by making the annual growth rate of exports (10%) higher than the growth rate of imports (7.7%).

Since the present program is a promotion program for the import substitution industry with the aim of introducing the domestic purchase of intermediate products (metal parts, etc.) which have so far been imported, it will have a direct effect on the saving of foreign currency. With the purchase of machinery from abroad as part of the investment in plant and equipment and the import of capital goods, however, some raw materials and quasi-materials will obviously increase. As a result, the saving of foreign currency under this program may be low in the short-term but will definitely be beneficial in the long-term viewpoint.

Moreover, the impact of the proposed program on Indonesian industry will certainly enlarge the industrial base. The localization of capital goods which are currently imported, the expansion of the domestic markets for certain types of parts or products and the export of products with international competitiveness achieved by the improvement of the production technologies will all contribute to the improved balance of payments in the future.

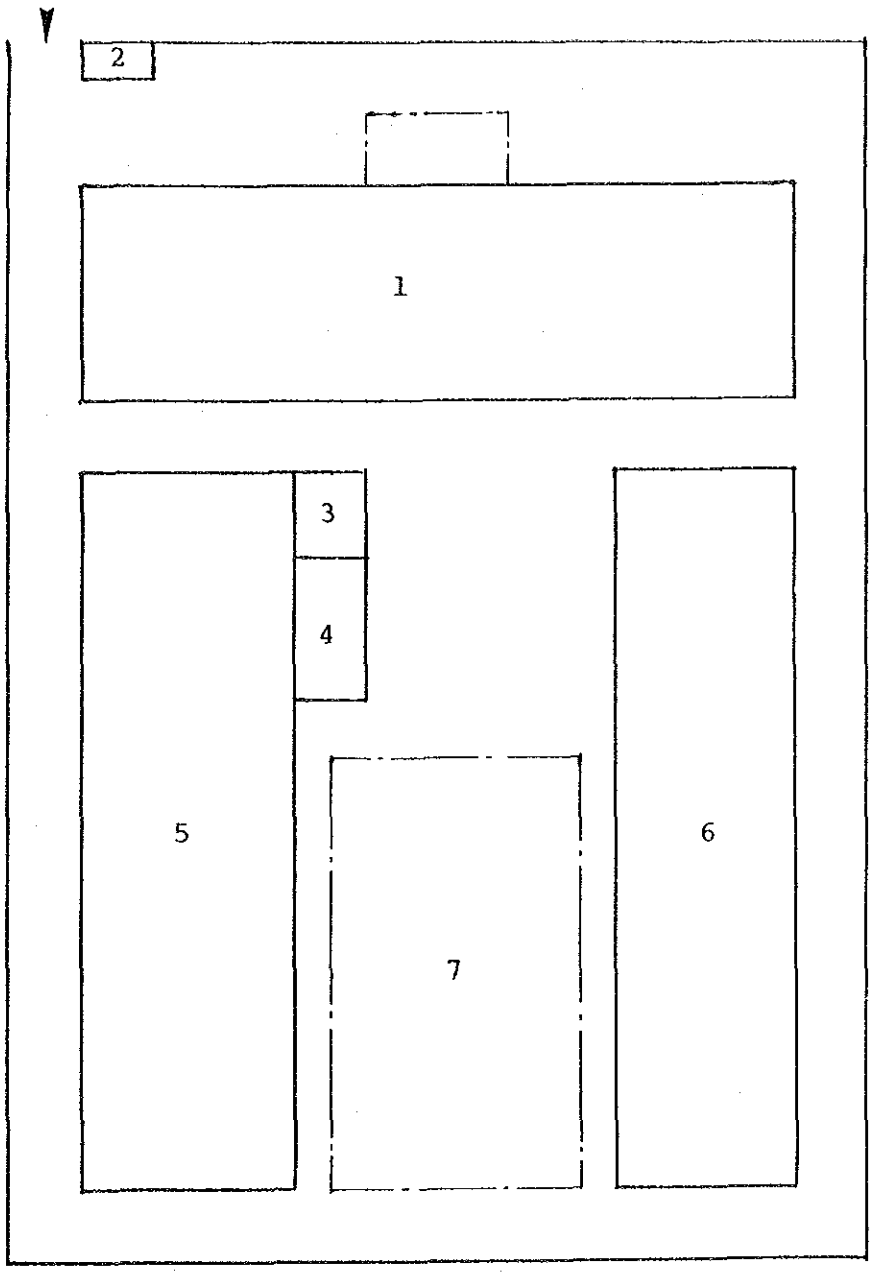
7.8.3 Indirect Benefits Caused by the Program

As the Indonesian Government's policy guidelines stipulate the active involvement of private companies in the economic development activities, it is recognized that economic development following the introduction of REPELITA I cannot be achieved solely by governmental efforts but requires the participation of the private sector. Particular emphasis is placed on the development of small companies with domestic capital, generally described as "industries with a weak economic background", which account for more than 90% of all companies. The fact that most of these small companies have hardly any business dealings with the large, public corporations or foreign affiliates, having almost a different world from these large companies, has been repeatedly mentioned in this Report.

REPELITA VI emphasises the expansion of the linkages between large, medium and small industries. As a result, it gives priority to those measures converting weak, small-size companies into modern, medium-size companies. In this regard, REPEITA IV tries to enforce an economic policy whereby private companies are fostered, together with the general expansion of the industrial base, instead of a social policy simply aiming at "protecting the weak".

The present Study has already confirmed the existence of medium and small size machine/metal processing companies with good prospects to become modern, medium standing companies. Therefore, it can be expected that the implementation of the present program will stimulate the fostering of private industrial capital and that economic development in Indonesia can be achieved by means of actively utilizing the vigorousness of the private sector in the national efforts for industrial development.

Figure 7.1 LAYOUT FOR CSF



1.	Main Office Building (2 stories)	750 x 2 M^2
2.	Guard House	15
3.	Power Sub-station	30
4.	Store House	50
5.	No.1 Work Shop	750
6.	No.2 Work Shop	600
7.	Car Park	---
Building Area		2,945 m^2 (49.5%)
Land Area (70 m x 85 m)		5,950 m^2

Figure 7.2 ORGANIZATION CHART FOR CSF

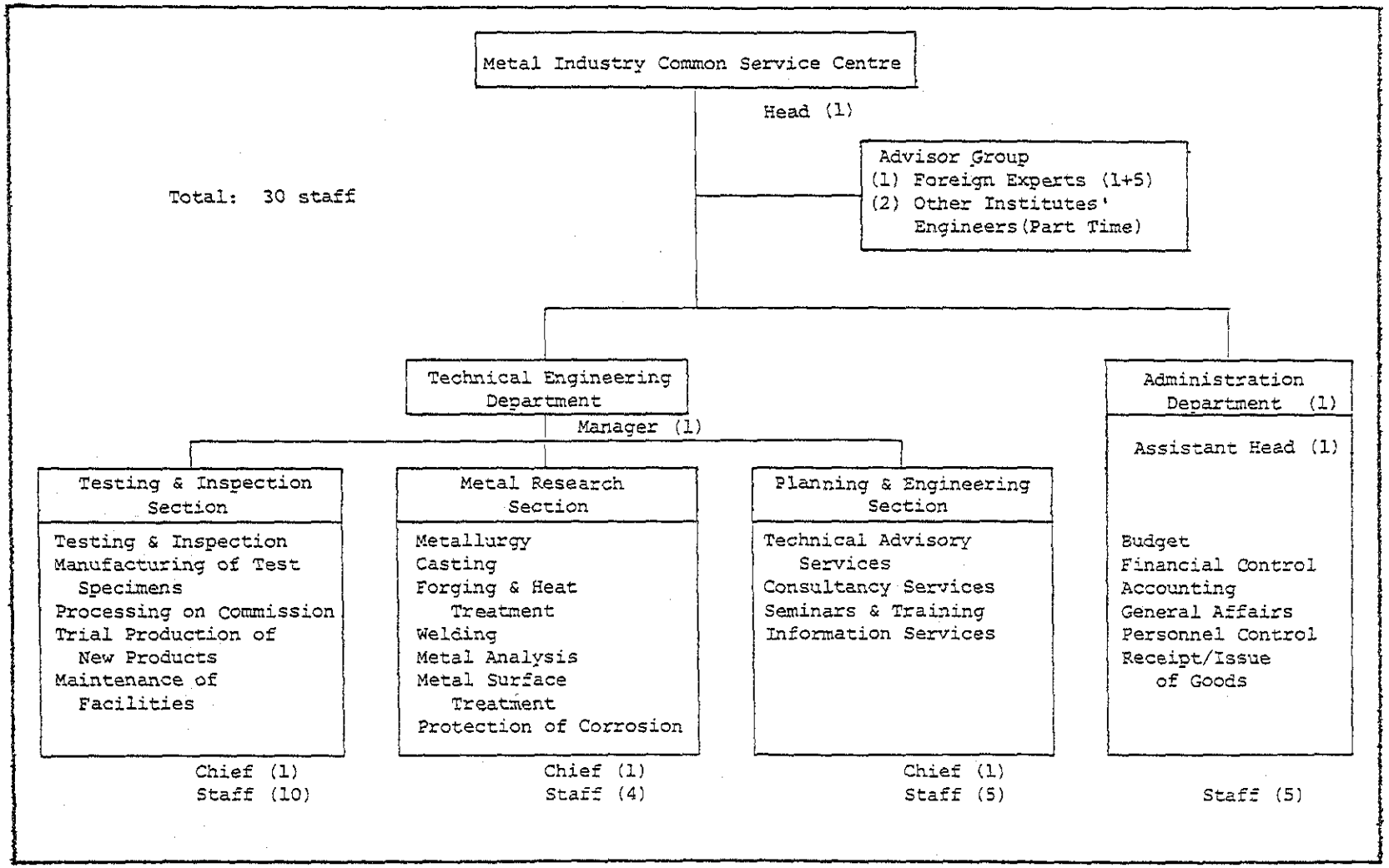


Figure 7.3 OVERALL FRAMEWORK OF EXECUTION OF THE PROGRAM

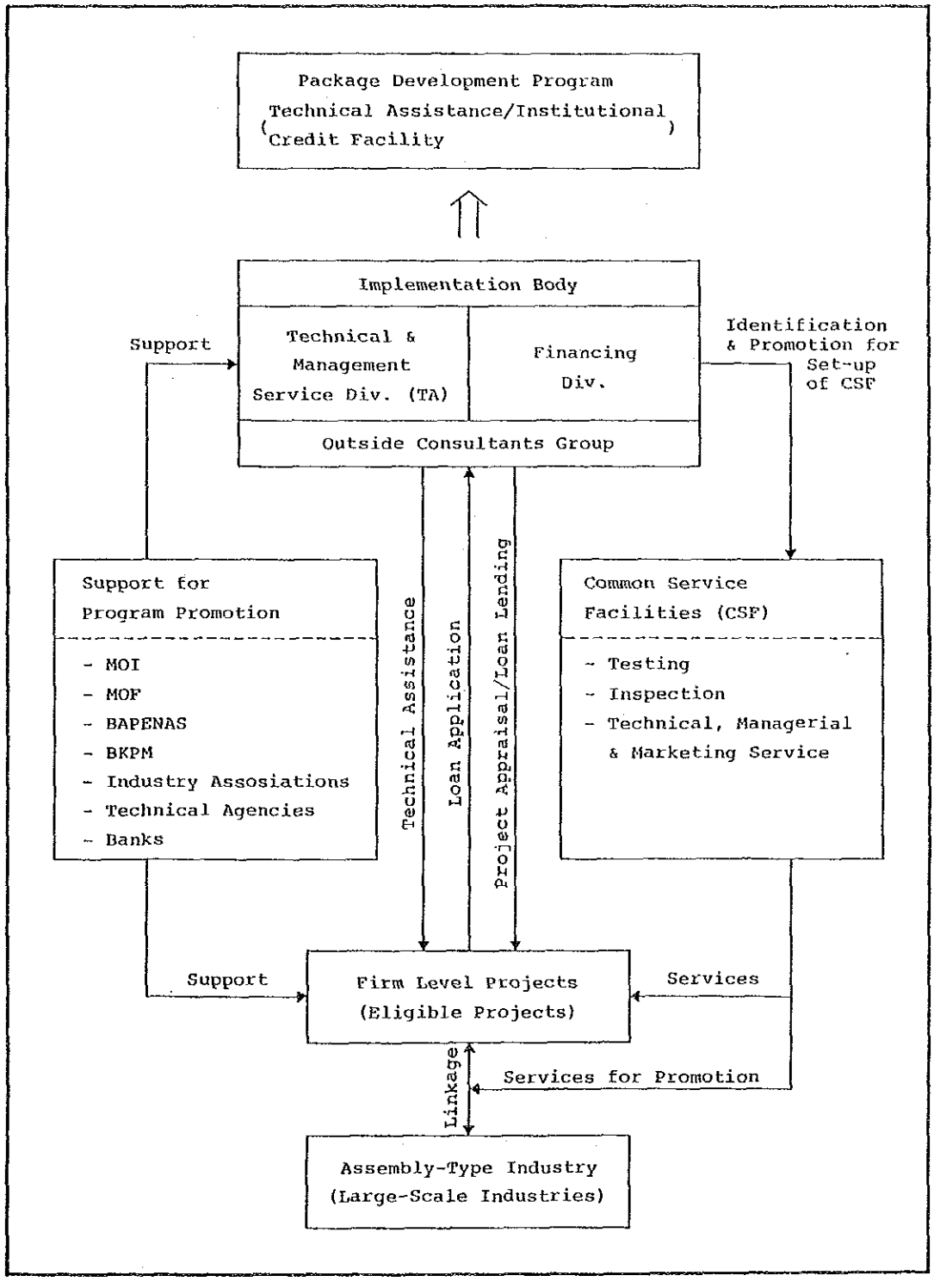


Table 7.1 EQUIPMENT LIST FOR CSF

(1/2)

Section	Name	Q'ty	Specification
(1) Facilities of testing and inspecting of metals	Testing machine	1	Universal type
	Fatigue testing machine	1	
	Hardness tester		
	Vickers hardness	1	
	Micro vickers hardness	1	
	Brinell hardness	1	
	Rockwell hardness	1	
	Shore hardness	1	
	Charpy impact tester	1	
	Magnetic particle inspection equipment	1	
	Ultrasonic flaw detector	1	
	X-Ray inspection equipment	1	
	Metallurgical microscope	1	
	Scanning microscope	1	
	Electron probe micro analyser	1	
	Emission spectrometer	1	
	Nodularity detector	1	
	Carbon equivalent meter with 3E meter	1	
	Others	1 set	
(2) Precise measuring equipment	Three dimension measuring device	1	
	Projector etc.	1	
	Profile projector	1	
	Roundness tester	1	
	Surface roundness tester	1	
	Measuring microscope	1	
	Gear inspection testers		
	Universal gear tester	1	
	Pitch tester	1	
	Hob tester	1	
	Gauge blocks	1 set	
	Micrometers	1 set	
	Dial guages	1 set	
	Level guages, vertical guages	1 set	
	Others	1 set	
(3) Dynamic performance testing apparatus	Dynamic balancing machine	1	
	Vibration analyser vibration level meter	1	
	Tachometer, sound level meter	1	
	Automatic temparature recorder	1	
	Dynamometer	1	
	Others	1	

Table 7.1 (Continued)

(2/2)

Section	Name	Q'ty	Specification
(4) Machine tools for manufacturing test specimen	Precision lathe	1	
	Jig milling	1	
	Shaper	1	
	Surface grinder	1	
	Cutting tool grinder	1	
	Bench drilling machine	1	
	Band sawing machine	1	
	Cutting tools and others	1 set	
(5) Special equipment for precise machining 1/	Electric discharge machine	1	
	Wire-cut electric discharge machine	1	
	Gear grinder	1	
	Surface grinder	1	
	Universal tool grinder	1	
	Gear hob grinder (hob sparpener)	1	
	Gear shaper	1	
	Internal cylindorical grinder	1	
	High frequency induction hardering equipment	1	
	Carborizing/nitriding furnace	1	
	Cutting & grinder tools, others	1 set	

Note: 1/ This section is included only in case.

Table 7.2 ESTIMATED CAPITAL REQUIREMENTS FOR CSF (CASE 1)[1/]

(Unit: US$ 1,000)

Item	Foreign	Local	Total
1. Plant direct cost			
(1) Equipment, materials	1,588.1	-	1,588.1
(2) Spare parts (1) x 5%	79.4	-	79.4
(3) Ocean freight (217.0 ton)	10.9	-	10.9
Insurance	23.8	-	23.8
Inland transportation (217.0 ton)	-	4.3	4.3
(4) Civil	-	1,480.7	1,480.7
(5) Erection (1) x 8%	-	127.0	127.0
(6) Superviser civil x 5%	74.0	-	74.0
(7) Office accommodation & facilities (1) x 2%	-	31.8	31.8
(8) Engineering & supervising (1) x 10%	158.8	-	158.8
(9) Over head expense [(1) to (8)] x 10%	193.5	164.4	357.9
Sub-total	2,128.5	1,808.2	3,936.7
2. Tax and duty			
(1) Import tax CIF x 10%	-	170.2	170.2
(2) Import sales tax CIF x 10%	-	170.2	170.2
(3) Value added tax Local x 10%	-	180.8	180.8
Sub-total	-	521.0	521.0
3. Contingency & other (1 + 2) x 20%	425.7	465.8	891.5
Grand-total	2,554.2	2,795.0	5,349.2

Note: (CASE 1) does not include the facilities of (5) in Table 7.1

Table 7.3 ESTIMATED CAPITAL REQUIREMENTS FOR CSF (CASE 2)[1/]

(Unit: US$ 1,000)

Item	Foreign	Local	Total
1. Plant direct cost			
(1) Equipment, materials	2,737.0	-	2,737.0
(2) Spare parts (1) x 5%	136.9	-	136.9
(3) Ocean freight (403.0 ton)	20.2	-	20.2
Insurance	41.1	-	41.1
Inland transportation (403.0 ton)	-	8.1	8.1
(4) Civil	-	1,480.7	1,480.7
(5) Erection (1) x 8%	-	219.0	219.0
(6) Superviser civil x 5%	74.0	-	74.0
(7) Office accommodation & facilities (1) x 2%	-	54.7	54.7
(8) Engineering & supervising (1) x 10%	273.7	-	273.7
(9) Over head expense [(1) to (8)] x 10%	328.3	176.3	504.6
Sub-total	3,611.2	1,938.8	5,550.0
2. Tax and duty			
(1) Import tax CIF x 10%	-	293.5	293.5
(2) Import sales tax CIF x 10%	-	293.5	293.5
(3) Value added tax Local x 10%	-	193.9	193.9
Sub-total	-	780.9	780.9
3. Contingency & other (1 + 2) x 20%	722.2	543.9	1,266.1
Grand-total	4,333.4	3,263.6	7,597.0

Note: (CASE 2) includes the facilities of (5) in Table 7.1

Table 7.4 COMPARATIVE STUDY IN OUTSTANDINGS OF RUPIA-ADVANCE, FOREIGN ASSETS, BORROWING AND DEPOSITS, END 1983, 1984

(Unit: billion Rp.)

	1983						1984					
	BNI'46	BRI	BEII	BBD	BDN	BAPINDO	BNI'46	BRI	BEII	BBD	BDN	BAPINDO
I. Whole Bank Account												
Rp advance	1,973	2,397	917	2,391	2,242	836[1/]	2,931	4,075	1,376	3,133	2,374	992
Foreign exchange assets	2,698	111	867	755	1,820	6	3,616	292	855	957	1,628	6
Demand deposit	789	757	433	560	408	12	1,027	1,246	742	715	485	15
Time/saving deposit	744	425	633	748	672	60	852	564	789	1,066	733	85
Total deposit	1,533	1,182	1,067	1,309	1,081	70	1,879	1,810	1,531	1,782	1,218	100
Borrowing	904	1,515	209	1,220	1,649	636	1,390	3,129	310	1,573	1,348	779
Foreign exchange liabilities	2,069	23	310	588	795	2	3,259	39	376	771	1,289	-
II. Per Branch Office												
Rp advance	8.2	8.2	18.7	31.1	28.7	39.8[1/]	(12.1)	13.9	26.0	40.2	26.7	47.0
Demand deposit	3.3	2.6	8.9	7.3	5.2	0.6	(4.2)	4.3	14.0	9.2	5.5	0.7
Time/saving deposit	3.1	1.4	12.9	9.7	8.6	2.9	(3.5)	1.9	14.9	13.7	8.2	4.0
Total deposit	6.4	4.0	21.8	17.0	13.9	3.5	(7.8)	6.2	28.9	22.9	13.7	4.7
III. Per Employee MM[2/]												
Advance	154	75	217	350	337	856[1/]	n.a	n.a	n.a	n.a	300	963
Demand deposit	61	23	102	82	61	13	n.a	n.a	n.a	n.a	61	15
Time/saving deposit	58	13	150	109	101	62	n.a	n.a	n.a	n.a	92	82
Total deposit	119	37	253	191	162	75	n.a	n.a	n.a	n.a	154	97

Notes: 1/ BAPINDO's advance includes equity investments
2/ Unit million Rp

Source: Annual Report from each bank

Table 7.5 COMPARATIVE STUDY OF MANAGERIAL PERFORMANCE AMONG SIX STATE BANKS, END 1983, 1984

(Unit: billion Rp.)

