Types : solid carbon and carbon film
metal film
wire wound
ceramic

Carbon resistors account for some 75 % of total world production.

Minimum annual economic production is around 10 million units. This a stabilised technology with little price movement over the years.

Table C.1.

(US $ million)

	73	74	75	76
Additional Quantities (million units)	12	16	27	56
Additional Output	0.09	0.11	0.19	0.39
Additional Fixed Assets	0.04	0.04	0.06	0.16
Additional Working Capital *)	0.03	0.03	0.05	0.12
Additional Jobs (units)	35	35	45	95

* Assumed rate of turnover equals 4.

C.2. Variable Resistors

Types : preset
continuously variable

Carbon film or film for both types
Minimum annual quantities around 200,000.
Technically relatively demanding product.
Usually not made in the early years of component production in a country.

Table C.2.

(US $ million)

	73	74	75	76
Additional Quantities (million units)	-	0.90	0.75	2.0
Additional Output	-	0.07	0.06	0.15
Additional Fixed Assets	-	0.025	0.025	0.05
Additional Working Capital	-	0.02	0.02	0.04
Additional Jobs (units)	-	45	45	85

C.3. Fixed Capacitors

Types : paper (30 % of world production)
electrolytic
aluminium (20 % " ")
tantalum (20 % " ")

mica
mylar
ceramic (15 % " ")
titanium

Paper, aluminium and ceramic capacitors are suitable for Thai production. Tantalum condensers suitable only for pulse circuits.

Minimum economic annual production about 7-8 million.

Well developed technology except tantalum which is relatively new.

Table C.3. (US $ million)

	73	74	75	76
Additional Quantities (million units)	9	12	20	41
Additional Output	0.12	0.23	0.32	0.70
Additional Fixed Assets	0.05	0.08	0.10	0.22
Additional Working Capital	0.04	0.06	0.08	0.15
Additional Jobs (units)	60	90	125	250

C.4. Variable Condensers

Types : air
PVC

Both type in single or multi-gang variety
Minimum economic annual production some 200,000 units.
Technically relatively demanding product.
Usually not made in the early years of component production in a country

Table C.4. (US $ million)

	73	74	75	76
Additional Quantities (million units)	1.1	1.6	2.8	5.3
Additional Output	0.22	0.35	0.56	1.0
Additional Fixed Assets	0.03	0.11	0.19	0.32
Additional Working Capital	0.06	0.09	0.15	0.24
Additional Jobs (units)	125	180	310	505

C.5. Coils

Minimum economic annual production around 200,000 units. Very simple process imminently suitable for a developing country.

Table C.5. (US $ million)

	73	74	75	76
Additional Quantities (million units)	2.5	3.4	6.0	12.5
Additional Output	0.25	0.37	0.62	1.25
Additional Fixed Assets	0.05	0.07	0.13	0.25
Additional Working Capital	0.04	0.06	0.10	0.19
Additional Jobs (units)	85	125	210	420

C.6. Transformers

Types : input
audio
video
power
fly-back
chokes

Minimum economic annual production
about 50,000 units
Simple process well suited for a developing country.

Table C.6. (US $ million)

	73	74	75	76
Additional Quantities (million units)	0.41	0.80	1.15	2.25
Additional Output	0.70	1.15	1.75	3.65
Additional Fixed Assets	0.18	0.27	0.41	0.87
Additional Working Capital	0.14	0.21	0.32	0.66
Additional Jobs (units)	285	450	680	1350

C.7. **Speakers and Earphones**

Minimum economic annual production around 100,000 units.
Number of types and sizes.
Starts as an assembly operation of imported components.

Table C.7. (US $ million)

	73	74	75	76
Additional Quantities (million units)	0.25	0.30	0.62	1.12
Additional Output	0.22	0.35	0.50	1.05
Additional Fixed Assets	0.05	0.09	0.13	0.25
Additional Working capital	0.05	0.09	0.13	0.25
Additional Jobs (units)	25	35	50	100

C.8. Printed Boards

Types : single sided
double sided

Table C.8. (US $ million)

	73	74	75	76
Additional Quantities (000 m.sq.)	4.1	7.0	11.2	22.5
Additional Output	0.05	0.07	0.12	0.23
Additional Fixed Assets	0.02	0.025	0.04	0.08
Additional Working Capital	0.020	0.025	0.04	0.08
Additional Jobs (units)	20	28	41	88

C.9. Cathode Ray Tubes

Types : monochrome
colour

Minimum economic annual production around 60,000 units

Complex process requiring a lot of special machinery and very strict control of quality. Monochrome tubes in the period under review.

Prices have been declining at about 10 % per annum. Screens based on liquid crystals and/or semi-conductor matrices exist in laboratory stages and will replace CRT's toward the end of 1970's.