	1983						1984					
	BNI'46 (%)	BRI (%)	BEII (%)	BBD (%)	BDN (%)	BAPINDO (%)	BNI'46 (%)	BRI (%)	BEII (%)	BBD (%)	BDN (%)	BAPINDO (%)
A. Total assets	4,955	3,004	2,050	3,467	4,015	970	7,063	5,299	2,601	4,515	4,920	1,201
B. Capital account 1/	195	165	113	209	151	96	270	177	146	244	331	134
C. No. of employees	12,812	31,779	4,215	6,835	6,649	976	n.a	n.a	n.a	n.a	7,904	1,030
D. No. of branch offices	241	294	49	77	78	21	(241)	293	53	78	89	21
E. Gross income	510	271	215	333	353	92	812	445	322	414	426	124
F. Profit before tax	79	19	46 2/	20	64	12	92	46	70	25	54	9
G. Financial expenses	280	93	85	168	202	48	491	211	162	262	276	67
H. Administrative cost	224	157	80	132	86	31	229	190	88	123	95	48
(Out of which reserve for possible loss)	(108)	(27)	(30)	(73)	(28)	(9)	(73)	(35)	(44)	(53)	(40)	(29)
E/A (%)	10.3	9.0	10.5	9.6	8.8	9.5	11.5	8.4	12.4	9.2	8.7	10.4
F/A (%)	1.6	0.7	2.3	0.6	1.6	1.3	1.3	0.9	2.7	0.6	1.1	0.8
G/A (%)	5.7	3.1	4.1	4.8	5.0	5.0	7.0	4.0	6.2	5.8	5.6	5.6
H/A (%)	4.5	5.2	3.9	3.8	2.2	3.2	3.2	3.6	3.4	2.7	1.9	4.0
A/C (%)	0.39	0.09	0.49	0.51	0.60	0.99	n.a	n.a	n.a	n.a	n.a	1.17
A/D (%)	20.56	10.22	41.85	45.03	51.49	46.20	(29.3)	18.09	49.09	57.89	62.26	57.20
E/D (%)	2.116	0.922	4.388	4.325	4.526	4.381	(3.369)	1.519	6.075	5.282	4.787	5.905
E/C MM 3/	39.8	8.5	51.1	48.8	53.2	94.5	n.a	n.a	n.a	n.a	54.0	121.1
F/C	6.2	0.6	11.1 2/	3.0	9.7	12.5	n.a	n.a	n.a	n.a	6.9	8.8
G/C	21.9	2.9	20.2	24.7	30.5	49.7	n.a	n.a	n.a	n.a	34.9	65.2
H/C	17.5	5.0	19.2	19.4	13.0	32.2	n.a	n.a	n.a	n.a	12.1	47.0

Notes: 1/ Capital accounts excluding profit of current year.
2/ BEII's profit before tax is excluded net other non-operating income in 1983; other non-operating income 115.3 billion Rp.; other non-operating expenses 4.3 billion Rp.
3/ From E/C through G/D, unit is million Rp.

Source: Annual Reports from each bank

Table 7.6 COMPARATIVE STUDY FROM THE GENERAL MANAGEMENT INDEX OF SIX STATE-BANKS

	1983						1984					
	BNI'46	BRI	BEII	BBD	BDN	BAPINDO	BNI'46	BRI	BEII	BBD	BDN	BAPINDO
1. Total marks	4 (0)	2 (2)	7 (4)	6 (0)	9 (1)	5 (4)	2 (0)	-	4 (4)	4 (0)	4 (0)	4 (2)
Ranking	5	6	2	3	1	4	5	6	1	3	3	2
2. Ratio net worth[1]/total operating assets	-	-	-	1 (0)	1 (0)	1 (1)	-	-	-	1 (0)	1 (0)	1 (1)
Ranking				3	2	1				3	2	1
3. Efficiency of total operating assets	2 (0)	-	2 (2)	1(0)	1 (0)	-	2 (0)	-	2 (2)	-	1 (0)	1 (0)
Ranking	2		1		3		2		1		3	3
4. Per branch - advance balance	-	-	-	1 (0)	1 (0)	1 (1)	-	-	-	1 (0)	1 (0)	1 (1)
Ranking				2	3	1				2	3	1
5. Per branch - deposit balance	-	-	1 (1)	1 (0)	1 (0)	-	-	-	1 (1)	1 (0)	1 (0)	-
Ranking			1	2	3				1	2	3	
6. Per branch - gross income	-	-	1 (0)	-	1 (1)	1 (0)	-	-	1 (1)	1 (0)	-	1 (0)
Ranking			2		1	3			1	3		2
7. Per employee - advance balance	-	-	-	1 (0)	1 (0)	1 (1)						
Ranking				2	3	1						
8. Per employee - deposit balance	-	-	1 (1)	1 (0)	1 (0)	-						
Ranking			1	2	3							
9. Per employee - gross income	-	-	1 (0)	-	1 (0)	1 (1)						
Ranking			2		3	1						
10. Per employee - financial cost	1 (0)	1 (1)	1 (0)	-	-	-						
Ranking	3	1	2									
11. Per employee - administration cost	1 (0)	1 (1)	-	-	1 (0)	-						
Ranking	3	1			2							

Note: 1/ Net worth excluding current year profit.

Source: Annual Report from each bank

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Section 1 INDONESIAN ECONOMY AND INDUSTRY - ROLE AND POSITION OF THIS STUDY IN THE FRAMEWORK OF REPELITA IV -

1.1 Historical Background of REPELITA IV

Under the First Five-Year Development Plan (REPELITA I) that started in 1969 and followed by the Second Five-Year Plan (REPELITA II: 1974-1979) the Indonesian economy achieved a remarkable growth and stability in 1970's. The authorities, however, paid more attention to the adjustment of income distribution, the creation of employment opportunities corresponding to an increasing population, and the transformation of the economic structure heavily depending on oil revenue. The Government started the Third Five-Year Development Plan (REPELITA III) in 1979, setting the objectives of (i) assuring social benefits for all people through equitable development and fair distribution, (ii) achieving a continuous economic growth at a reasonable level and (iii) establishing a sound and dynamic national economy.

After the middle of 1970's, since a recession was gradually taking shape in the industrialized countries for the implementation of REPELITA III, the Government paid cautious attention to its impact on the Indonesian economy. While setting the target for economic growth during the period of the Plan at a rate below the records achieved during REPELITA II, prior to the start of REPELITA III, the Government enacted a 50% devaluation of the rupiah in November, 1978. Nevertheless, from 1979 up to 1981, the economy tended in a prosperous condition. The devaluation of the rupiah stimulated exports without inducing a serious inflation, and in particular a large increase in oil revenue resulting from oil price rises provided favourable impetus to the economy. In the meanwhile, the rice production in 1979 and 1980 substantially increased nearly to a self-sufficiency level.

However, a continuing worldwide recession adversely affected the Indoensian economy in 1982. In 1982/83, the depressed oil demand and the fall in oil prices decreased the Indonesian exports of oil (including LNG), while the non-oil exports also decreased because of the fall in the demand for and prices of the primary agricultural commodities for exports. The impact of external shocks on the Indonesian economy was aggravated by the drought in 1982. The real growth of the agricultural sector and the manufacturing sector was limited to an increase by 2.1% and 1.2% respectively over the previous year, while the real growth of the mining sector turned to a decrease by 12.1%, so that the real growth of GDP was limited to a mere 2.2% increase.

In response to such problems facing the country, the Government adopted to take immediate measures to improve the balance of payments and to lay the foundation for pursuing the development in a sound financial structrue. While the adjustment policies began in 1982, the more fundamental measures were introduced during 1983. They consisted of:

1) Adoption of an austere budget for 1983/84

2) Reduction in subsidies on petroleum products, foods and fertilizers as well as rising the domestic sales prices of petroleum by 34% (January, 1983)

3) Devaluation of the rupiah by 28% (to Rp.970 per U.S. dollar on March 30, 1983)

4) Rephasing of public investment projects with a budgeted foreign exchange expenditure of some $21 billions (May, 1983)

5) In addition to the tightening of domestic credit, a reform of the financial sector enacted for the liberalization of the financial sector which freed up deposit and lending rates for State Banks, abolished credit ceiling for State Banks and signalled the Government's intention to reduce liquidity credits (June, 1983)

6) Announcement of intention of reduce and simplify the regulations governing economic activities, particularly in the private sector (August, 1983), and

7) Adoption of a tax reform, aiming at increasing government revenues by broadening the tax base and simplifying the underlying structure and rates (December, 1983).

The range of measures and the speed with which the Government responded to the deterioration in the internal and external financial stability were highly appreciated by IMF and other international institutes as well as by the authorities of relevant countries.

Those basic policies and the situation of the national economy were succeeded to the Fourth Five-Year Development Plan (REPELITA IV) which started in April, 1984.

Table A-1.1 shows a past performance of Indonesian economy in terms of GDP growth rate and value added in the manufacturing sector since 1970 to 1985 by every five years.

1.2 REPELITA IV and the Manufacturing Industry Sector

The Government started the implementation of the Fourth Five-Year Development Plan (REPELITA IV) in April, 1984, following the sustained efforts paid over the last two years in struggling the economic and financial difficulties, particularly in adjusting to deterioration in external economic conditions stemming from a worldwide recession and the weakening of international oil market. Hence, in a view that the external environment is beset with uncertainty and likely to be less favorable than the 1970's, the authority adopted a patient approach to development aiming at establishing self-sustainable economic structure with harmonious, steady growth, in which the Fourth Development Plan was designed to establish the basis for and framework of the future development.

In this context, an emphasis was placed on strengthening the foundation of enabling the development goal to be attained through the Fifth and Sixth Five-Year Development Plans for take-off, and thus the present Plan called for the completion and efficient performance of the projects which were underway, as well as the creation of employment opportunities thereby improving the national welfare.

Priority was given to the further development of agriculture for attaining a self-sufficiency in food supply, as well as the advancement of heavy and light industries which could lead to establishing a harmonized economic structure while increasing employments.

Major target economic indicators to be achieved during REPELITA IV are set as follows:

GDP	:	5% per annum in real terms
Inflation	:	Lower than 8%/year
Population		
Growth rate	:	2%/year (2.3% was the rate during REPELITA III)
Population	:	175.6 million at the end of REPELITA IV
Employment	:	To create job opportunity for 9 million
Investment		
Growth rate	:	19.1%/year
Ratio to GDP	:	26.3%

From internal resources : 84.1% of the total

The projected growth rate of sectoral value-added with their composition to GDP is shown in Table A-1.2.

Growth rate of manufacturing sector at 9.5% is to be supported by the target growth rate of each sub-sector as stated below:

Metal products, machinery & equipment	:	17%
Chemical industry	:	17.2%
Small-scale industry and handicraft	:	6%

The industrial development policy to achieve the goal of REPELITA IV aimed at the development in balance between large-scale industries and small- and medium-scale industries between export industries and domestic-market-oriented industries, and between capital intensive industries and labour intensive industries in the manufacturing sector, under the long-term strategy of attaining a harmonized development of industry and agriculture. Specifically, priority was given to the development of engineering industries including offshore engineering, aircraft, heavy machinery, electric machinery, agriculture machines and for this end it was decided to pursue the measures for establishing the supply of raw materials and intermediate materials, and the transfer of necessary technologies. As the goals of such industrial development, the following four points are cited.

1) By succeeding the previously adopted industry promotion policy, promote to produce essential commodities at the costs which can meet the consumer's purchasing capacity.

2) Give priority to the promotion of the industries which are related to engineering industries and basic metal industries.

3) Promote the industries related to the efficient utilization of indigenous resources and energy, including basic chemical industries.

4) Develop modern industrial society and promote small-scale industries and handicraft industry for the increase of employment.

The following policy measures for attaining the above goal were cited.

a) Establishment of industrial development centers in the regions and the development of financing institutions required for promoting the industrial development.

b) With the rational measures for protecting the domestic industries, improve the competitiveness of domestic products against imports in terms of costs and quality.

c) Modernization of small-scale industries.

d) Foster the local consultants, and enhance development planning capability.

e) Supporting measures in transportation and finance to improve the competitiveness of manufactured products.

f) Education and vocational traings in respect of management and technology for linkage-type industries.

The objectives of the Study which is aiming to examine a development program on linkages between the machine assembly industry and the metalworking industry mainly agrees with an above goal of 2), and the planning of a program loan packaged with technical assistance and technological service center as a common service facilities which will be recommended in the Study exactly meets a policy of a) and e) as well as a part of b) and f).

It is clearly said that the Study is one alongside of implementation of REPELITA IV.

Table A-1.1 REAL GROWTH RATES AND PROPORTION TO GDP OF SECTORAL VALUE ADDED (MANUFACTURING SECTOR)

Real Annual Growth Rates (%)	Manufacturing Sector	GDP
1970 - 1975	14.3	8.1
1975 - 1980	15.0	7.9
1980 - 1985	8.8	5.2
Proportion of Value Added to GDP in the Manufacturing Sector (%)	**Nominal Price**	**Real Price**
1970	9.3	9.6
1975	8.9	11.1
1980	11.6	15.3
1984	14.5	17.5

Note: Real price is based on constant 1973 prices.

Sources: Team's estimates based on Table ANX II-1 and Table ANX II-2, ANNEX II

Table A-1.2 PROJECTED GROWTH OF SECTORAL VALUE ADDED (REPELITA IV)

	Real Growth Rate (% year)	Composition of GDP
Agricultural, forestry and fishery	3.0	26.4
Mining	2.4	6.6
Manufacturing	9.5	19.4
Construction	5.0	6.3
Transportation and communication	5.2	6.0
Others	5.0	35.3
GDP	5.0	100.0

Source: REPELITA IV

Section 2 PRESENT STATUS AND FUTURE TRENDS OF SUBSECTOR

Section 2 PRESENT STATUS AND FUTURE TRENDS OF SUBSECTOR

2.1 Present Status and Problems of Assembly-type Machine Industry

2.1.1 Introduction

In this report, the assembly-type machine industry (the assembly-type industry) is defined as the industry in which the components or parts of machinery are manufactured internally or procured from out-house and these components and parts are assembled as final industrial products.

The target assembly-type industry is set up as follows by the Terms of Reference for this Study.

1) Machine tool
2) Agricultural machinery & equipment
3) Heavy equipment and construction machinery
4) Process plant equipment
5) Electrical machine
6) Shipbuilding
7) Automotive
8) Motorcycle

The objective of this study is to study how to develop the linkage-type metal-working industry, which is linked vertically or horizontally with the above assembly-type industry. The production trends in the assembly-type industry govern the demand for the metal processing industry as sub-contracting business. In this section, the present status of the assembly-type industry is reviewed for each subsector.

Referring to the industrial statistics of BPS, Table A-2.1 is a summarized list of the basic data of the assembly-type industry. (However, small-scale industry of 20 employees or below are excluded.)

The industry is outlined as follows according to the 1982 data.

No. of establishment	:	392
Total No. of employees	:	80,000
Total amount of value-added	:	Rp.450 billion
Average No. of employees per company	:	204
Value-added per employee	:	Rp.5.6 million
Domestic procurement ratio of material conponents and labor	:	24.6%

The industry categories of Table A-2.1 are divided into 2 groups. One is a group in which products are sold directly to household consumers and end users in other industries (in the table, (2), (3), (5) and (6)), and the other is a group for other categories ((1), (4) and (7)). The former and the latter are called consumer's goods manufacturer and capital goods manufacturer, respectively.

In terms of the total amount of value-added, the consumer's goods manufacturer the automotive assembly industry (5), 20.4%, the motorcycle assembly industry (6), 20.2%, the household appliances (3), e.g., refrigerators, electric fans, air conditioners, 20.4%, radio, recorder, etc. (2), 16.4%. The total for this group amounts to 77.4% of the total value-added. The number of establishment is 149 or 41.3% of the total.

In contrast, the capital goods manufacturer alone shares the remaining 22.6% in value-added, although the share in number of companies is 58.7% including machinery manufacture and repair (1), shipbuilding and repair (4) and automobile body and equipment manufacturer (7). Regarding the per-capita value-added, sectors (7), (4) and (1) are in the lowest ranks of 3.2 milliion rupiahs, 3.3 million rupiahs and 4.2 million rupiahs respectively. These are about 1/2 to 1/3 of those of the automotive assembly or motorcycle assembly.

The average numbers of employees per company for the consumer's goods manufacturer are also ranked in the lower groups, namely (1) 99 persons, (7) 108 persons and (4) 150 persons. On the other hand, the largest 3 industries are (6) 576 persons, (2) 426 persons and (5) 342 persons.

Another interesting figure is the ratio of local content involved in the finished goods in which the capital goods group uses more domestic components and parts, namely (4) 60.3%, (7) 53.8% and (1) 32.8%. The three lowest industries in terms of local content comprise (3) 12.8%, (2) 14.3% and (5) 20.2%, which belong to the consumer's goods group.

Based on the above facts, the following general trend can be observed.

1) Enterprises manufacturing capital goods employ less employees on average but its production style is labor-intensive, so that production facilities are not yet modernized. They are manufacturing various variety of goods in small quantity, while large quantities of domestic materials and parts are used. Their costs are considered to be high with smaller amount of value-added.

The manufacturers in this group are those in the machine tool, agricultural machinery, construction machinery, plant equipment, industrial electrical machines and shipbuilding industries.

2) Enterprises that produce consumer's goods employ the mass production system and mainly belong to large-scale assembly industry. These companies directly import components and parts for assembly, while using a smaller amount of domestic material and parts. The manufacturers in this group are those for household electrical appliances, automotives and motorcycles.

The present status of each sub-sector is reviewed in the following paragraphs. The PENGEMBANGAN KAPASITAS NATIONAL SEKTOR INDUSTRI (Development of National Capacity, Industry Sector) is only one set of statistical data edited and published by the Ministry of Industry, which shows the production capacities, actual production volume and demand for each item of industrial machinery products. Other documents are incomplete or show the production amount only in monetary terms. The following description is based mainly on these data. The data also include forecast figures over 1983 - 1986 in the publication of 1983 and 1984 - 1987 in 1984. However, estimated figures are only used as a reference. These data are briefly named as "KNS" in this report.

The statistics of import/export are based on the data from BPS. However, its classification does not meet with that of the KNS. These data are summarized and attached in ANNEX III, for each industry.

Among the data of the KNS, "capacity" represents the fixed licensed capacity. Only paper-licensed ones are called temporary licensed capacities. The fixed licensed capacity relates to the factories where production is already underway or construction has already started. Therefore, even "Fixed" capacity may become larger than the installed capacity in certain amount.

2.1.2 Machine Tool Industry

(1) Demand and supply

Table A-2.2 shows the production capacities, actual production and demand for ten major machine tools. Estimated total demand for these machinery is indicated as 19,104 units, while production capacities are

only 12% or 2,275 units of the demand. Thus the capacity utilization ratio is 35%, while supplying only 4% of the total demand. The reasons for such low utilization ratio would be the obsoleteness of production facilities for manufacturing high quality products demanded by the market, and the lack of competitive against import in terms of the price and quality.

The imported amount of machine tools in 1984 is available from Import Statistics of BPS which is shown on Table A-2.3. According to this statistics, consisting of 14 categories of machine tools, the total import is 10,756 units for 8 items while the number of unit is not given for the remaining 6 items. On the other hand, the Table A-2.2 indicates the domestic supply shortage of 18,314 units. It is considered that this shortage is fully covered by imports.

On the other hand, Table A-2.4 shows the annual production capacities of the 11 licensed companies according to the decree of the Ministry of Industry on January 4, 1985 which is the Deletion Program for the production of specified machine tools. The licenced capacity amounts to 15,295 units for various types of machine tool.

The number of insufficient units for each mahcine type shown in Table A-2.2 does not agree with the number of the licensed capacity for production of each machine. However, in terms of the total production capacity, an additional capacity of 15,295 units will satisfy the capacity shortage of 16,829 units for the present demand except for high-class machine. (See Table A-2.2)

Some of the existing workshops were surveyed by the Study Team through visiting the companies. It has revealed automatic machines such as NC lathes and MC machinery are equipped in the few workshops but most of the machinery are conventional general-purpose machine tools. In general, the machine tool industry is considered to accumulate investment during economic boom periods, however, it is necessary for them to modernize and expand their equipment as soon as possible, in order to expand their market, through improvement of quality and productivity.

The NC machine tools occupy about 12% of the total imported machinery. For a reference, the production ratio of NC machine tools in Japan (value of NC machine tools/total machine tools manufactured) has recently been increasing rapidly, namely 8% in 1977, 11% in 1974, 20% in 1979, 33% in 1980 and 58% in 1984. it is expected that, the proportion of NC machine tool import in Indonesia will rapidly increase in the future.

(2) Present status and problems of the machine tool industry

In Indonesia, the machine tool industry is characterized by its medium or small scale production, as in other countries. The machine tool industry is one of the most basic industrial activities for determining technological level of the whole machine industries. It greatly influences the quality, and productivity of the goods produced in the machine industries and efficiency of whole industries. Machine tools produced in Indonesia are mainly supplied to general machine industries as general-purpose machines. At present, NC machine tools or Electric discharge machines which are more suitable for mass production and high-precision processing, are not largely manufactured domestically.

More than 90% of the domestic demand for machine tools is presently supplied by imports from Taiwan, Korea, Japan and Western Europe. The domestic machine tool industry consists of medium and small sized companies having short history of production, so that technology, equipment and production system is not yet established. At present, most major parts for machine tools are dependent on the CKD import. In other words, the domestic machine tool industry is considered being just have started its development. Future tasks for the machine tool industry include the establishment of basic technology by assembling CKD imported parts and organizing reliable service systems for the users, which are indispensable in selling machine tools, and R & D for original brand products. As these problems can not be solved on a single company basis, the tasks to be taken at company level and industrial society level are explained in the following sections.

1) Company level

a) Technical potential should be increased based on the experience obtained from general-purpose machines currently manufactured, through analyzing the funcitons and R & D for improving machining accurary.

b) A more competitive price should be acquired by establishing production systems, procedures, quality control and inspection methods. Effective results can be expected just by introducing efficient auxiliary tools or improving work methods, even if the latest equipment is not employed.

c) Establishment of marketing and service organizations

Immediate after-sales service should be maintained in order to obtain users' confidence and expand the market for the machine

tools as described before. This is one of the weakest points of the domestic manufacturers.

d) Establishment of corporate brand

The users of machine tools often prefer the same product from the same manufaturer. Therefore, corporate identity should be established as the domestic brand products.

2) Industrial society level

a) R & D systems must be built under the leadership of industrial associations such as Federation of Indonesian Metal Works and Machines Industry (GAMMA) and its member association, Machine Tool Manufacturers Association (ASIMPI), thereby new products should be developed to comply with users' demands.

b) Opportunities for domestic engineers to communicate with foreign engineers such as a conference of machine tool engineers, should be held to improve technological levels.

c) A quality guarantee system for the members of the ASIMPI should be established with a view to ensuring the reliability of domestic machine tools and improving reputation of the product brands.

d) Public relation actvities should be promoted for the user industries and the government for marketing and requesting policies to support the machine tool industry.

2.1.3 Agricultural Machinery Industry

(1) Demand and supply

Table A-2.5 lists the production capacities, actual production, and demand for major equipment in 1984/85 referring to the statistics of the Ministry of Industry, KNS, 1984/85. (Also refer to ANNEX III, Table ANX III-6.) Except for the irrigation pumps and atomizers, the total of 104,500 agricultural machines are demanded, while only about 7%, 7,135 units are supplied while the production capability is 21,270 units, which is able to cover 20% of the demand. The capacity utilization ratio is 53% except for the tractors larger than 22.5 KW.

Table ANX III-8 lists a summary of capacities for the 26 companies listed on DIRECTORY Basic Metal Industry 1982, BKS-ILLMA, which are also listed on Table A-2.6 together with the MOI data.

Since export of agricultural machines is almost nil, only the past record of imports are shown on Table A-2.7 based on Table ANX III-7. Since the figure of pumps for agricultural use is not clear, only the centrifugal pumps are listed. The grain threshing machines are not given in terms of number of machine but by weight. The figures on A-2.7 are the rearranged figures to correspond to A-2.5 and A-2.6.

With no agricultural machine export, the sum of domestic production and import matches the demands. However, there are considerable differences between these figures, which makes it difficult to conduct further analyses.

The data of Table A-2.6 for equipment capabilities contains significant differences even after taking into account of the compatibility of the equipment to manufacture various types of machine with the same equipment. At any rate, the production capacity is considerably lower than the demand, while the gap is supplied by the imports in CKD and CBU at present.

(2) Present status and problems of agricultural machine industry

In the beginning of mechanization of Indonesian agriculture, the Ministry of Agriculture founded a mechanization department in 1950, which started to diffuse the use of large tractors and crawlers. Although it changed for use of smaller machines in ten years, any specialized R & D organization have not been founded to take care of the mechanization of agriculture up to the present. The only exception is Machine Development Bureau of the Ministry of Agriculture which is promoting the manufacture of machines designed by the International Rice Research Institute (IRRI).

In 1980, the number of manufacturers for agricultural machinery is less than 30, of which 8 companies are producing tractors and hand-tractors, 4 companies for threshers, 10 companies for hullers and driers, 3 companies for sprayers and 7 companies for irrigation pumps. Except for large tractor and combine, manufacturing of agri-machineries do not require highly sophisticated technology, so that the domestic production is proceeding following the deletion program. (The domestic production is stipulated for item 1 to 7 on Table A-2.5 by the deletion program.)

On the other hand, since the government also allows import of built-up agri-machinery, the low priced products such as hullers and rice millers are flowing-in from Taiwan and China, which brings closures of domestic production of certain items. In other words, although domestic production of some machines are technically possible, they are not able to supply the products at competitive price to the domestic market. The measures to reduce the production cost through modernization of facilities, mass-production of standardized products and stable supply of low-priced raw material are desirable.

2.1.4 Construction Equipment Industry

(1) Supply and demand

Table A-2.8 lists the production capacity, actual production, and demand for construction machinery as of 1984/85 from statistics of Ministry of Industry, KNS, while the data on Table A-2.8(2) are obtained from another source within Ministry of Industry.

Concerning export/import statistics, there is no export of construction machinery but imported amount are shown on Table A-2.9. Although the figures have to be estimated from limited sources in 1984/85, 623 bulldozers are imported and 530 were domestically manufactured while the production capacity is 1,065 units per year. (Capacity utilization rate of 50%.)

For the road rollers, the figures are 182 units by import and 424 units by domestic production, while the capacity is 1,000 units operating at 42% utilization.

In the whole construction machinery industry, 3,141 units are estimated to be produced by the capacity of 6,385 units, 49% of utilization rate, while it fills 79% of the demand in 1984/85. However, these figures seems to include over-estimated capacities in licensing and the optimistic estimation of production amount. In fact, production figures in 1983/84 show 22 units for the bulldozer, 10 units for the excavator, 1 unit for the wheel loader and no unit for the motor grader.

The import of construction machinery is declining these years, as shown in Table A-2.9. Because of the continuing recession induced by oil price drop in 1981, there has been termination and postponement of large projects and infrastructure construction projects, resulting in a decrease of the demand for construction machinery. However, it is not

clear whether the import of used machinery is included in the above figure or not.

(2) Present status and problems of construction machinery industry

The construction machinery industry is still in its initial stage of development. Manufacturers of construction machinery are dominated by several large scale companies which should lead the future development of this subsector. Licensed manufacturing system seems to have established a sound production and supply system, however, actual manufacturing has not yet reached to its efficient and practical operation.

The second problem is that local parts manufacturers are not yet developed, and their technological skill is low. The construction machinery belongs to a sophisticated products of composite manufacturing techniques which is the integration of domestic technology. One construction machine is manufactured by concentrating various techniques and know-how covering casting, forging, heat treatment, pressing, machining, etc. Therefore, subcontractors in these areas must have advanced technology. At present, 90% of components used to assemble construction machinery is CKD import.

The third problem is the necessity for R & D which is particularly important for low-cost production. Since manufacturers of construction machinery belong to large companies, they will be able to initiate activities for R & D, for example, development of special products, technology and new models for the Indonesian market. These activities enable to provide the users with simple and low-cost products competing well against with imported products, although this is not peculiar requirement to the construction machinery industry. There are still several other problems common with those of the machine tool industry.

2.1.5 Automotive Industry

(1) Demand and supply

Passenger vehicles are imported in CKD condition and assembled, while commercial vehicles are assembled from imported CKD-minus components and domestically produced components. In the CKD-minus, the CKD components are imported with the exception of locally produced components specified by the deletion program.

The import of a completed car is restricted and no car is exported, which makes the domestic market "closed". Domestic production capacity is larger than the present demand, which will be described later, so that the production record can be regarded as the domestic demand.

Several statistics shown in Tables ANX III-11 to ANX III-14 of ANNEX III, agree with the statistics of the Ministry of Industry and the Export Statistics of Japan. These are summarized on the Table A-2.10.

There are 17 automotive assembling companies each of which associated with Japanese, US and European auto-makers, producing 25 types of model in the comparatively small market. The capacity of production facilities are 55,000 units of passenger cars and 313,000 units of commercial cars, total of 368,000 cars. Most of the factories are located near Jakarta. (The Japanese joint venture companies include Daihatsu, Mitsubishi, Toyota, Suzuki, Honda, Isuzu, Mazda, Hino and Nissan.) About 85% of the total demand is commercial vehicle and 15% is passenger vehicles. About 75% of the commercial cars belong to the light loading cars. About 92% of the total demand is supplied by the Japanese subsidized joint ventures.

After the oil boom in 1980, the demand rapidly increased to record a production level of 210,000 cars in 1981. However, after 1981, demand gradually fell because of the stagnated world economies and the influence of oil depression, resulting in the demand in 1984 being about 27% less than that of 1981. The capacity utilization ratio also recorded a peak of 57% in 1981 but decreased to 42% in 1983 and 1984. Demand forecast of the industry in general indicates that it will maintain the same level in 1984 and 1985, and will then recover.

(2) Present status and problems of automotive industry

The commercial vehicle is particularly emphasized in production under the governmental policies prohibiting import of completed cars and forcing to use domestic components. In 1979, the Deletion Program/Local Production Schedule was issued mainly for car bodies (No. 168/M/SK/9/1979), along which each foreign joint manufacturers started local production of required parts with local companies. At present, the local production of required components has achieved its target, and the second local production plan (No. 371/M/SK/9/1983), for engine, is being prepared by each auto-manufacturer.

However, the auto-manufacturers are facing serious difficulties because of low capacity utilization ratio caused by falling demand over recent

years, while personnel dismissal is prohibited by the governmental policies. This would be the largest factor in delaying the Deletion Program. In order to expand market size, increase of income level and the lowering of costs are required.

In Indonesia, the proportion of the production of commercial cars is overwhelmingly higher than that of the passenger cars namely 85% to 15% respectively instead of 40/60, common in other countries. This is because the light commercial cars of lower cost, namely jeeps or vans are restructured for the purpose of passenger use. One of the reasons for this characteristic is the tax system, the CKD import tax for the passenger car is 100% while that of the commercial car is 0%.

Such a demand structure has been already fixed in Indonesia so that the assembly lines are already constructed under this ratio. If another policy is adopted to change the ratio largely, the industry might be thrown into confusion.

The automotive industry retains a wide range of supporting industries. As the local production schedule is advanced, the supporting industries must be developed together. At present, the supporting industries are not yet sufficiently developed, and very few subcontractors can supply parts which satisfy the quality required, delivery deadline and the price level.

2.1.6 Motorcycle Industry

(1) Demand and supply

The term "motorcycle" here includes motorcycle, scooter and motor-driven tri-cycle.

Import of motorcycle is also prohibited in complete built-up form (CBU), as the automobile, CKD-minus components are imported then assembled together with locally manufactured components. The present production capacity and actual production amount from 1975 to 1984 is shown on Table A-2.11.

Regarding the production capacity, the 5 companies including the 4 Japanese joint companies (Yamaha, Honda, Suzuki and Kawasaki) have the total capacity of 1.11 million units, among which the 4 Japanese joint companies shares more than 85%.

Demand for motorcycles has the same tendency as the automobiles, after a peak of 560,000 cycles recorded in 1982, the demand dropped to 250,000 cycles in 1984 and perhaps 210,000 cycles in 1985, the same level as 5 years ago.

The motorcycle is a very convenient means of transportation for ordinary citizens and its price is in a range of affordable level by common people, so that there is a large latent demand.

Models for production are regulated by the governmental policy to limit to 5 types of 50 cc to 200 cc motor displacement. About 90% of the total production comprises 70 cc to 150 cc motorcycles.

(2) Present status and problems of motorcycle industry

Each foreign manufacturer organized a joint venture with a local company to produce motorcycles locally according to the governmental policies for prohibiting import of completed cycles and using locally produced parts. The local production of the parts has begun according to the localization schedule, mainly for the body-frame, issued in 1981 (No.651/M/SK/11/1981) and now its target has been achieved. The localization schedule for the engine (No.505/M/SK/12/1983) has been established as the second localization plan and each manufacturer is preparing the realization of the plan.

One of the most difficult problems for the motorcycle industry is, as same as the automotive industry, how to achieve to follow the deletion program. However, for motorcycles, the situation would be slightly easier because the program does not specify detailed parts individually but only the ratios in standard price base and the scale of motorcycle production is very large resulting in a large quantity of each part and component.

2.1.7 Electrical Machinery and Household Appliance Industry

(1) Demand and supply

Table ANX III-17 of ANNEX III lists the production capacities, actual production volume and demand for the 22 items of electrical machinery, and household appliance apparatus industry from 1982/83 to 1987/88, referring to KNS statistics of the Ministry of Industry.

Since the IC and other electronic component industries do not use the component supplied from the metal processing industry, which is the

subject of this survey, the electronic industry is eliminated. Other exceptional items for the present survey include radio, cassette recorder and dry cell battery. These items do not demand much parts supplied from the subcontractors of the metal processing industry.

Table A-2.12 lists the production statistics of the electrical machinery and household appliances in 1984/85.

Table ANX III-19 of ANNEX III lists up the names of probable assembly-type manufacturers, the numbers of which are shown below. The list includes manufacturers with no production experience of the item and some are counted in more than one item of the products.

a) Electrical machinery related products

Generator set (including welding generator)	:	24 companies
Panel	:	31 companies
Transformer	:	17 companies
Electric motor	:	5 companies
KWH meter	:	7 companies
Storage battery	:	7 companies

b) Household appliances related products

T.V. black & white	:	12 companies
Radio/radio cassette	:	24 companies
Room air-conditioner	:	19 companies
Room fan	:	3 companies
Dry battery	:	5 companies
Refrigerator	:	15 companies
Filament lamp	:	10 companies
Fluorescent lamp	:	7 companies

Tables ANX III-19 and ANX III-20 of ANNEX III list the import/export of the electrical products. The export of the 10 items listed in Tabld A-2.12 cannot be found in the records from 1981 to 1984.

On the other hand, the import of the following items is recorded. The quantities of the import are generally decreasing after a peak recorded in 1982.

Referring to Table A-2.12, the production of motors is about 300,000 units short of demand in the electrical machinery industry. However, the detailed Kw ratings of these 300,000 motors are not known. In addition, the household KWH meters are still short by 430,000 pcs.,

although the manufacturers are in full production. The other items are manufactured to fill the domestic demand while there are excess capacity in production facilities.

However, the following conclusions may be derived by considering together with the import/statistics shown in Table A-2.13.

1) Local production capacities for the electrical machinery industry, such as motor, generator and transformer are rather insufficient and, when the economic environment recovers, large latent demands will reveal larger capacity shortage.

2) The production capacities for household electrical appliances are rather excessive so that, even when demand recovers, the present facilities can cope with the demand for the time being.

(2) Present status and problems of the electrical machinery, apparatus industry

The Indonesian electrical industry began in 1930s when Philips of Netherlands constructed a bulb and dry cell battery factory for exporting the finished products to Netherlands. However, many of the present joint veture factories were planned in the latter half of the 1970s and started production around 1981. These firms speculated an increased demand by the oil boom. However, the recent recession resulted in excessive production facilities, as the automotive industry. The demand for household appliances quickly responds to the given economic conditions, so that the demand will remain steady for sometime.

On the other hand, demand for electrical machinery and apparatus related to public investment, for example generators, transformers and panels, is steadily increasing. This demand will be supported mainly by the electrification of rural villages and agricultural development and irrigation, for which small generators, substation equipment, pumping plant and other related facilities are demanded. In addition, 800,000 units of the watthour meter (KWH meter) were demanded in 1984 and it will be 1.16 million units in 1985. This demand will be supported by the housing construction plan based on the REPELITA III, the power facilities installation planning arranged by the PLN, and the localization plan of the watthour meter.

The watthour meter has been listed in the Deletion Program by the Decree No. 140 of the Minister of Industry in 1984. At present, manufacturing license has been given to the 7 companies including 1

domestic firm, 3 Japanese joint companies and 1 French joint company which have already begun manufacturing. The total production capabilities of the 7 companies amount to 1.55 million units/year.

The electric industry in Indonesia has been investing in equipment as an import substitution industry while household electrical appliances, consumer product industry, has achieved the target production level.

However, the production of electrical machinery, the capital pro ducts, has not been increased as targetted, in these 3 years, annual imported goods amounted to $250 million to $350 million. This should be noted for promoting the localization of industrial products which saves foreign exchange at the same time promotes domestic industries.

2.1.8 Shipbuilding and Ship Repair Industry

(1) Demand and supply

The production capacities, actual production and demand patterns of shipbuilding and ship repair industry are listed on the Tables ANX III-21 to III-25 of ANNEX, all cited from various sources of statistics. The data is categorized into shipbuilding and ship repair, each of which is consisted of different types of ship. However, there are considerable differences in the data between different sources of statistics. Table A-2.14 shows the statistics for 1985, and the Figure ANX III-1 shows locations of shipyards in Indonesia.

There are 113 shipbuilding companies (steel ships only) including 10 state-owned companies. Out of a total of 104 berths, the majority of 65% has adequate capacity for 100 GT or smaller, while none can accommodate anything above 5,000 GT. Domestic navigation ships of 5,000 DWT or less, are built domestically, while ocean-going navigation ships are imported. A tanker of 3,500 DWT was first built in 1985. The annual capacity for building new ships is 45,000 GT but actual production is only 20,000 GT, the capacity utlization ratio of 44%, which supplies 18% of the demand of 110,000 GT. These figures include latent demand, for which the situation is supply shortage causing overflow of orders. Low utilization ratio is largely due to such factors as low efficiency in shipbuilding and long construction period, which will be explained in more detail.

Annual repair capabilities are estimated between 90,000 GT and 120,000 GT. Out of a total of 136 docks, 63% handle 100 GT class

or smaller. According to the government policy, ships smaller than 30,000 BRT have to be repaired domestically and that these docks are enjoying sufficient repair orders corresponding to their repair capacities. However, facilities for repairing 10,000 to 30,000 BRT class ocean-going navigation ships are obviously insufficient, resulting in most contracts being awarded to foreign firms.

(2) Present status and problems of shipbuilding and ship repair industries

Indonesia is consisting of a multitude of islands, more than 13,500 scattered over an area stretching 5,000 km from east to west and 1,700 km from north to south. Over this total area of 1,920,000 sq. kilometers, there lives a population of 158 million with rich natural resources of oil, natural gas, wood, rubber, coffee, palm oil, tin, coal, etc. The efficient & economical transportation of these resources is therefore indispensable for the development of the Indonesian economy, with maritime transport playing a very important role in the overall transportation network. The Indonesian Government has devoted considerable attention to this point ever since its independence, by among other policies, organized its own merchant marine. The Indonesian shipbuilding and ship repair industries play an important role in supporting the domestic shipping business.