Table C.9. (US $ million)

	73	74	75	76
Additional Quantities (thousand units)	-	63	63	125
Additional Output	-	0.75	0.75	1.5
Additional Fixed Assets	-	0.32	0.32	0.75
Additional Working Capital	-	0.29	0.29	0.56
Additional Jobs (units)	-	95	95	175

C.10. Semiconductor Devices

Transistors and diodes although their quantities and dollar volumes are shown in Tables 6 and 7 have not been processed here since it is not recommended that production or over assemblies should start in Thailand during the considered period. There is a very considerable over production world wide at present and the devices are sold at low prices. Only large world companies capable to subsidise the production, directly or indirectly, can afford to be in this business at present.

APPENDIX D

ELECTRONIC COMMITTEE

D.1. Membership

National Corporation for Development of El. Industry
Ministry of Industry
Board of Investment
Industrial Finance Corporation (IFCT)
Bankers Association
Electronic Industries Association
Telephone Organisation (TOT)
P and T Department
National Research Council

D.2. Functions

Define national policy
Set promotion priorities for next 5 years
Set targets for types and numbers of factories wanted in
(a) domestic sector, (b) expatriate sector
Recommend fiscal and promotion policies to Government

APPENDIX ME

DRAFT JOB DESCRIPTION

Post Title: Business Planning Expert

Duration: Four months

Date Required: As soon as possible

Duty Station: Bangkok

Duties:

In close cooperation with the officers of the Ministry of Industry, the members of the Electronic Committee and possibly with other Government or semi-Government agencies to study the feasibility of setting up a corporation for the purpose of promoting and developing electronic industry in Thailand. The duties will include:-

a) detailed evaluation of the commercial viability of the project.

b) accurate assessment of the capital needs of the proposed corporation.

c) examination of the possibilities to raise the required capital.

d) drafting the terms of reference of the corporation and of its modus operandus.

e) proposing alternative means of active promotion of the electronic industry should the concept of the corporation prove commercially impractical.

Qualifications: Extensive knowledge of technical and marketing problems and practical experience of planning business ventures in several sectors of electronic industry.

Language: English

Background Information

Analysis of Thai electronic industry's capabilities and projections of the demand for electronic equipment has recently been carried out. The study concluded that extensive investment programme will have to be implemented to achieve the needed rate of expansion. Since the available facilities for promotion of industrial investment were found inadequate for the task the study has proposed to set up a corporation to plan,

promote and execute the programme. It is envisaged that the corporation will be run on business lines deriving its own income from charging for services rendered in marketing and engineering fields and for introductions of prospective investors to business opportunities. It is also envisaged that the corporation will run its own industrial estates. The profits will be applied to publicise at home and abroad the investment opportunities in the Thai electronic industry.

DRAFT JOB DESCRIPTION

APPENDIX F

Post Title: Electronic Market Planning Expert

Duration: One year with possible extension

Date Required: As soon as possible

Duty Station: Bangkok

Duties: To set up an information bank as an aid to the promotion drive to enlarge enlarge the electronic industry in Thailand. The bank should collect all marketing and technical information relevant to pre-investment studies of markets and products and needed for periodic re-appraisals of the national development policy with respect to the electronic industry. The bank should make use of the Economic Evaluation Group (EEG) and the Instrument Repair and Calibration Centre (IRCC) of the Applied Scientific Research Corporation of Thailand using EEG for work in the marketing area and IRCC in the technical area. The expert's particular duties will be :

a) To set up programme of work for EEG and IRCC to meet the needs of the information bank. Apart from collection of information the work may involve a programme of pre-investment studies on the part of EEG and complementary programme of equipment and component evaluation by IRCC

b) To devise administrative means of controlling the electronic work within the ASRCT and in coordination with complementary activities of Board of Investment, Ministry of Industry, the Industrial Finance Corporation and other agencies interested in electronic industry.

c) Recommend changes in the present organisation of EEG and IRCC in order to make them fit into the new pattern.

d) Act as an adviser to EEG and IRCC on matters concerning their new activities.

Qualifications: Extensive knowledge of technical and marketing problems and practical experience of planning business ventures in several sectors of electronic industry.

Language: English

Background Information:

Analysis of Thai electronic industry's capabilities and projections of the demand for electronic equipment has recently been carried out. The study concluded that extensive investment programme will have to be implemented to achieve the needed rate of e expansion. The programme will have to be supported by marketing and technical information not available at present.

10. INTERMEDIATE ACTIONS

In order not to waste valuable time before the Executive Agency can be set up some intermediate steps ~~could~~ should be taken immediately. Activities thus started could be later transfered to the Agency.

(I) An Electronic Committee composed as per Appendix D should be immediately convened in order to set in practice recommendations contained in this report and to define new policies as necessary.