As described before, there are many Indonesian shipbuilding yards, most of which, however, employ the traditional shipbuilding methods and repair methods. Even for the several leading yards, their technological level has not yet reached to international level, confronted with many problems. These major problems are listed in the following.

1) Production systems of the Indonesian shipbuilding industry

Major materials and components are being imported. For those components produced domestically are mostly in-house production, while only a few components are procured from out-house suppliers. The production system of Indonesian shipyards is shown on Figure ANX III-2. The figure indicates the very complex system of production, which does not clarify the production lines of hull construction as well as composition of sources of outfittings. This may cause delay in production process due to unproper delivery timing of in-house and out-house components. Compared with an internationally competitive shipbuilding yard, excessive numbers of in-house products are employed, which makes production processes in the shipbuilding yard very complicated and time-consuming while employing excessive personnel and cost increases. Figure ANX III-3 provides the structures of Japanese shipyard as a reference.

2) Shipbuilding process

Figure ANX III-4 shows the actual shipbuilding processes in Indonesia and Japan. To build 3,500 DWT in Indonesia, 25 months were required in total, of which 14.5 months were spent in dock. In Japan, however, a total building period of only 8 months, including a dock period of 3 months is required to build a larger vessel such as 80,000 DWT. Longer production time results in a considerable economical loss by increased labor costs, swelling operation fund, waste of materials, increased fixed cost due to lower dock utilization ratio, loss of opportunity for the next order, etc.

3) Price of newly-built ship

The average price of a newly-built Indonesian ship is about two times higher than the Japanese ones. This is an example of Indonesian high cost economy because of domestic production. One reason is the high prices of steel and parts. Other major reasons might include the long shipbuilding time due to systems in the shipbuilding industry, which have not get reached a level of full economic efficiency.

The foregoing problems must be solved and improved by considering the following issues.

a) The in-house production items in shipbuilding yard should be largely abolished, switching to procurement from external suppliers. For example, the shipbuilding yard should manufacture only hull, pipe assembly, etc., while ordering all outfits to external suppliers.

b) More engineers and design technicians should be employed in order to give adequate training in technical skills up to the drafting of production design drawings. In addition, process control engineers should be educated and trained.

c) Each shipbuilding yard should specialize in the construction of ships of particular type. Laborers should be accustomed to the jobs for a more rational operation, while reducing the amount of material waste. The specialization of each shipbuilding yard should be developed.

d) In Indonesia, standard types of ship are specified when designing new ships. Such practice should be further advanced to increase standard parts and should apply to as many types as possible.

e) Material procurement should be thoroughly controlled to buy material at the lowest prices for use at proper time. Such a system is applicable to standard parts, produced based on the design standard. Figure ANX III-5 shows an example of flow chart of such a material control system in Japan.

f) Organization and coordination of various institutions

Institutions and public organizations should be established for studying shipbuilding technology and propagating the technology among various shipyards. In addition, the shipbuilding association should keep close contacts with the ship owners association so that the actual requirements of the ship owners can be passed on to the shipbuilding works.

2.1.9 Plant Equipment

(1) Demand and supply

The following plants are listed up in the KNS statistics of the Ministry of Industry.

- Copra processing plant
- Sugar plant
- Coffee processing plant
- Tea processing plant
- Water treatment plant

Table ANX III-26 of ANNEX III summarizes the production capacities, actual production and total demand in the units of the number of plants.

Table ANX III-27 of ANNEX III lists plant equipment cited from the KNS. Data in 1984/85 is shown in Table A-2.15.

There are many other plants, including oil refining, petrochemical, natural gas processing, fertilizer, pulp & paper, cement, steel, textile, food processing, etc. Other plant equipment also includes vesseles, tanks and towers, furnaces, rotary machines, etc. These items are then further sub-divided into smaller groups. An overall picture of the nation's plant equipment industry is not eaily grasped from the statistical data alone but it is assumed that there are about 40 plant equipment manufacturing firms at present in Indonesia. These firms

incude 3 state-owned firms, P.T. Barata Indonesia, P.T. Boma Bisma Indra and P.T. Boma Stork. All of them started operation as repair and maintenance workshop for the sugar industry. At present, these firms are manufacturing steel structures for normal plants, plate work products, tanks, boilers, mechanical processing and casting in addition to equipment for sugar plants.

Their approximate production capabilities are summarized as follows. (The figures do not include cast iron products.)

P.T. Barata Indonesia	
Surabaya	2,600 t/y
Gresik	16,600 t/y
Jakarta	3,400 t/y
Tegal	800 t/y
P.T. Boma Bisma Indra	
Indra	5,800 t/y
Wahana	4,140 t/y
P.T. Boma Stork	
Pasuruan	4,500 t/y
Total	37,840 t/y

Since the Wahana Plant of P.T. Boma Bisma Indra is mainly engaged in the assembly of freight cars, the total plant equipment manufacturing capacity of these plants is about 35,000 t/y, by excluding the Wahana.

On the other hand, about 200,000 tons of plant equipment were demanded in 1982, of which about 60,000 tons, 30%, were produced domestically.

(2) Present status and problems of plant equipment industry

The plant equipment industry is not yet developed to such a level that designing of plant processes can be done by their own staffs. Therefore, an equipment is manufactured according to the given manufacturing drawings. When a new plant is constructed, a general contractor normally becomes responsible for supplying equipment and guaranteeing quality and delivery schedule. In such cases, imports are allowed even if domestic products are available. Consequently, all big-plant construction projects do not always increase the demand for domestically-produced plant equipment.

It a plant involves operation of processes with high-pressure, high or low temperatures, or produces toxic or corrosive gases or fluids, the steel wall of special thickness must be used, however, the domestic steel manufacturer is not yet capable of producing the thick steel. Such plants include oil refining, petrochemicals, natural gas processing, fertilizers, steel making and pulp & paper.

Therefore, the industry has the limited market, processing plant for sugar, cement, palm oil, food, particularly for replacing or repairing works for the existing plants.

2.1.10 Diesel Engine Industry

(1) Demand and supply

The manufacture of marine diesel engines except for automotive engines belongs to the assembly-type industries.

The demand and supply statistics of diesel engine are shown on Tables ANX III-28 to ANX III-30 of ANNEX III, which also includes the automotive diesel engines. The following estimation is of the marine diesel engines in 1984/85.

Production capacity	:	227,750 units
Production	:	96,000 units
Import	:	35,000 - 45,000 units
Demand	:	130,000 - 140,000 units

As of 1982, about 8 companies were producing diesel engines in Indonesia, of which production capacities amounted to about 220 thousand units covering large and small sizes.

However, its actual production remained at about 60 to 100 thousand units, though this figure varies according to the sources of statistics. Most of them are small compact engines of 34 HP or less, normally used for supplying power to the agricultural, forestry and mining industries.

Most of these engines are assembled by using imported CKD components, except for a few domestic parts. With the effect of the Deletion Program, more parts are now procured from domestic manufacturers.

In addition, large diesel engines such as those used in ocean vessels, power plants, and industrial equipments are almost all imported.

(2) Present status and problems of the diesel engine industry

Most of the diesel engine producers comprise joint ventures with Japanese or Western firms, resulting in their technical level and control technology comparatively higher than other industries. This makes difficult for the surrounding medium and small industries to have the linkage because of wide technological difference. Nevertheless, since the deletion program strongly encourages the use of domestic components, the diesel engine manufacturers have to make strenuous effort to achieve the target of the program. Unfortunately, the economic environment in Indonesia has been in a recession, reaching its trough in 1984 and 1985, after a peak in 1981. As a consequence, the manufacturers were reluctant to invest in the necessary equipment, causing delays of the deletion program.

As for a future development of the diesel engine industry, the most important factors are recovery of the market and technological improvement of surrounding industries of casting, forging and other material-related industries.

2.1.11 Pump Industry

(1) Demand and supply

Table ANX III-31 of ANEX III shows the production capacities, actual production, and demand for the pumps, referring to the KNS statistics of the Ministry of Industry. The figures in 1984/85 are summarized in Table A-2.16.

Although various discrepancies can be seen in the statistical data, it is reported that there were 10 domestic pump manufacturers in 1981, among which 9 companies were producing irrigation pumps and 1 company for mining pumps, total of 3,691 units. According to the report by BKPM, these were supplying less than 4% of the demand in 1982.

The pumps are generally classified into the following 4 types.

- Reciprocating pump
- Rotary reciprocating pump
- Centrifugal pump
- Special pump

These pumps are used in agriculture, fishery and industries such as building construction, shipbuilding, mines, oil, sugar, paper, and chemical industries. Most of these pumps are still imported.

(2) Present status and problems of pump manufacturing industry

The main components of a pump are casing, piston, impeller, shaft and bearing. Engines are separately procured. As a result of the survey of the pump manufacturing factories, a high percentage of defective castings and poor quality of coke used in the casting process were evident. Particularly, the inner surface of casing and the surface of impeller is so jagged that pump performance might be largely affected.

There are still many other problems in the casting, because the composition of the material and its strength are not always tested to prove as reliable components. In addition, the assembled pumps seem to be not completely tested and inspected for leaks during operation and other operation defects.

Referring to the table listed before, the market is expanding such that there will be substantial demand for domestically-made pumps provided that the quality and price are competitive against import.

2.2 Present Status and Problems of the Linkage-Type Industries

2.2.1 Introduction

In this section, the current status of each subsector of metalworking industry is reviewed and its problems are pointed out. These industries under the study are called as "linkage-type industry", by corresponding with the "assembly-type industry" studied in the foregoing sections. The linkage-type industry is the supplier of components as a subcontractor to an assembly manufacturer. The subsectors of the linkage-type industries are;

1) Casting
2) Forging/heat treatment
3) Sheetworking/welding
4) Plating
5) Machining
6) Presswork
7) Repair/maintenance

The production statistics for each of these subsectors are not available, however, brief outlines and problems of each subsector are described in the following, based on the site survey by the Study Team.

The situation of available raw material for the linkage-type industry are reviewed before covering each subsector.

2.2.2 Supply of Raw Material

Present status of raw material supply

In general, the metal working industry is highly dependent on the quality and supply of raw materials. The supply and demand for steel, as a basic material, are very important factors for the manufacturing industries such as general machinery, transportation equipment and electrical equipment. Therefore, the following description outlines the supply conditions of the steel. Table A-2.17 lists up the statistical figures of the production capacities, actual production and import. More detailed data are shown on Table ANX III-32 to ANX III-34 of ANNEX III.

(1) Domestic materials

Crude steel (a total of slab and ingot/billet) production stood at 990,000 tons and 1,350,000 tons in 1983/84 and 1984/85, respectively. At present, about 1.81 million tons of major steel-based materials are domestically produced, including hot coil (about 130,000 tons in 1983/84), bar and shape (about 720,000 tons), wire rod (about 300,000 tons), galvanized steel sheet (about 420,000 tons), welded steel pipe (about 230,000 tons, including spiral steel pipe) and wire metal (9,000 tons). In addition, plates are also produced (amount of production is included in the hot coil above). In addition to the steel materials, domestically produced metal material include copper bar (33,000 tons), aluminum plate (8,000 tons), aluminum bar (about 35,000 tons).

Items not locally produced include cold rolled steel strip, galvanized sheet and seamless pipe which are planned to be produced domestically after 1986/87.

The foregoing steel materials presently produced in Indonesia are marketed in so-called normal size and quality. For example, the government-owned P.T. Krakatsu Steel (the only integrated domestic steel manufacturer) is producing the following sizes for each steel-based material.

- Hot rolled strip	Thickness	2.0 m/m - 25.0 m/m
	Width	900 m/m - 2,235 m/m
- Steel bar	Dia.	10 m/m - 32 m/m
- Wire rod	Dia.	5.5 m/m - 12.5 m/m
- Spiral steel pipe	Dia.	500 m/m - 2,000 m/m

Only normal steel is produced domestically as described before, so that no special alloy steel, high tension steel and stainless steel is produced in Indonesia.

(2) Local production capacity

P.T. Krakatau Steel is the leading domestic producer of steel, equipped with the direct reduction furnaces from pellet using natural gas, with capacity of 2 million tons of sponge iron per annum (541 thousand tons were produced in 1983/84 at an operation ratio of 27%). The production capacities of crude steel and steel products are shown on the table, indicating 1.5 million tons per annum for crude steel and 1.5 million tons per annum for steel products including spiral pipe

(produced in a subsidiary company). The production capacity for hot coil is 1 million t/y (67% of total steel products), produced by the only hot strip mill (1 unit) in Indonesia.

There are 11 domestic manufacturers equipped with electric furnaces (including 1 open-hearth furnace) which are mainly producing bars, shapes, wire rods, etc. Annual production capacities are 870,000 tons for crude steel and 540,000 tons for steel products. There are about 22 rolling mills manufacturers including the rerolling mills which are producing bars and shapes, with the capacity of 750,000 tons per year. There is only one thick plate manufacturer, whose capacity is 70,000 tons per year.

In addition, 14 companies are manufacturing galvanized steel sheets at capacities of 400,000 tons per year, and 21 welded steel pipe manufacturers have the total capacity of 530,000 tons per year.

As reviewed above, the annual domestic production capacities can be summarized as follows: 2.37 million tons for crude steel; 1.37 million tons for bar and shape steel; 370,000 tons for wire rods and others; 400,000 tons for galvanized sheets; and 580,000 tons for welded steel pipe. A total production capacity of 3.79 million tons per year for all steel products (the steel production amount in 1983/84 recorded about 1.81 million tons, which suggests an utilization ratio of 48%.)

(3) Export/import of steel

In 1983, 1.66 million tons of steel products were imported, sharing 48% of the total domestic consumption of 3.48 million tons, while the domestic production standing at 1.81 million tons in 1983/84. However, this ratio is an approximate estimate because of the discrepancy in statistical periods.

In 1983, the import decreased by about 280,000 tons from the record peak of 1.9 million tons in 1982. Imports in 1983 can be broken down into 766,000 tons for sheet, 222,000 tons for steel pipe, 207,000 tons for plate, 147,000 tons for shape steel and 119,000 tons for galvanized sheet. The imported quantity of each product exceeds 100,000 tons per product.

One reason for the large share of steel sheet in the import might be that the hot strip mill of P.T. Krakatsu Steel (total capacity: 1 million t/y), did not operate at full capacity after starting up in February, 1983. On the other hand, the strong demand for hot and

cold steel strips arose from the domestic galvanized steel sheet and welded steel pipe manufacturers. No steel product is considered yet to be exported.

(4) Present status of distribution and sales

In Indonesia, the import of steel products and other metal-based materials is regulated in order to protect domestic steel manufacturers and encourage the use of domestic products. The two kinds of system are used for import restriction, namely, the concentrated purchasing system, and the quota license system. The former aims to protect the state-owned steel manufacturer and the latter protects the domestic private steel industry.

According to the concentrated purchasing system, specified articles must be imported through the three central purchasing organizations, established by the government, which mainly deal with the following items.

- PPBB (a department of P.T. Krakatsu Steel)
  Wire rod, billet, scrap, hot coil, plate & slab

- P.T. Giwang Selogam
  Cold rolled strip, GI Sheet & stainless steel

- P.T.Kemasinti Nuabakti
  Tin plate & aluminum

These regulations are intended to protect the domestic (especially state-owned) steel industry by controlling the quantity and price of specified items.

According to the quota license system, special items other than the above centrally purchased items (for example, shape steel, pipe & wire rod product) should be imported after obtaining permission within the limited amount licensed to the two national trading companies, P.T. Dharma Niaga & P.T. Kerta Niaga. This aims at controlling domestic supply and demand in terms of quantities, thereby protecting the domestic steel industry.

In addition, another import control policy was issued on April 14, 1985, by the Presidential Instruction, to appoint the SGS located in exporting countries to handle taxation process for all imported goods and issue the inspection certificate (LKP). The aim of this policy is to simplify and rationalize the domestic custom process.

Although the foregoing import restrictions are effective, there is no policy measure for distribution and sales of domestic steel products, which are sold and distributed through the general market distribution mechanism, that is, manufacturer to dealer/supplier and then to user. The so-called steel center has been organized as a supplying organization for dealing with the stock sales of steel products which is including cutting.

The domestic price of steel products is set higher than the international market price with a view to protecting high-cost domestic products. The prices in 1984 and 1985 are shown below.

	1984 (Apr-Jun)	1985 (Apr-Jun)
Hot coil	404Rp./kg	404Rp./kg
Cold Coil	458	448
Plate	425	495
Galvanized steel plate		
(Dipping)	760	650
(Electroplating)	750	642
Colored steel plate	1,020	902

The imported goods are also sold at the above prices. However, compared with the C & F prices of imported goods, domestic selling prices are higher by 40% to 45% for hot coil and plate and 30% to 35% for galvanized steel and colored steel plate. The difference in domestic and international prices for the cold coil, which is not produced domestically, is smaller, only 2% to 4% higher. (exchange rate of Rp.1,110/US$ is used.)

The above could be a cause for the high cost penalty of Indonesian metal working products and machinery products.

(5) Future plan

The nominal steel consumption in Indonesia (local production + import - export) is estimated at 3.12 million tons in 1983, after converting to crude steel. This corresponds to 19.6 kg per head of populatin. The local consumption of steel products can be broken down into each demand sector, standing at about 65% for the construction industry and

about 24% for manufacturing industry. These two sectors share almost 90% in 1983.

In the future, the development of the Indonesian economy and industry is expected to be accompanied with increasing demand for steel products, and there are already some projects which are under planning to cope with the expected future demand increase.

- Cold strip mill, planned by the P.T. Krakatau Steel Group (Capacity : 850 thousand tons/y, to be completed in 1986)
- Tin plate plant, planned by the P.T. Krakatsu Steel Group (Capacity : 120 thousand tons/y, to be completed in 1986)
- Steel complex plan in the yard of P.T. Krakatsu Steel (Pressure vessel works, maintenance and repair works, plateworking and galvanizing works, machine tool works and training school and welded "H" shape steel works)
- Expantion plans of electric furnace equipment. (Steel bar mill in P.T. Tosan Prima and shape steel mill in P.T. Ispat Indo)

The second steel mill plan, as part of the second steel generation plan.

Figure ANX III-6 shows the relationship between the per capita steel consumption and per capita national income for various countries. The steel consumption of Indonesia is currently 20 kg/person, while that for Korea, an intermediate advanced country, is ten times higher (GNP is about 2.85 times) When the GNP in Indonesia reaches the level of the present Korea, Indonesia will become a steel consuming country by an amount of at least 30 million tons per annum.

2.2.3 Casting

Table A-2.18 shows the statistical data on production, import and consumption of casting products. In 1983/84, the demand for castings amounted to approximately 110,000 tons, of which 70,000 tons or 64%, was produced locally and the rest, 40,000 tons, was imported, according to the estimation.

Table A-2.19 shows various forecast figures. According to the 4th 5 year plan, a 17% growth rate for basic metal industries is planned, which agrees with the 15% to 18% of estimated increases shown in the table. However, according to the production planning of MOI, it is assumed that growth rate for cast iron will suddenly increase twofold in 1986/87 and about threefold in 1987/88, while that for cast steel might increase gra-

dually. Such a sudden increase will not be probable because the facilities must be expanded in advance. Instead, the capacity of 71,000 tons up to 1985/86 might be an underestimation, bearing in mind the low level of current utilization ratio. In fact, actual capacity would be about 100,000 tons.

There are no casting works for automotive engines at present in Indonesia. Recently, it was reported that several automotive manufacturers would establish a casting works for engines (perhaps including forging products) as a joint venture.

However, castings other than the automotive engine, are manufactured by several large and specialized casting plants and by many other medium or small companies including cottage industries. Particularly in Tegal and Ceper areas of Central Java, there are many casting factories, and in outer islands, a large casting company is located in Medan.

Although the traditional production system is still dominant, one possible development way of the future casting industry will be a joint business operation such as the Batur Jaya Association located in Klaten Area in Central Java, where the machining process, the receiving of orders, and the purchase of coke, are all carried out on a joint basis by small and medium casting firms.

The average rate of defects of the Indonesian casting industry is 10% to 20% or even higher, resulting in high production costs. In addition, the quality of cast iron is very poor. The reasons can be analyzed as follows.

(1) Melting

Melting problems include the low quality of major raw and sub materials (for example, coke), low tapping temperature and the omission of chill test and composition analysis.

(2) Molding

Molding processes currently employed are green sand mold process, CO_2 mold process and self-setting organic process, sometimes combined with the shell mold process and cement mold process.

The green sand mold process is introduced into most factories but medium and small companies are not properly controlling molding sand. The strength, permeability and moisture of molding sand are not

actually measured. These measurements are so important that they have a direct influence on gas holes, sand inclusion and other defects of the cast iron.

Furthermore, some works do not use a mixer to mix the sand, which may increase the rate of defects. Moreover, the floor molding can often be seen, in which the metal flask is not used in the drug, resulting often in gas holes, shift or other defects. The gating system is highly important, directly influencing the possible internal defects such as cracks. No major effort for standardizing the quality of the cast iron were observed.

(3) Fettling

In the fettling process, sand and other adhesives should be removed by blasting with shots, so that the casting surface is cleaned for easy inspection. In addition, it is preferable to prepare various types of grinders to maintain the high quality of casting surface to compete with the imports.

(4) Quality assurance

At present, medium- or small-scale casting firms in Indonesia have no system to assure their quality, by QC in each process and inspections. The QC and inspections for each process usually require the following management.

Gating system:	Shrinkage allowance scale, machining margin, dimensions and position of ingate, runner, sprue etc. sand to be used and the determination of pattern material
Pattern:	Dimension inspection
Melting:	Control of tapping temperature & content control
Molding method:	Control of sand properties, pouring temperature, etc.
Fettling:	Control of heat treatment temperature and time
Inspections:	Quantity, dimensions, mechanical properties, weight, non-destructive inspection for checking surface and internal defects

In order to maintain close ties with an assembly-type industry and to compete against imported products, reliable technical assurance is required.

(5) Quality of raw material

1) Pig iron

Pig iron is one of the basic raw materials for cast iron, in order to assure the quality of cast iron. Many medium- and small-scale casting firms are not using pig iron. If scrap iron alone is used, the undiluted impurities remain in the scrap, and will be carried over to the casting, resulting in poor strength of material and easy chilling. Since April, 1985, Lampung Pig Iron has started manufacturing pig iron at a capicity of 8,000 t/y. This pig iron comprises charcoal pig iron, and is manufactured in three grades as a test run. The pig iron is specially intended for casting, and will contribute significantly to the improvement of cast iron quality. The three grades do not include a grade for the ductile cast iron (DCI). However, the DCI will be largely used for the automotive castings in the future so that the grade for DCI of lower manganese content (less than 0.40%) should be included. Furthermore, a production volume of 8,000 t/y will be insufficient for the domestic demand of cast iron.

2) Iron scrap

Based on the firm visit survey, the quality of iron scrap belongs to lower grade. The scrap mainly comprises rejected components from machine parts, of thin wall, and in pulverized in the works. As the scrap might include alloyed cast iron, the foregoing problems might arise by use of iron scrap. Therefore, the use of pig iron should be considered. It was only one firm which is using the iron scrap with thick wall and imported pig iron which is an ideal method of using iron scrap as raw material.

3) Steel scrap

The steel scrap contains smaller amounts of impurities such as phosphorus and sulfer, which should preferably be used to dilute the iron scrap of poor quality. In the melting shop of a pump manufacturer, high-quality steel scrap was used. This factory does not purchase commercial iron scrap, because of the occurrence of pressure leakage. Instead, it uses cast iron return scrap from its own factory together with pig iron and steel scrap, thereby manufacturing high-quality castings. Much of steel scrap used in Indonesian casting works comprises thin wall sheet scrap from the press factories. Such scrap is used in the induction furnace or

Heroult type furnace. Because of thin wall sheet scrap, transportation and charging are not easy, with considerable amounts of electricity being spent in melting. Therefore, pressing the scrap to a rectangular shape of certain dimensions will greatly contribute to a reduction in transportatin costs, melting period, and the consumption of electricity.

4) Sub-material

a) Coke

Coke largely influences the cupola and tilting furnace (cast iron melting furnace often used in medium and small casting factories in Indoensia). Much of the coke used in Indonesia has a high ash content, while yielding lower strength. In consequence, the tapping temperature of cast iron melted in these furnaces is low, which might result in defective castings such as miss run. With regard to DCI, the temperature of molten iron will decrease, because of the addition of magnesium alloy and the re-ladling of the ladle for adding magnesium alloy. Therefore, high-temperature melting should be introduced, in which a tapping temperature of 1500°C is required to produce small DCI products. Normally, an ash content lower than 8% is required.

b) Silica sand

The silica sand from Bangka Island is used in Indonesia. The sand contains SiO_2 of 99% or above and its sand grain is also satisfactory. However, the sand is moistened with sea water by ship transportation, so that each user company washes and dries the sand. If drying and packing are done in Bangka Island before shipment, no energy will be wasted in user factories. In addition, the measurement of silica sand will no longer be required before mixing, bringing more precise addition ratio of the binder, which makes quality control easier.

2.2.4 Forging

The manufacturing methods of forging can generally be divided into two groups. One is a method in which large forgings or alloy steel forgings are manufactured by the free forging system. This method can provide an integrated production system from steel making to forging, which is most suitable for large companies.

The other is a system in which small forgings are produced by the die forging and free forging, which is better suited to medium or small-sized companies where the steel materials is obtained from general market.

In Indonesia, however, only few of these modern systems are actually observed in the survey (only 2 or 3 companies), while traditional black smith work is dominant. This sector is the least modernized of the entire Indonesian metal working industry.

As an example, the production ratios of the Japanese ferrous casting, forging and press products are shown in the following.

Cast iron	61
Cast steel	7
Small forging	22
Large forging	9
Press products	1
	100

Referring to the above, a 100% production volume of ferrous castings requires a 33% proportion of small forgings and 12% of large forgings. Even if only the small forgings are considered, which are more suitable for medium- or small-scale Indonesian firms, an amount of about 20,000 tons per year, namely 33% of the total annual casting production in Indonesia of about 70,000 tons will be demanded.

With a view to developing the machine and the metalworking industry, production facilities should be reinforced together with the technological improvement of the heat treatment industry, including the manufacturing techniques of dies, tools, high tension steel bolts, etc.

Materials used for forgings should be not only mild steel, but also medium carbon steel and low alloy steel, for providing strength and hardness. If such materials are not easily procured, the forging industry will not be easily expanded.

Many of the automotive parts are small in size and mass-produced. These parts are manufactured by die forging, which seemed to have problems in the supply of the raw material and its machining technology.

In particular, material for hot forging die consists of medium alloy steel or high alloy steel, which both require a complicated manufacturing method including heat treatment.

2.2.5 Sheetworking/Welding

The sheetworking and welding industries in Indonesia employ comparatively more advanced technology than other metal working industries. This is due to various reasons, for example, the steel raw material, including welding electrodes, alloy steel plates and other imported products can be easily obtained, the processing technology and skill can be easily learnt and the demand is comparatively stable.

Sheetworking and welding works consist mainly of medium or large companies, in which plant equipment is repaired.

As sheetworking and welding products do not require very high accuracy or strength, manufacturing facilities are not modernized. A technical problem is that welding is done manually, without testing facilities of detailed pre-test, such as X-ray inspection, supersonic inspection or other flaw detection equipment. Problems related to welding sector include; 1) selection and control of welding electrodes; 2) welding current and voltage; 3) groove preparation; 4) use of jigs & tools. Regarding sheetworking, manual or foot operated roll benders were often seen in the facilities, but advanced jigs and tools were not witnessed. Necessary jigs, tools and inspection equipment should be completely prepared and examined.

The sheetworking and welding industries should introduce modern equipment and technology in order to develop and build their role as a linkage industry for plant equipment, shipbuilding and other metalworking/machinery industries.

2.2.6 Plating

No specialized plating factory was observed during the survey. Each factories retains plating works as a part of the finishing process in other metal machining industry. At present, since products sold directly to the general market are plated, the plating work at each factory is many in variety but small in quantity. The size of plate works is not yet sufficiently large to justify the buildup of specialized plating factory. Many plated parts are used as automotive parts and electrical parts. The plating industry should therefore be developed as rapidly as possible, as long as the localization plan proceeds with its aim to facilitate genuine domestic production of all parts. Products are usually plated after completion of machining. Therefore, the plating industry will be able to develop along with precise metalworking which includes high accuracy

machining of pomponents. Improvements in metal machining technology will be one of conditions for increasing demand for the plating industry, as its process follows after various machining process.

On the technical points, plated film should be uniformly adhered with specified thickness to the given surface, without any impure metal to be included.

For this purpose, important control items include the setting of current and voltage, and the adjustment of plating liquid concentration and temperature. At that time, plating liquid should be infiltrated and stirred. In addition, waste liquid and sludge should be treated to prevent water pollution.

In view of the above, it is expected that various items of technical management should be improved, including plating film measurement which is not completely done.

In terms of facilities, the pre-treatment equipment such as furface finishing, degreasing acid cleaning and water linse seemed insufficient. The necessity of enhancing safety precautions was particularly important since strong acids and alkalis are used in the process.

2.2.7 Machining and Machine Assembly

In most cases, machining process is accompanied with other metal-working process, rather than machining alone is employed in one company. According to questionnaire survery, 163 companies out of 219 have machining shops, while these companies are also employing repair shops or assembly shops.

In terms of equipment and technology, there is still a wide gap between joint venture companies and medium and small companies. A considerable effort is required to promote them as linkage-type industries linked with assembly-type industries.

More than half of medium and small machine firms retain only convensional lathes and bench drilling machines, but very few companies hold grinding machines and milling machines. In addition, many of the present machinery is quite obsolete, and machining accuracy is not so high because of poor maintenance and machining techniques. In fact, the range and type of machinable products are rather restricted. In other words, these firms cannot easily enter the market of genuine and new

products, but are doing business mainly in the fields of repair. Machining of imitation spare parts, disassemly of faulty machines, inspections and assembly.

Regarding high precision machining, related equipment is only seen in very few companies. Only a small fraction of these companies retain the complete set ups of the equipment and technology.

In considering these conditions, there are very few existing companies which could possibly produce machine parts requiring high levels of accuracy and technology, such as the transmissions for agricultural machinery. Such companies should therefore be founded completely newly by providing integrated technical and financial assistant to potentially capable companies.

On the basis of these present status, the following tasks may be required as those technical problems which must urgently tackled.

a) Basic knowledge for structure, function of machine tools and necessary attachment tools for machining

b) Basic knowledge of cutting and grinding tools and operation techniques

c) Concept of accuracy and application of measuring tools

d) Method of maintenance

In addition, machining work normally falls into multi-variety but small-quantity production, having a tendency to lose orderly production environment. The following control and managing items should be studied.

a) Process design and philosophy of control
b) Work allocation and creation of work standards
c) Method of material control
d) Concept of process control
e) Use of jig and tools
f) Method of quality inspections
g) Safety and cleanness control in workshop

2.2.8 Pressworking

The joint venture companies are equipped with large press machine for large press work with imported dies. Most of medium and small companies are producing mainly punched and bent products by using small press machine. However, the die manufacturing capabilities of these companies are still poor. The medium and small companies prepare by themselves the dies, of which the working life is short because of inadequate heat treatment and faulty finishing accuracies, resulting also in low product accuracy. As die is the vital component in pressworking, design and manufacturing technology should be immediately improved.

Main pressworking jobs for local medium and small companies consist primarily of punching and bending processes of small parts. Major working machines comprise the traditional lever-type manual press machines. Dies are manufactured in house without high level of accuracy. In spite of such a status, pressworking companies are strongly demanding orders and technical instructions from father-type industries. However, the pressworking companies should first become aware of general information about advanced industrial machinery in order to recognize the level of state-of-the-art technology. According to our general survey, work facilities seem to be out of date. Therefore, future improvement and development of the present status will not be expected unless new technologies and equipment are introduced for the purpose of innovating the working environment. The organization of a national level leading organization will be urgently required.

2.2.9 Repair and Maintenance

Indonesian industries have started from repairing jobs. The curricula of training schools include automotive repair, various industrial machinery repair and other repair works, which all widely contributes to practical jobs because of the excellent craftsmanship and manual skills of the Indonesian people. Simple equipment repairs are done by the owners themselves. The specialized and technically demanding repairs on passenger cars can perhaps be carried out in automotive repair shops located in urban areas. However, the repair or overhaul of the engine requires the facilities and technology of a certain level, which are exclusively carried out by the specialized engine repair shops. These specialized shops possess high-precision machinery, equipment and technology, and some companies also carry out manufacturing work on dies, subcontracted machining jobs of mechanical parts by using their own technology and equipment.

In addition to these repair shops, there are a few companies which deal with large mechanical parts such as plant machinery, equipment and industrial machinery, which employ large machinery, welding equipment and press machines. However, even in these factories, the reproduction of the original shape is considered to be the most important task, while the accuracy is of the second importance.

In view of the local production of industrial machinery components, those employees working in the existing repair shops and machining shops could be trained to manufacture components which require high levels of accuracy and technology, such as the transmission assembly. As for the improvements on the production line, the specialized equipment and machinery with QC suitable for intermediate mass production have to be introduced in order that the industrial machinery components will be domestically produced.

2.3 Measures to Reinforce Industrial Linkage

2.3.1 State of Linkage Between Machine Assembly Industry and Metalworking Industry

(1) Industrial structure

The machine assembly industry are mostly large companies with 100 or more employees which include many joint ventures mostly with Japan, which produce automobiles, motor cycles, home electrical appliances and agricultural machinery. In this report, this group of companies is categorised as the "assembly-type industry".

On the other hand, medium- and small-size companies (medium: from 20 to 99 employees, small: 5 to 19 employees) in the metalworking industry are mostly those with domestic capital. This group is categorized as the "linkage-type industry" in this report. While the number of cottage industries is said to be innumerable, the number of medium-size industries is relatively small.

The assembly-type industry imports a large part of components and parts, assembles them into complete products and then sell them to the market, while the linkage-type industry mainly uses domestic raw materials to produce building materials and piping materials, etc., then selling them in the general market too. A survey carried out by means of a questionnaire showed that 66.2% of all companies sell their products to the general market while the remaining 33.8% are direct supply to other companies as parts. Both the assembly-type and the linkage-type industries manufacture their products to the general market and have their own direct links with consumers. Their industrial structures lack inter medium companies to supply components to the assembly-type industry, i.e. both large and medium/small companies have direct connections with consumers and form their own worlds without linkage with one another. Therefore, unless the medium- and small-scale companies increase manufacturing of products as replacements for imported products, the horizontal and vertical linkage between the assembly-type and the linkage-type industry will not be developed.

The deletion programs intend the fostering of the above-mentioned linkage-industry, while introducing the compulsory utilization of domestically manufactured components in order to promote localization in the machine assembly industry. In reality, however, they have so

far failed to generate effective demands for the medium- and small-scale companies with domestic capital. The assembly-type industry tends to manufacture their parts in-house, some of which are obligated to be produced out-house by deletion programs. Even if they conduct out-house procurement, they tend to set up new joint ventures with foreign capital within its group for those parts which in-house production is prohibited. In this way, deletion programs do not generate an increased demand for the local linkage-type industry. The automotive industry, for which deletion programs were first introduced 8 years ago, is the case. These pratices result from the facts that the quality of those parts manufactured by the local medium- and small-scale industry is unreliable and there is a lack of mutual understanding between the assembly-type industry and the linkage-type industry in regard to contract customs.

(2) Types of linkage

Two types of linkage exist betwen the assembly-type industry and the linkage-type industry, i.e. father and son relationships. The first type is where a parent company holds part, or majority of the shares, sends management staff and carries out technical assistance to the subsidiary in order that they can meet the specifications of the products to be manufactured for the parent company. In this case, all the products of the subsidiary are purchased by the parent company which supplies the raw materials in some cases. The second type is that a sub-contractor is independent from its parent company in terms of capital and personnel and supplies its products to more than one assembly-type company. Generally speaking, the first type of linkage is often seen in the case of Japanese companies while the second is more often seen with Western companies. In Indonesia, joint ventures with Japanese companies tend to follow the first type of linkage, although local industries are basically classified as the second type.

According to the questionnaire survey on sub-contractors which have linkage with their parent companies, 3% have capital investment from the parent companies while 15% receive either credit lending or loans from the parent companies, 24% receive supplies of raw materials and 40% receive constant orders under the planned order system while the others manufacture according to by orders.

(3) Production style

As previously described, the style of production employed by the linkage-type industry is one where the purchase of materials and the manufacture of finished products are carried out within the companies. In addition, due to the limited market sizes, a large variety of products in small volumes are manufactured. As a result, the management, as well as the production technologies, are dispersed, resulting in the supply of high cost, low quality products which could be manufactured elsewhere. It is, therefore, essential that this linkage-type industry is directed towards the manufactures of high quality, low cost products through the accumulation of technology and the rationalization of production, which in turn can be achieved by selecting product items and introducing specialized production system.

Nevertheless, the production style where specific parts are supplied to a single large-size company may not be able to reach a commercial production level in volume, or in the case of seasonal products it may lead to a low capacity utilization due to smallness and fluctuation of the markets. Countermeasures for such aspects include the specialization in similar components for different products, for example, the production of transmissions for agricultural machines, machine tools, construction machines and automotives, by one manufacturer.

If the specialization and concentration in specific products succeeds in achieving a supply of high quality, and low cost products, the possibility of exporting processed metal products will then arise as the next step. In fact cast iron products, the plants have been transferred from advanced countries to developing countries in ASEAN and East Asian Countreis some of which even started the export.

(4) Foster-father system

The idea behind the foster father and son system created by MOI is the introduction of the traditional Indonesian spirit of mutual assistance between companies without the existence of any statutory regulations or laws. Accordingly, there are no obligations, penalties or economic rewards for foster-father companies. A government request for a company to be a foster-father may be refused and in the case that a foster-father company finds his assistance nonprofitable, he is not obligated to continue. Those companies which have shown remarkable achievement in their fostering and assistance of son companies are officially commended by the Minister every year.

Foster-father companies usually assist son companies in terms of sales promotion, the provision of guarantees for loans and technical training, etc. In the case of the textile industry, it is very common to commission processing work, i.e. the supply of raw materials, to son companies and to finish half-finished products received from son companies.

It is still not clear what kind of role this system can play in the establishment of a linkage-system between different industries in Indonesia.

2.3.2 Countermeasures for Factors Obstructing the Development of the Linkage-Type Industry

(1) Manufacturing technology

The reason why the metalworking industry, which supplies components to the machine assembly industry, cannot compete with imported products lies in the inferior product quality and in high cost. The cost disadvantage may be dealt with by customs tariffs and cost-down may be achieved by the advancement of mass-production, however, as the improvement of product quality can only be brought about by the improvement of the manufacturing technology, priority should be given to quality improvement if the linkage-type industry is to be promoted.

The Indonesian metalworking industry originates from the repair industry for various machines (e.g. locomotive, and carriage cars) and plants (e.g. sugar plants) which were brought in by the Dutch. As a result, the transferred metalworking technology was biased towards repairs thus delaying Indonesians from learning about production technology. They are able to manufacture products similar to originals but remain at a stage of product imitation due to lack of techniques in regard to design, strength calculation, drafting and manufacturing according to drawings.

With regard to the actual manufacturing technology at plants, there is no place for shopfloor workers to learn such technological skills as blade sharpening or how to use tools, which can be immediately utilized in their work. In addition, the number of technical publications in Indonesian is limited. Since the only way to improve the manufacturing technology is to train administrators, plant managers and workers, serious consideration should be given to the consolidation of educational/training centres and/or educational facilities which will be described later.

(2) Industrial standards and product inspection

One of the technical problems which makes the linkage between the assembly-type industry and the linkage-type industry difficult is the lack of a common technical language, i.e. industrial standards and drawings.

The preparation of industrial standards, known as SII (Standard Industri Indonesia), has in fact already begun with REPELITA II. According to the explanation given by BPPI of the Ministry of Industry, 1,300 standards have so far been introduced in 9 sectors and by the end of REPELITA IV, 1,605 standards are planned to be made. It appears, that the work has started with product specifications, but not yet totally covered for design standards, drawing methods, manufacturing methods and inspection methods.