(II) Economic Evaluation Group (EEG), of the Applied Scientific Research Corporation of Thailand should be asked to set up an information centre on ~~the~~ electronic industry as outlined in Sub-section 9.3.

(III) Instrument Repair and Calibration Centre (IREC),

of the Applied Scientific Research Corporation of Thailand should be asked to undertake tasks of the Agency's electronic laboratory as outlined in Subsections 7.7 and 9.3 (v).

(vi) Board of Investment should adopt more dynamic practi

(ix) An officer should be appointed in the ASRCT to supervise and coordinate the new activities of EEG and IREC. Services of an UNIDO Expert could be requested for an initial period. Draft Job Specification is attached in Appendix F.

(x) Board of Investment should adopt more dynamic practices of promoting domestic and foreign investment in accordance with recommendations in Sub-section 7.6.

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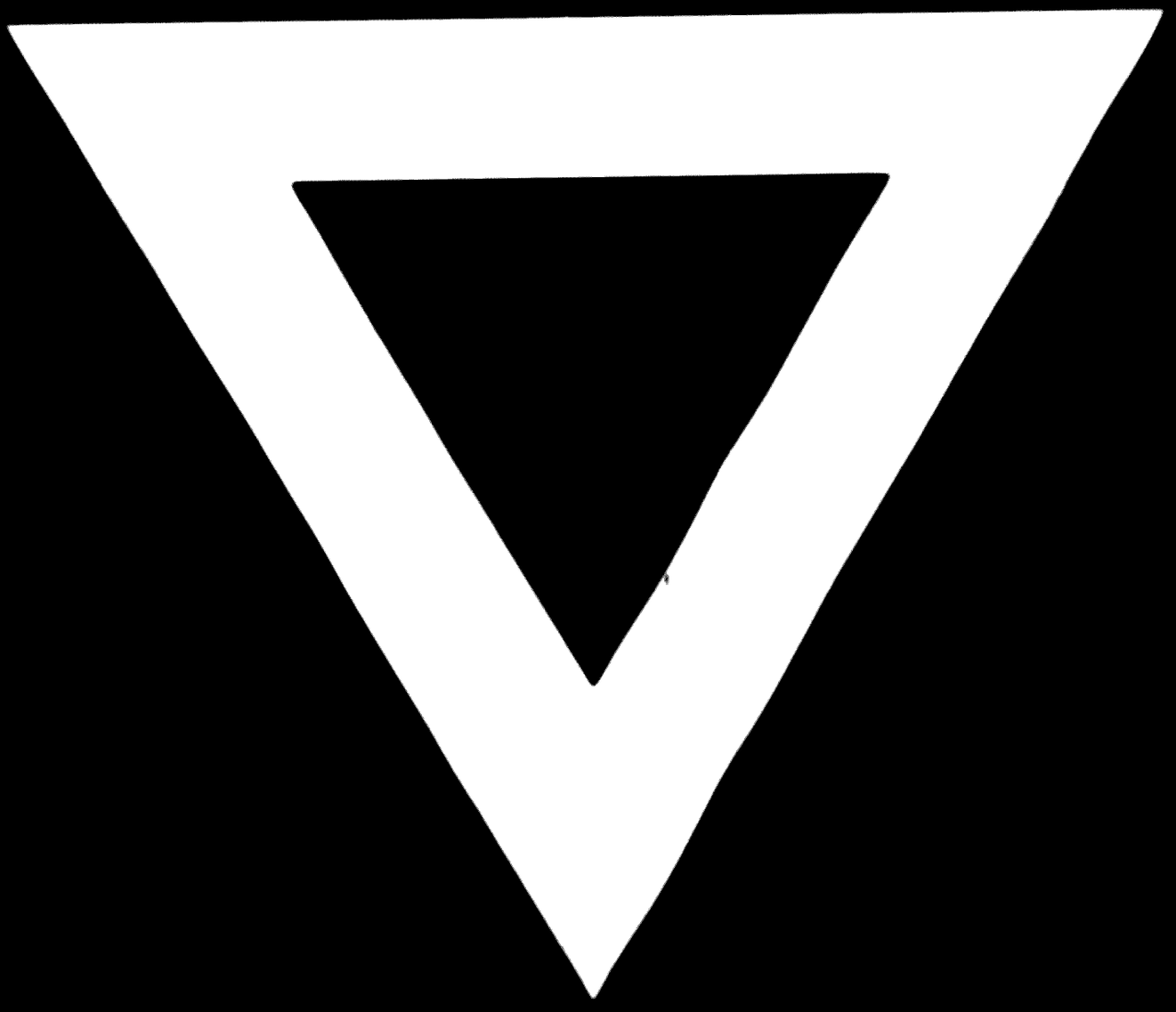

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