Industrial standards can only be expected to play their roles to the full extent when they are prepared as a package. While it generally requires a long period of time to set up reasonably systematic standards, both the assembly-type industry and the linkage-type industry hope for their provision at the earliest possible time. There is, however, one persistent opinion which favours the introduction of already established industrial standards, such as the International Industrial Standards, instead of preparing Indonesia's own standards, for the benefit of rapid industrialization in Indonesia.

The users might wish to use reliable components with the standard guarantees by SII mark, at the same time, manufacturers might wish to produce components under the standard in order to reduce the rates of defect and expand the markets. There is, however, a shortage of product inspection institutions and the authority and reliability of inspection results have not yet been established in the industrial society. Due to the insufficient number of these institutions, some companies send their domestically manufactured sample components to Japan for product inspection, which will be again returned for assembly to Indonesia.

Whenever the localization and the fostering of linkage-type companies have been tried to be carried out, the inadequate preparation of industrial standards and the shortage of inspection institutions have always proved to be bottlenecks and, therefore, their provision is an important task for the Government of Indonesia in the industrialization of the country.

(3) Business climate and buiness customs

If powerful leading subcontractors are to be fostered in Indonesia in the future, there are several points to note regarding the required reform of consciousness in view of the business climate and customs.

1) There is one prevailing concept that the improvement of product quality will not directly lead to the improvement of profitability. This concept presupposes that the cost of quality improvement cannot be paid off because there would be little difference in the actual sales prices, regardless of the quality.

2) The attitude to prefer a stable product supply with stable prices by means of planned production based on a long-term contract with an assembly-type company is lacking. When a subcontractor is fostered to the stage where it can manufacture products which are qualitatively satisfactory under the technical guidance of an assembly-type company, it easily resorts to price increases and ultimately the stoppage of the product supply in the case that the price increase would fail under the situation where no competitors exist. As a result, the assembly-type company, which must constantly supply its assembly lines with parts to maintain the mass-production system, will be forced to stop its own operation. This is the major reason why assembly-type companies are not eager to foster subcontractors.

3) The concepts of achieving the cost-down by mass-production with reasonable profit margin and quick returns are not common. The prevailing concept is that the same products have the same prices regardless of the style of production. This is because the traditional production method with large share of labour and raw materials does not have any scale economy by volume of production. However, it must be understood that the cost-down based on high efficiency, which is realized by the shift to capital-intensive industries with modern facilities, and the resulting decline in sales prices will ultimately contribute to the profitability. Unless the consciousness is changed from one favouring short-term investment in trade and commerce to a long-term investment for industrial capital, the development of the linkage-type industry will be hindered.

A series of regular seminars will be required to educate business owners and managers in order to improve the conventional business customs. The seminars and training courses which have been held up until today have been too general and superficial, which was also mentioned by the participants. It will be necessary to provide education, while concre-

tely showing that improvements in quality, plant control and environment safety will lower the production cost and that a quick-return policy will contribute to better profitability. Moreover, it will be effective to appoint model plants, providing them with through guidance, in order to show that modern plant management based on the idea of industrial capital actually generates more profits than the traditional method.

(4) Provision of information to strengthen linkage

The field investigation carried out by the Study Team found several linkage-type companies with local capital that had relatively high technological levels. This shows the possibility for medium-scale companies in Indonesia to develop themselves without assistance from foreign companies or joint ventures. These companies, however, have few dealings with large joint ventures while large companies do not know of their existence. There is an absence of effort by these linkage-type companies to open new markets, as shown by the fact that there is no staff in charge of market promotion except for the owners themselves. Another reason is that large companies, which are the users, do not make any effort to find and further promote excellent companies in Indonesia by continuously placing their orders.

As the ability of individual companies to gather market information is limited, the government assistance should also be provided. In other words, introductory work to combine assembly-type companies and linkage-type companies will be needed by establishing information centres for entrepreneurs. Moreover, the dissemination of the information must be continuously carried out by visiting companies in turn. Furthermore, it is preferable that technical publication be intensively promoted in Indonesia.

(5) Industrial organizations and cooperation

There are successful cases of the joint purchase of raw materials and of the joint marketing of products on a cooperative basis in Central Java. With a lot of fluctuation in the supply of raw materials, the cost burden for each company becomes rather heavy if each company tries to have its own adequate inventory level. The cost for company will be reduced if a joint inventory system is introduced. The following methods may also reduce the cost burden of each company on the basis of a joint cost sharing system. These should be seriously examined by the respective industrial societies.

1) Joint purchases of expensive machinery, such as inspection machines

2) Commencement of commissioned processing service by setting up processing centres

3) Roving technical guidance system

4) Provision of educational trainings and seminars

(6) Role of large companies

Assembly-type companies can play an important role in the fostering of the linkage-type industry and their technical asssistance is particularly indispensable. At present, the large companies have no economic incentive to promote localization and foster local industries. This is the reason why the compulsory out-house procurement of certain components was necessary when the deletion programs were introduced. This regulation is a government policy, it does not necessarily agree with economic rationality in many instances, thus making the implementation of deletion programs difficult.

However, as the localization of components has been given national priority, large companies are obliged to bear certain responsibilities. Conversely, the linkage-type companies have their own problems in such fields as trade customs, etc. The Government, therefore, is expected to play the role described in this section in order to bring about mutual concessions between these two types of industries.

(7) Introduction of technological service centres

The fostering of the linkage-type industry has many problems to solve, as has been discussed so far. Here, the establishment of Technological Service Centres for Metalworking industry is proposed as one possible method to solve these problems. As the detail of this idea will be given in another chapter, only a brief description is stated here.

This centre should provide the following functions.

1) With the installment of testing and inspection equipment, the centre should carry out testing and inspection services quickly and issue the test certificates.

2) The centre should be a place for information exchange between users (mostly large companies) and suppliers (mostly medium- and

small-scale subcontractors) providing them with informations on markets and technologies.

3) Dissimination activities of adherence to industrial standards and practical application should be conducted.

4) The centre should offer educational/training courses for practical techniques and skill for designing and manufacturing.

5) The centre should implement technical guidance, including roving services to linkage-type industries.

While there are already various types of research institutes, training centres and service organizations in Indonesia, the bureaucratic service practice is often seen because of their public nature. In addition, as they are managed under government budgets, their activities are limited by the budget allocation. The service centres suggested here are by the co-operation of private industrial society in terms of personnel and finance and only a minimum charge would be imposed on users in order to maintain the activities of the centres.

GAMMA[1/], which is an organization for the machinery and metal working industries, strongly hopes for the establishment of this type of service centre and, therefore, has positive opinion for the personnel and financial co-operation, management participation and the sharing of reasonable service charges.

Note: 1/ GAMBUNGAN INDUSTRI PENGARJAAN LOGAN DAN MESIN INDONESIA (Federation of Indonesian Metal Works & Machinery Industires). The Federation consists of the following 9 Associations with 224 companies of all sizes.

ABI	(Engine Association: 6)
ALSINTANI	(Agricultural Machinery Association: 40)
APKOBI	(Steel Structure Association: 3)
ASPEP	(Machine Industry Association: 43)
APLINDO	(Basic Metal Association: 22)
AIMKI	(Construction Machinery Association: 10)
ASIMPI	(Machine Tool Association: 11)
AIPSI	(Pump Manufacturers' Association: 13)
AIPPI	(Plant Equipment Association: 46)

2.4 Future Linkage for Major Industries

The state of the linkage between the machine assembly industry and the metalworking industry, which supplies parts, and the measures required to strengthen this linkage were examined in the previous sections. This section presents desirable form of linkage in the long-term perspective, although some of their aspects may appear to be too idealistic.

The industries that will be considered here are the machine tool, construction machinery, agriculatural machinery, shipbuilding and automobile industries.

2.4.1 Machine Tool Industry

(1) First stage (1985 - 1989)

The first stage has been set from 1985 until 1989. In this stage, the major parts will consist of imported CKD components and products will be shipped upon completion on the basis of the assembly of imported components and the raw materials and auxiliary components available in the domestic markets. This stage, therefore, is a period for the learning of the assembly technology for machine tools, the understanding of user requirement and the consolidation of manufacturing systems.

(2) Second stage (1990 - 1994)

The five years between 1990 and 1994 has been designated as the growth period. Based on achievements in learning the assembly technology using imported CKD components, as well as the processing technology for auxiliary components and the operation of machine tools, consultations and/or guidance will be provided in this period to related industries on materials, shapes and the precision of components. For example, local companies will purchase special materials such as alloy steel and will supply them to the heat treatment companies in order for them to be processed to the prescribed hardness and quality. They will then carry out the testing and inspections themselves in this period. With regard to cast iron products, local companies will provide subcontractors with detailed specifications in terms of product shape, dimensions, material and quality for trial production and will test and inspect themselves in order to positively participate in the localization of cast products. In other words, the linkage-type industry will begin to appear and then grow during this period.

(3) Third stage (1995 -)

The stage after 1995 has been defined as the initial stage of the period of industrial maturity. By this time, machine tool manufacturers will have accumulated the basic technologies, mostly centred on medium- and small-size general use machine tools. As the dependence on imported CKD components will be limited to a small number of specific components, most components will be supplied by the linkage-type industry. Linkage will, therefore, have established itself as an actual entity. The local machine tool industry will achieve reliance from user industries. In accordance with the expansion of the market, the consolidation of technologies and production systems to meet the demand for the development of not only medium- and small-size machine tools but also large or high performance machine tools, high precision and special usage will be achieved during this period.

2.4.2 Construction Machinery Industry

The localization schedules and the manufacturing classifications, i.e. either in-house or out-house for each component are designated under the deletion programs for the construction machines.

This means that those component to be manufactured by the linkage-type industry, out-house, are designated and these components will be manufactured by such sectors as casting, forging, heat treatment, sheetmetal work and welding, machining and press work. Figure A-2.1 shows the type of linkage preferred for construction machine production based on the analysis to determine which components will be actually made by which sectors.

The following explanaiton is given based on Figure A-2.1. Those components for construction machines, main frames, blade blocks, C frames, track frames and idlers, etc. are the important basic components. According to the deletion programs, they are designated to be manufactured in-house. These components mainly require equipment for sheetmetal work and welding and machining and, therefore, it is preferable that assemblers have sheetmetal work and welding and machining equipment in order to carry out these types of processing.

While the components for construction machines are to be manufactured by a number of sectors, as shown in the figure, the key sectors are sheetmetal work and welding and machining. Although assemblers possess these two sectors, it is not appropriate for assemblers to carry out all

the required processing work as too much a burden is involved. As a result, the deletion programs also allocate a number of components for out-house manufacturing. Consequently, a preferred form of the linkage for these two sectors to be is a close relationships between them as though they are subsidiaries.

It is important that assemblers give direct guidance and instructions in regard to casting, forging and heat treatment, etc. In addition, as those sectors specialising in these types of work have strong ties with subsidiary machining or sheetwork and welding companies (especially with the former), they should be given the characteristics of both subsidiaries and grand-child companies.

As far as the press work sector is concerned, it is preferable to be allocated to a part of assemblers or to various linkage sectors, in view of the small work volume, although the work itself is indispensable for the production of construction machinery. Since the production of construction machinery has a strong tie with the heat treatment sector, it has been devised here that the heat treatment sector also includes the presswork sector.

With regard to engines and radiators, it is appropriate for these components to be purchased from machine component manufacturers rather than fostering them into linkage-type industries. Figure A-2.1 summarises these ideas explained so far.

At present, since the production of construction machinery has just begun using the CKD method, the linkage-type industry has not yet made its appearance. However, in the case of sheetwork and welding, part of the processing of ordinary steel plate is ordered externally. In addition, radiators, mufflers and exhaust pipes have begun to be purchased from domestic manufacturers. Nevertheless, it is considered that certain period of time will be necessary for establishing the production system shown in the figure. The localization schedule given in the Figure shows the process of the establishment of the linkage-type industry for each sector, fully elaborating the deletion programs, which gives the schedules for each component.

2.4.3 Agricultural Machinery Industry

Figure A-2.2 shows the linkage system preferred in the case of the agricultural machinery industry in Indonesia. The following conditions were taken into consideration when this sytem was prepared.

1) Because of the small market size, it is necessary for subcontractors to supply component to some other machine assembly industries.

2) It is necessary to foster specialized subcontractors in similar processing job of components from different fields of industry.

3) It should be intended that the Agricultural Machinery Industry Association actively takes its prescribed functions, such as the provision of joint facilities and the promotion of joint purchases, etc.

As forementioned above, since the Indonesian market size of agricultural machinery is small, it is inevitable for a specialized linkage-type firm to have contracts with several assembly-type firms. However, it is not probable that one linkage type firm to have contracts with different assembly-type companies in the same subsector, but the firm may have linkage with other sub-sectors for example, construction machinery sector. This situation is illustrated on the Figure A-2.2. For example, firm (1) is specialized in process "a" and undertakes jobs from firm A and A', whose products belong to different subsectors.

The activities taken by the Agricultural Machinery Manufacturers' Association include acquiring technical and financial supports from the related governmental and international organizations, while the fostering activities for linkage-type industries on the association level.

2.4.4 Automotive Industry

Figure A-2.3 shows the present status of the linkages in the automotive industry in Indonesia. The components in solid line boxes are the ones already or will be manufactured by foreign joint ventures. (The power-train group is now under preparation for domestic production.) The major components as body, chassis, engine, transmission unit and steering unit are categorized in this group which will be domestically producted within five years.

With regard to components indicated in dotted line boxes, the domestic supply system has not been established. These include wide range of

components such as standard components, precise machine components, auxiliary components, electric fitting parts and instruments. Some of these have been tried for local production, however the quality does not meet the required level, even though there is foreign collaborationare. Consequently, it is expected to take about ten years for those components to be domestically produced.

Once those components in the dotted line boxes are domestically produced, it can be considered as the complete linkage system of the industrialized country as shown in Figure A-2.4.

2.4.5 Shipbuilding Industry

The future linkage structures in 1985, 1990 and 1995 is illustrated on Figure A-2.5, by assuming that the Government of Indonesia and the shipbuilding industry both understand the structural problems of the industry and bring about measures to improve these problems and presupposing that the ongoing localization of shipbuilding materials/components is carried out according to the schedule.

The illustration shows that in accordance with the gradual localization of those components which are currently imported, the imported items become mostly raw materials except for some special equipment. Those components already localized will be centrally purchased by and delivered to individual shipyards. In other words, a production line of shipyards will be changed into sole assembly line, while procurement of components will be consolidated into three groups, namely, (1) government's central purchase system, (2) linkage-type manufacturers and (3) components purchased on individual basis.

It is also assumed that structural reforms will be implemented by the sipyards in the same region jointly fosters linkage-type industries by ordering the out-house components. Then it is expected that most fittings are not manufactured in-house by 1995.

Figure A-2.1 DESIRABLE PATTERN OF LINKAGE IN CONSTRUCTION EQUIPMENT INDUSTRY

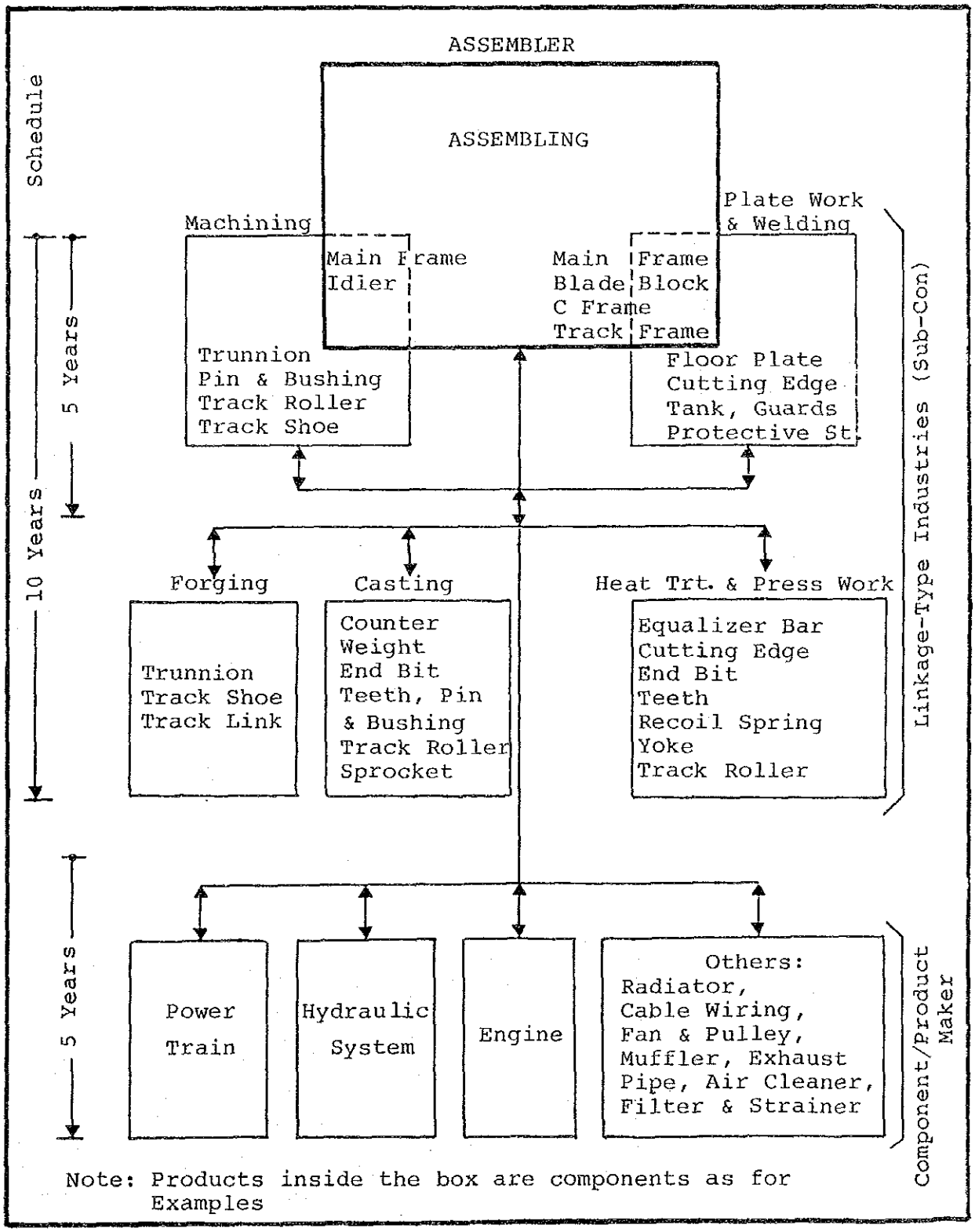


Figure A-2.2 SCHEME OF AGRICULTURAL MACHINERY INDUSTRY

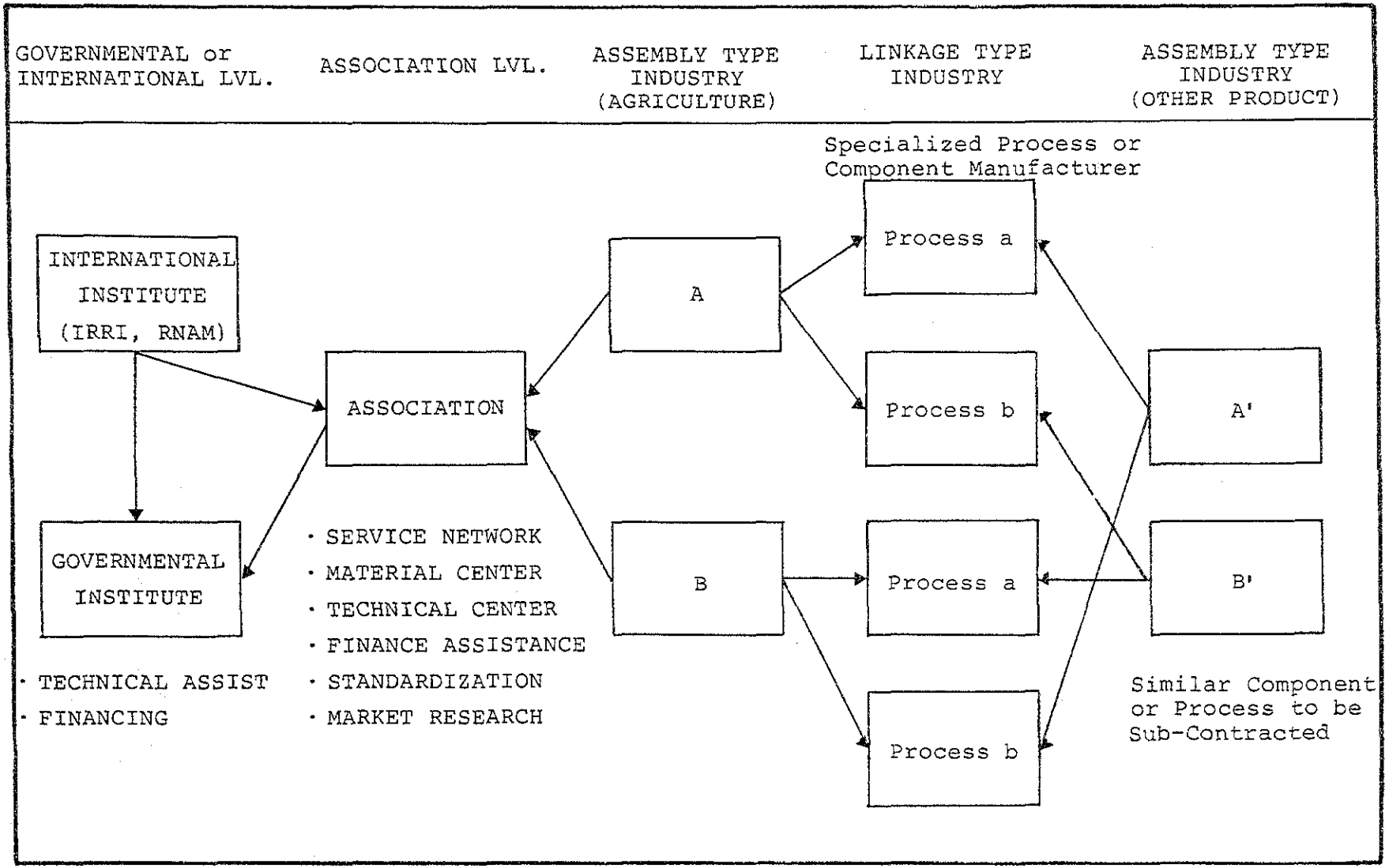


Figure A-2.3 PRESENT LINKAGE FORM OF AUTOMOTIVE MANUFACTURING IN INDONESIA

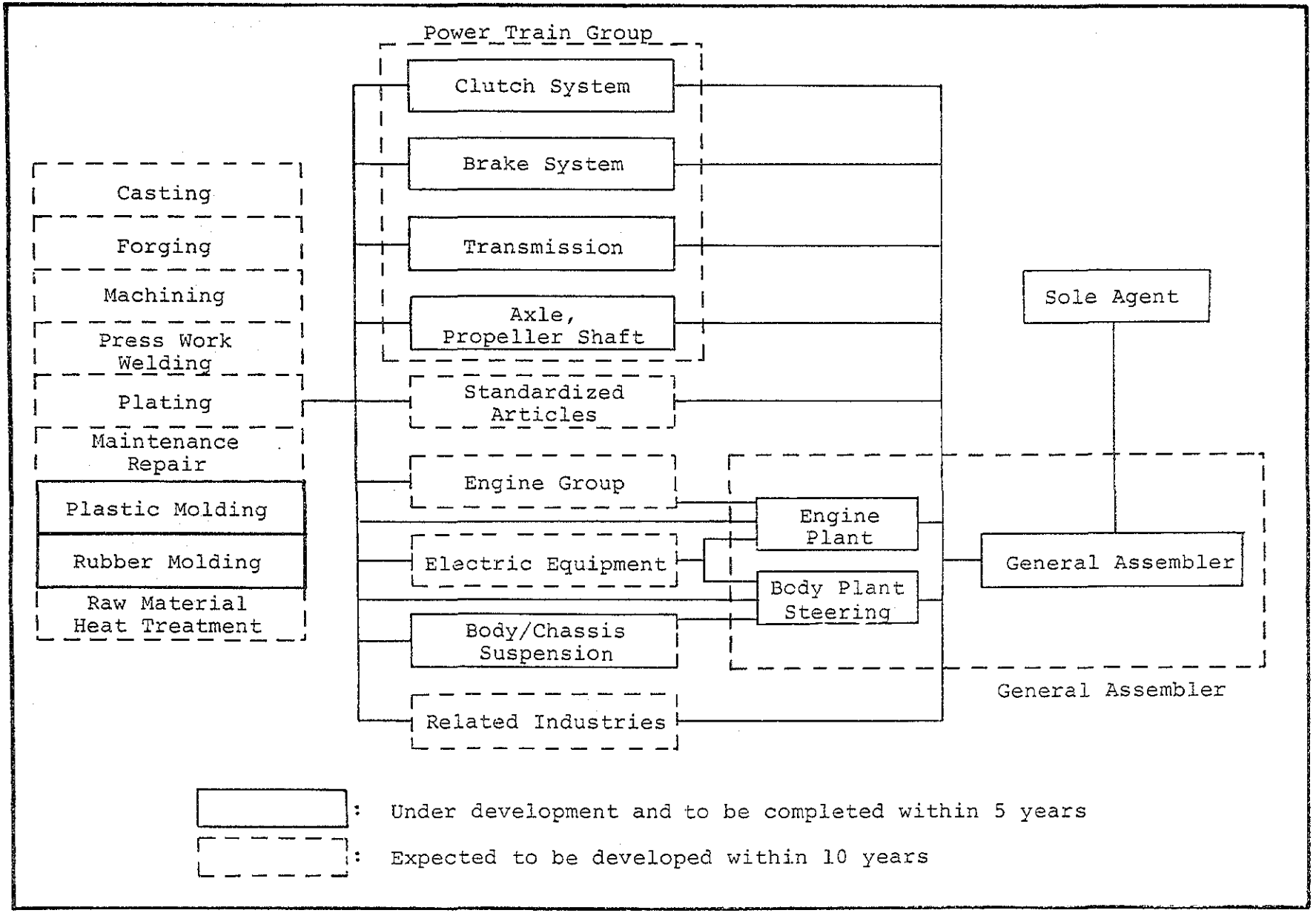
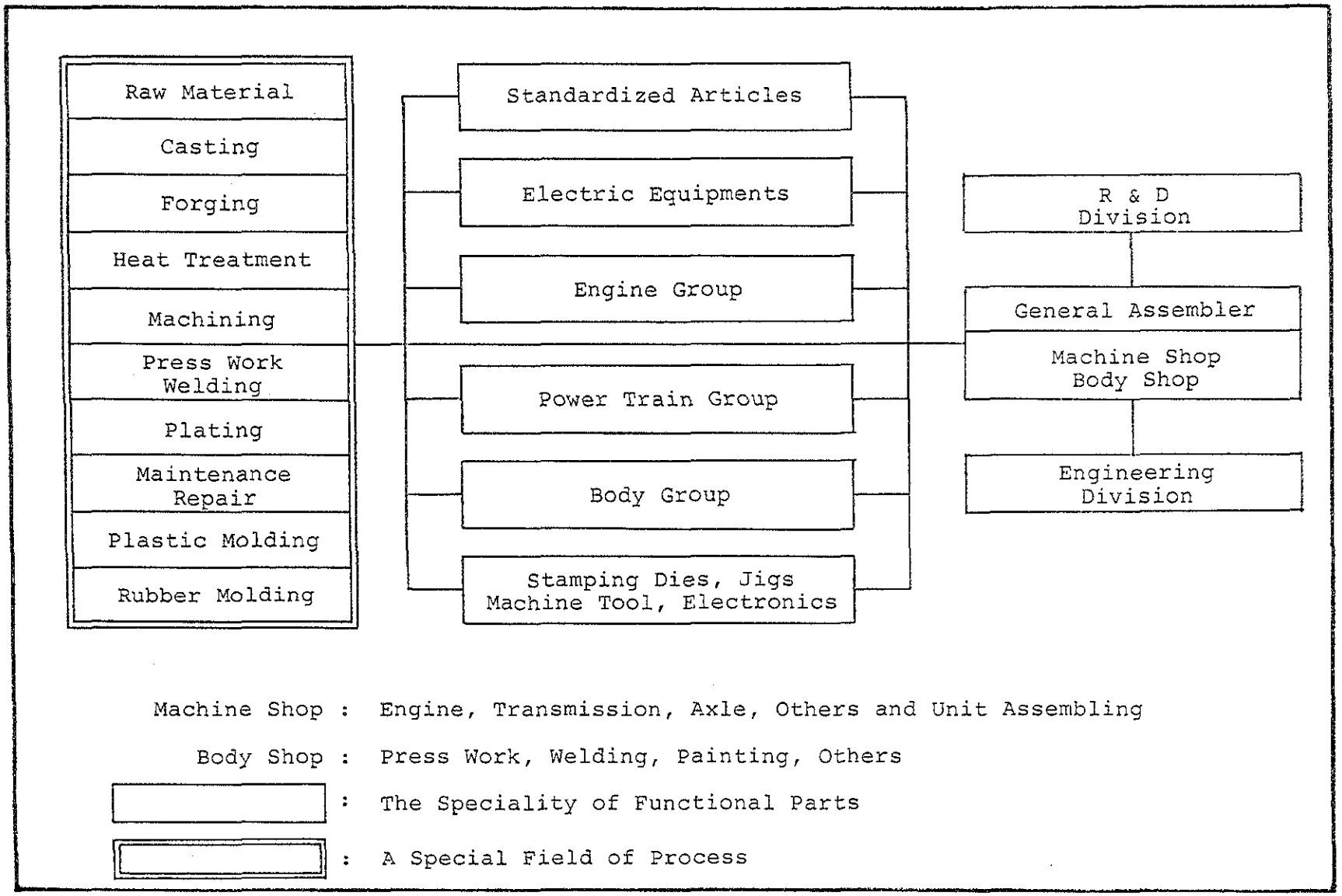


Figure A-2.4 DESIABLE LINKAGE FORM OF AUTOMOTIVE MANUFACTURING IN INDONESIA



ATTACHMENT TO FIGURES A-2.3 AND A-2.4

. Standardized Articles
Bolt, nut, washer, pin, clip, clamp, snap ring, key, bearing, metal bearing, oil seal, gasket, shim, paint, lubricant, sealer, adhesive agent, tool, etc.

. Electric Equipment
Ignition coil, spark plug, distributor, starter, alternator, head lamp, fog lamp, signal lamp, combination lamp, license lamp, room lamp, bulbs, battery, battery cable, wire, wireharness, wire connector, switch, relay, windshield wiper, radio, horn.
Flasher unit, antenna etc.

. Engine Group
Piston, piston ring, chain, inlet/exhaust valve, oil pump, fuel pump, oil cooler, radiator, fuel tank, thermostat, belt, exhaust system, air cleaner, oil filter, fuel filter, venturi, carburetor, injection nozzle, injection pump, canister assy, etc.

. Power Train Group
Clutch system, brake system, clutch/brake lining, control cable, universal joint, wheel disc, steering gear, steering wheel, ball joint assy, brake/fuel tube, leaf/coil spring, shockabsorber, tire & tube, flap, clutch/brake booster etc.

. Body Group
Safety glass, weatherstrip, window sash, window lock, window regulator, roof/floor insulator & lining, doorhandle & door lock assy, door hinge, cylinder lock assy, seat & seat track assy, seat belt, sun visor, mirror, moulding, air conditioning set, compressor, speed meter, tachometer, fuel gauge & meter, temperature meter, meter cable gasspring, reflector.

Figure A-2.5 ILLUSTRATED STRUCTURE OF INDONESIAN SHIPYARD AND FLOW OF SHIPBUILDING MATERIAL FOCUSED IN 1985, 1990 and 1995

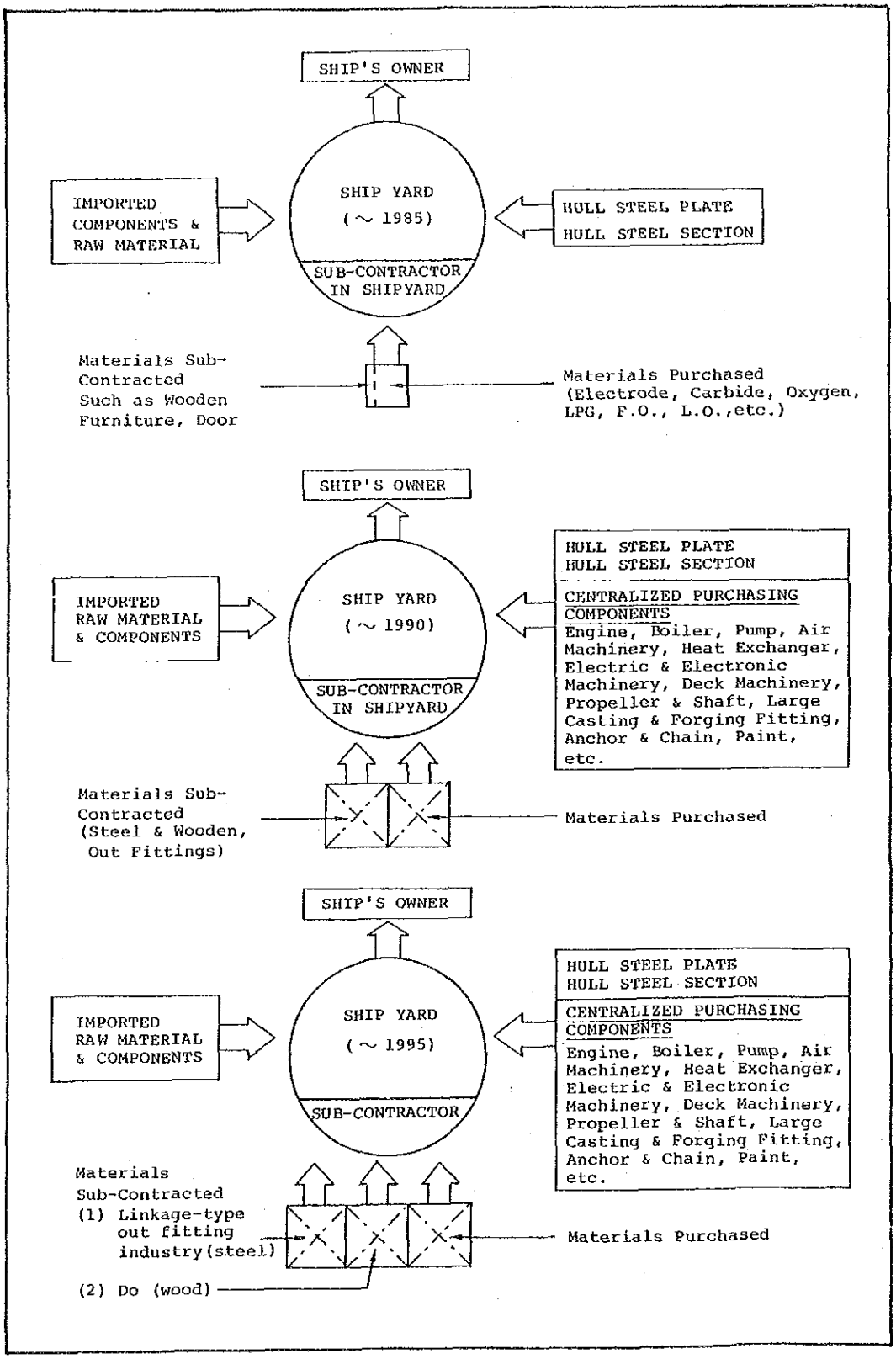


Table A-2.1 SUMMARY OF BASIC DATA FOR ASSEMBLY - TYPE INDUSTRY

	Establishment (No.)		Employees[1] (M)		Value added[2] (BRp.)		Employees/ Est.		Value added per employee[3] (MMRp.)		Local content (%)	
	1980	1982	1980	1982	1980	1982	1980	1982	1980	1982	1980	1982
(1) Machinery & Repair (38200)	132	131	12.1	13.0	34.9	54.6	91	99	2.9	4.2	17.4	32.8
(2) Radio, T.V., and others (38320)	34	36	14.5	15.3	53.9	73.6	427	426	3.7	4.8	12.1	14.3
(3) Electrical apparatus etc. (38330, 38340)	56	58	15.9	15.3	59.8	91.6	297	264	3.8	6.0	25.1	12.8
(4) Ship building & repairing (38411)	42	54	7.0	8.1	20.3	27.0	65	150	2.9	3.3	54.6	60.3
(5) Motor vehicles assembling & mfg. (38430)	32	42	11.4	14.4	78.5	91.5	167	342	6.9	6.4	18.8	20.2
(6) Motor cycle assembling & mfg. (38440)	15	13	5.6	7.5	35.8	90.5	357	576	6.4	12.1	35.3	31.0
(7) Motor vehicle body & equipment	50	58	4.3	6.3	6.9	20.2	371	108	1.6	3.2	42.5	53.8
Total/Average	361	392	70.8	79.9	290.1	449.0	196	204	4.1	5.6	23.0	24.6

Notes: 1/ M = Thousand persons
2/ BRp. = Billion Rp.
3/ MMRp. = Million Rp.

Sources: ANNEX III, Tables ANX III-1 and ANX III-3

Table A-2.2 CAPACITY, PRODUCTION AND DEMAND FOR MAJOR MACHINE TOOL (1984/85)

(in unit)

		(1) Capacity	(2) Production	(3) Demand	(4) Deficit (3)-(2)	(5) Capacity utilization (%)
1.	Lathe	700	300	4,200	3,900	43
2.	Drilling	550	225	2,500	2,275	41
3.	Sawing	100	50	8,950	8,900	50
4.	Milling	250	50	650	600	20
5.	Bending	100	25	700	675	25
6.	Shaping	100	20	75	55	20
7.	Grinding	25	25	25	0	100
8.	Rolling	100	25	1,520	1,495	25
9.	Shearing	100	50	360	310	50
10.	Special m/c	250	20	124	104	8
	Total	2,275	790	19,104	18,314	38
11.	Dies, Mold, Jigs & Fixture (ton))	11,500	1,000	11,800	10,800	9

Note: Utilization of domestic component is stipulated by the Deletion program for machine tool manufacturing.

Source: ANNEX III, Table ANX III-4

Table A-2.3 IMPORT OF MACHINE TOOL (1984)

	Kind of Machine Tools	Quantity (Unit)	Net Weight (Ton)
1	Machine tool operating by electricity, ultrasonic	1,726	327
2	Gear cutting machine	12	5
3	Lathe	1,053	1,032
4	Reaming or milling machine, metal working	620	354
5	Drilling or boring machine	3,973	482
6	Sawing machine	2,807	130
7	Plating machine	140	89
8	Tapping of screw cutting machine	425	51
9	Sharpening, trimming, trueing, grinding, polishing	-	720
10	Other metal working, press, grinding, polishing	-	1,798
11	Forging machine, strapping machine	-	54
12	Bending, forming, folding or flattening	-	479
13	Shearing, punching or notching	-	1,042
14	Other machine tools for working metal	-	4,716
	Total	10,756	11,279

Source: ANNEX III, Table ANX III-5

Table A-2.4 LICENCED ANNUAL CAPACITY FOR MACHINE TOOL MANUFACTURING (1985)

(unit)

Lathe:	1,920	Freis:	
		Knee type	550
Drilling:		W/drill	500
Stationary	5,000		1,050
Column	375		
	5,375	Press folding:	250
Sawing:	850	Plate folding:	1,900
Surface grinding:	250	Shearing:	1,250
Pipe bending:	400	Forging:	1,550
Punching:	500	(Total:	15,295)

Source: ANNEX V, Table ANX V-1, Deletion Program

Table A-2.5 CAPACITY, PRODUCTION AND DEMAND FOR MAJOR AGRICULTURAL MACHINE AND EQUIPMENT (1984/85)

(in unit)

		(1) Capacity	(2) Production	(3) Demand	(4) Deficit (3)-(2)	(5) Capacity utilization (%)
1.	Hand tractor	2,150	1,500	8,000	6,500	70
2.	Mini tractor (12-22.5KW)	200	125	3,000	2,875	63
3.	Tractor (over 22.5KW)	5,250 1/	10	2,000	1,990	-
4.	Thresher	2,500	1,500	10,000	8,500	60
5.	Huller	6,100	2,000	39,000	3,700	30
6.	Polisher	3,500	1,000	39,000	38,000	29
7.	Rice milling	1,570	1,000	3,500	2,500	64
	Grand-total	21,270	7,135	104,500	64,065	53 2/
8.	Irrigation pump	7,200	5,000	6,000	1,000	69
9.	Hand sprayer (1,000)	497	200	185	(15)	40

Notes: 1/ Most of the capacity is under planning and construction.
2/ Simple average of six products excluding "3. Tractor".
Item 1 to 7 are stipulated by the Deletion Program.

Source: ANNEX III, Table ANX III-6

Table A-2.6 COMPARISON OF PRODUCTION CAPACITY

(unit)

Source	KNS (1984/1985)	BKS-ILLMA (1982)
Hand tractor	2,150	9,950
Mini tractor	200	5,000
Tractor	5,250	
Thresher	2,500	4,310
Huller	6,100	10,960
Polisher	3,500	5,650
Rice milling	1,570	120

Table A-2.7 IMPORT OF AGRICULTURE MACHINE

	1981	1982	1983	1984
Hand tractor CKD	755	808	855	-
Built up	716	1,633	1,986	1,100
Mini tractor CKD	-	71	80	20
Built up	430	66	145	32
Tractor CKD	41	50	142	17
Built up	603	923	695	278
Other tractor CKD, built up	238	212	1	-
Thresher with combinder 1/	170	1,100	5,000	110
Rice huller	-	7,315	5,163	9,660
Miller	-	11,186	11,619	6,168
Pump (centrifugal)	8,032	11,695	23,132	7,239

Note: 1/ Units of thresher is estimated from weight (tons) using the following unit weight by JICA Team.
Combined Harvester - Thresher = 560 kg/unit
Other Harvester - Thresher = 200 kg/unit

Source: ANNEX III, Table ANX III-7

Table A-2.8 CAPACITY, PRODUCTION AND DEMAND FOR CONSTRUCTION EQUIPMENT

(in unit)

	(1) Capacity	(2) Production	(3) Demand	(4) Deficit (3)-(2)	(5) Capacity utilization (%)
1. Crawler bulldozer	1,065	530	650	120	50
2. Hydraulic excavator	635	160	230	70	25
3. Motor grader	255	147	150	3	58
4. Wheel loader	340	120	170	50	35
5. Road/vibro roller	1,000	424	525	101	42
6. Stone crusher	590	20	110	90	3
7. Concrete mixer	2,000	1,300	1,650	350	65
8. Plate compactor	500	440	500	60	88
Total	6,385	3,141	3,985	1,032	49

Source: ANNEX III, Table ANX III-9

Table A-2.9 IMPORT OF CONSTRUCTION EQUIPMENT

		1982	1983	1984
1.	Road roller (unit)	650	471	182
	(weight ton)	2,800	2,273	1,097
2.	Bulldozer, (unit)	1,488	957	623
	angle dozer, (weight ton)	21,765	11,644	8,721
	& leveller			
3.	Mechanical shovel (unit)	n.a.	n.a.	n.a.
	and excavator (weight ton)	10,926	8,295	5,593
4.	Other machine (unit)	n.a.	n.a.	n.a.
	self Propelled (weight ton)	2,698	3,427	1,904

Note: CKD and CBU

Source: ANNEX III, Table ANX III-10

Table A-2.10 PRODUCTION OF AUTOMOTIVE

(1,000 NBR)

	Passenger Car	Commercial Car	Total	Capacity Utilization (%)
1975	30	54	84	-
1976	31	51	82	-
1977	12	78	90	-
1978	15	92	107	-
1979	14	87	101	-
1980	22	151	173	47
1981	27	183	210	57
1982	30	160	190	52
1983	24	132	156	42
1984	23	130	154	42
Capacity (1984)	55	313	368	

Sources: ANNEX III, Table ANX III-11 to Talbe ANX III-14

Table A-2.11 PRODUCTION OF MOTORCYCLE AND SCOOTER

(1,000 NBR)

	Production	Capacity utilization (%)
1975	301	-
1976	270	-
1977	302	-
1978	320	-
1979	213	-
1980	410	37
1981	503	45
1982	557	50
1983	362	33
1984	248	22
Capacity (1984)	1,110	

Sources: ANNEX III, Table ANX III-15 and Table ANX III-16

Table A-2.12 CAPACITY, PRODUCTION AND DEMAND OF ELECTRICAL MACHINE AND APPLIANCES (1984/85)

(Unit: 1,000 units)

	Capacity	Production	Demand	Deficit 1/	Capacity 2/ utitlization (%)
Electrical machine					
1. Electric motor	72	36	333	297	50
2. Generator	62	37	42	5	60
3. Panel	27	19	21	2	70
4. Transformer	20	10	11	1	50
5. KWH meter	1,120	1,120	1,550	430	100
Sub-total	1,301	1,222	1,957	735	66
Household appliances					
1. Refrigerator	450	186	177	(9)	41
2. Rice cooker	233	58	58	0	25
3. Room fan	1,356	1,056	960	(96)	78
4. Electric iron	130	40	40	(0)	31
5. Fluorescent lamp	22,200	17,476	15,888	(1,588)	79
Sub-total	24,369	18,816	17,123	1,693	51

Notes: 1/ Deficit = Demand - Production
2/ Capacity utilization = Production/Demand x 100

Source: ANNEX III, ANX III-17

Table A-2.13 IMPORT OF ELECTRICAL PRODUCTS

(US$ million)

	1981	1982	1983	1984
DC motor & generator	4.5	22.0	4.1	4.7
AC/DC motor	23.7	38.9	31.7	35.1
AC generator (< 5kg)	22.7	8.0	11.0	5.1
Generator set	77.9	112.4	103.8	68.0
Parts for motor	14.9	21.3	17.0	19.2
Transformer	56.9	113.9	32.5	70.1
Switch board & panel	19.6	26.9	42.9	30.7
Junction box	1.5	1.1	1.9	2.5
Total	221.7	344.5	244.9	235.4

Source: ANNEX III, Table ANX III-19

Table A-2.14 CAPACITY, PRODUCTION AND DEMAND OF SHIP BUILDING AND REPAIRING (1985)

1. Annual Capacity, Production and Demand (1,000BRT)

	Capacity	Production	Demand	Capacity Utilization (%)
New building	45	20	110	44
Repairing	1,200	700	2,700	58

2. Distribution of Demand

Class (BRT)	New Building (1,000BRT)	(%)	Repairing (1,000BRT)	(%)
501 & below	20	18	250	9
501 - 2,000	45	41	450	17
2,001 - 5,000	30	27	300	11
5,001 - 10,000	15	14	300	11
10,001 - 30,000	0	0	1,400	52
	110	100	2,700	100

3. Distribution of Capacity Installed

Class (GT)	New Building Capacity(GT)	No of Berth	%	Ship Repairing Capacity(GT)	No of Docks	%
100 & below	6,355	65	63	7,840	86	63
101 - 500	5,350	11	10	11,050	27	20
501 - 1,000	22,550	24	23	8,940	9	7
1,001 - 5,000	11,100	4	4	27,180	11	8
5,001 - 20,000	0	0	0	35,680	3	2
Total	45,355	104	100	90,690	136	100

Note: BRT (BRUTTO RESISTED TONNEN) = Gross Registered Tonnage

Sources: ANNEX III, Table ANX III-21 to Table ANX III-25

Table A-2.15 CAPACITY, PRODUCTION AND DEMAND OF PLANT EQUIPMENT AND MACHINERY (1984/85)

	Capacity	Production	Demand	Deficit	Capacity Utilization (%)
Process plant					
1. Copra processing plant (unit)	140	32	100	68	23
2. Suger plant (unit)	346	337	341	4	97
3. Coffee processing plant (unit)	260	130	160	30	50
4. Tea processing plant (unit)	250	158	158	0	63
5. Water treatment plant (unit)	130	80	140	60	62
Equipment & machinery					
1. Structural steel (ton)	52,850	32,000	77,000	45,000	61
2. Steel tank (ton)	16,000	11,300	46,000	34,700	71
3. Boiler (unit) (upto 20t/h)	30	23	180	157	77
4. Boiler (unit) (20t/h & above)	10	6	8	2	60
5. Heat exchanger (ton)	0	0	10,000	10,000	-

Sources: ANNEX III, Table ANX III-26 and Table ANX III-27

Table A-2.16 SUPPLY AND DEMAND OF PUMP

1. Capacity, production and demand

(1984/85)

	Capacity	Production	Demand	Deficit	Capacity Utilization (%)
Irrigation pump	7,200	5,000	6,000	1,000	69
Turbine pump	400	40	30	(10)	10
Industrial pump	3,000	1,000	9,600	8,600	33
Water treatment pump	130	80	140	60	62
Total	10,730	6,120	15,770		

Source: ANNEX III, Table ANX III-31

2. Import

Year	BKPM	BPS	
	US$'000	Weight (ton)	US$'000
1973	13.7	-	-
1977	27.9	-	-
1978	55.5	-	-
1979	49.8	-	-
1980	59.6	-	-
1981	56.6	-	-
1982	94.8	18,339	160
1983	137.6	20,397	197

Source: BKPM, BPS

3. Domestic production/import (10^9 Rp.)

	Import	Domestic production	Total	Domestic (%)
1981	57.57	1.75	59.32	3.0
1982	94.27	2.34	96.61	2.4

Source: UNIDO

Table A-2.17 CAPACITY, PRODUCTION AND IMPORT OF STEEL

(1,000 ton)

	Capacity	Production	Import
Crude steel			
Steel slab	1,000	108	27
Ingot/Billet	1,370	883	143
Sub-total	2,370	991	170
Steel products			
Hot coil	1,000	127	-
Plate	70	-	207
Bar/Shape	1,370	724	213
Sheet	-	-	766
Wire rod	370	300	29
Metal wire		9	12
Electroplating sheet	-	-	3
Tin plate	-	-	119
Other coated sheet	-	-	36
G.I. Sheet	400	419	16
Welded pipe	530	180	223
Spiral pipe	50	50	
Pipe fittings	-	-	14
Secondary products	-	-	29
Sub-total	3,790	1,809	1,667
Grand-total	6,160	2,800	1,837

Sources: ANNEX III, Table ANX III-32 to Table ANX III-34

Table A-2.18 PRODUCTION, IMPORT AND CONSUMPTION OF CAST IRON

(1) Production, Import and Consumption

(1,000 ton)

Year	Production	Imports	Consumption
1978	26.0	33.5	59.5
1979	59.9	29.2	89.1
1980	66.0	24.1	90.1
1981	70.5	36.4	107.0

Note: Not including products which are imported as components of finished products.

Source: BKPM Nov. 1983

(2) Imported Ferrous Castings in 1983

(1,000 ton)

678.5	Cast iron fittings for tubes or pipes	14.1
678.1	Cast iron and tubes for pressure systems	29.1
679.41	Castings iron in the rough state	0.5
951.09	Castings, metal for militarry small arms	0.3
679.42	Castings, steel, in the rough state	1.5
	Total	45.5

Note: Not including castings used in complete machine components.

Source: IMPORT STATISTICS 1983, INDONESIA

Table A-2.19 PROJECTED CAPACITY, PRODUCTION AND DEMAND OF CAST IRON

(1) Projected Production of Crude Steel, Cast Iron and Cast Steel

(1,000 ton)

Year	Crude Steel	Cast Iron	Cast Steel
1984/85	3,150	140	2.7
1985/86	3,600	170	2.9
1986/87	3,800	200	3.1

Source: BKPM. OCT. 1984

(2) Projected Demand of Cast Iron

Year	Cast Iron (1,000t/y)	Increase (%/y)
1983	124.8	-
84	143.5	14.8
85	165.0	14.2
86	189.8	15.5
87	218.2	14.6
88	251.0	13.7
89	288.6	15.8
90	331.9	16.6

Source: Executive Fact Book. Indonesia

(3) Capacity, Production and Demand of Ferrous Castings from 1982/1983 to 1987/88

(1,000 ton)

Year	Capacity		Production		Demand	
	Cast Iron	Cast Steel	Cast Iron	Cast Steel	Cast Iron	Cast Steel
1982/83	71	6.5	70	2.5	93.5	2.7
83/84	71	6.5	71	2.8	110	3.4
84/85	71	13	71	3.23	140	4.25
85/86	71	13	71	3.72	170	5.3
86/87	260	13	150	6.62	200	6.62
87/88	260	13	200	7.3	220	7.3

Source: PENGEMBANGAN KAPASITAS NASIONAL SEKTOR INDUSTRI 1984 - 1987, MOI, 1984

Section 3 QUESTIONNAIRE SURVEY AND ITS RESULTS

Section 3 QUESTIONNAIRE SURVEY AND ITS RESULTS

3.1 Questionnaire Survey

The questionnaire survey was conducted separately for assembly-type machine industries and linkage-type metalworking industries, since the contents of inquiries and the method of distribution and collection were different.

3.1.1 Assembly-Type Machine Industry

The questionnaires are prepared both in English and in Indonesian, and the Indonesian version was used for distribution. The questionnaires consist of the following six parts. (See ANNEX for questionnaires)

(1) General

(2) Products

(3) Conponents and raw material

(4) Outline of subcontracting companies being used

(5) Increase of domestic manufactured components

(6) Future plan

For choosing companies to be surveyed, list of large- and medium-scale industires under the subsectors of the study were obtained from Directorate General of Basic Metal and Machinery Industries, as well as from Directorate General of Multiferious industries. After the close consultation with staff of MOI, 160 companies were selected throughout Indonesia and the questionnaire sheets were mailed to each companies. After the survey period, 55 answers were obtained by mailing from the companies or through company-visit by the Study Team.

The answeres given from 55 companies are almost all well-filled-in, and since the major state-owned and joint-ventures using subcontractors sent back the answered questionnaires, the results provides reliable data to explain the present conditions of assembly-type industries in machinery sectors. The Study Team estimated the sample population to be about 230 companies, so that the sample/population ratio is 24%.

Although the area of the survey was whole Indonesia, the most large industries are in Jawa, particularly in Jakarta. Out of 104 companies selected in Jakarta, 23 sent answers, from West Jawa, 11 answered the questions out of 20, then from East Jawa, 10 answers from 20 distribution. In West Jawa, the area surrounding Jakarta, i.e. Boqor, Tangeran and Bekasi, and Bandung are major areas. In East Jawa, Surabaya and its vicinity is the area of concentration. In Central Jawa and Yogyakarta, where the industries are comparatively less developed, two companies answered out of 9 companies. For outer islands, 4 companies from Sumatera (Medan and Palembang), 2 from Kalimantan (Samarinda and Balikpapan) and 3 from Sulawesi (Ujung Pandang) answered the questionnaires.

ANSWERS FROM ASSEMBLY-TYPE INDUSTRY (MAILED)

	No. of Distribution	Answer
DKI Jakarta	104	23
West Jawa	14	11
Central Jawa 1/	9	2
East Jawa	20	10
Sumatera	7	4
Kalimantan	4	2
Sulawesi	2	3
Total	160	55

Note : 1/ Includes YOGYAKARTA

3.1.2 Linkage-Type Metalworking Industry

The questionnaires are also prepared in English and Indonesian, and the Indonesian versions were used for field survey. The following six items are major contents. (See ANNEX for questionnaires)

(1) General

(2) Produts

(3) Material and facility

(4) Problems and conditions with parent company

(5) Problems faced by your company

(6) Future plan

The questionnaire survey was conducted through interview-visit to each medium and small industries (MSI), by mobilizing industrial extension workers (TPL) at regional industrial offices (KANWIL) mainly because of the following reasons;

(1) The mailing of questionnaire is expected to be ineffective for MSI.

(2) Each KANWIL has company list and data of MSI, so that selection of surveyed companies has to be done at each KANWIL.

(3) Since TPLs are in daily contact with MSIs in the area, it is easier to collect various firm-level data.

Major area of interest was Jawa, where 212 MSI were surveyed. For outer islands, the total of seven companies were visited and obtained the answeres, totaling the sample number to be 219. (See Table A-3.1) The population of the MSI under the survey is estimated to be 2,600. (Refer 4.3.2 for the estimation method)

ANSWERS FROM LINKAGE-TYPE INDUSTRY (INTERVIEW)

	No. of Enterprises	Interviewer
DIK Jakarta	48	4
West Jawa	61	12
Central Jawa 1/	31	6
East Jawa	72	10
Sumatera	3	-
Kalimantan	2	-
Sulawesi	2	-
Total	219	32

Note : 1/ Includes YOGYAKARTA

3.2 Outline of Survey Result

The data collected by questionnaire survey were processed by computer for further analyses. This section reviews the answers to each questions by looking the total and average figures, then try to outline the whole picture of the present conditions of assembly-type industry and linkage-type industry.

3.2.1 Assembly-Type Industries

The questionnaire items are re-classfied into the following six categories. (See ANNEX IV for the detail)

Code	
10000	Basic information
20000	Production & ratio
30000	Size of enterprises
40000	Products & market
50000	Future plan
60000	Sub-con from parent company's view

(1) Basic information (10000)[1/]

1) Number of answers (10100)

Out of 55 companies answered, Jakarta shares highest of 23 companies (40%), then West Jawa; 11 (20%), East Jawa; 10 (18%). Other areas of central Jawa, Sumatera, Kalimantan and Sulawesi are 2 to 4 companies, indicating high concentration in Jawa, particularly in Jakarta area.

2) Number of employees (10200)

The average employment of all sample is 470 per company, while the engineers with degree are 8.6 (1.8%) and technicians or non-degree engineers are 120 (25.6%).

Note: 1/ The numbers in parentheses indicate item code number used in ANNEX IV.

3) Capital (10300)

The average of paid-in equity capital amount is 4.8 billion Rupiahs, while the value of fixed assets (excluding land and building) is Rp.7.9 billion. As for the background of establishment, 1/4 of the answers indicates they are initiated by the Government, another 1/4 are by foreign companies, then the rest, 1/2, are by local companies. The year of establishment is around 1970 in average, corresponding with the years of investment boom arose after the stipulation of Foreign Investment Law (1967) and Domestic Inventment Law (1968).

4) Sales amount and material cost (10400, 10500)

The average annual sales is Rp.10.8 billion, while the cost of raw material and component is Rp.5.2 billion of which 70% is paid for imported material and component. Since the cost for imported component shares 47.9%, there are substantial room for domestic procurement of components.

(2) Production & ratio (20000)

The average capacity utilization of production facilities is 60%, with the value-added amount of Rp.3.7 billion per company and Rp. 6.8 million per employee, while the capital-labor ratio (fixed assets/employee) is Rp.9.97 million.

(3) Size of enterprises (30000)

Out of 55 samples, 13 companies falls in the range of 200-299 employees scale, while 8 companies employs more than 1,000 workers, which affected the average figure of 417. As for scale of capital-labor ratio, 32 companies (62.7%) are between Rp.1 to 10 million, and 14 companies (27.9%) are between Rp.10 to 50 million.

(4) Products and market (40000)

The products are categorized into 9 items listed below. About 30% of the sample are producing automobiles, then both shipbuilding and electric machinery are produced by 17%, and agricultural machinery by 13%. The products are sold to sole agent/dealer, then public sector and general market, while no export is observed.

Name of Products	Number of Companies Producing
1) Machine tool	5
2) Agriculture machinery	7
3) Heavy & construction machinery	3
4) Process equipment	3
5) Electrical machinery	9
6) Ship building	9
7) Automobile	17
8) Motorcycle	4
9) Others	16
Total	73 1/

Note: 1/ Since some companies produce more than one items, the total exceeds 55.

(5) Future plan (50000)

92% of the total samples have future expansion plan, and answered average investing amount of Rp.13.7 billion per one company in very near future (1986). The major market is still domestic, but 6 companies are looking for overseas market. Answering to the questions about increasing rate of the future market, they are expecting 74% increase in 5 years, and 132% in 10 years which shows they are generally expecting prosperous future market.

As for assistances to the subcontracting companies, most companies answer the possibility of cooperation of training, supervising, or inspection, and reply that the government assistances including financial assistance to the subcontracting companies are effective and necessary.

(6) Subcontracting companies from parent companies' view (60000)

37 companies of 55 sample companies (67%) have 181 subcontracting companies, which accounts for 5 subcontracting companies per one parent company. The size of these subcontracting companies varies. The scale of 5 employees to 49 employees shares almost half of the valid answers (91), but 26 of them have over 200 employees. The average is 135 employees. As for capital amount (57 valid replies), 50% is under 70 million Rp. (equals to the category of small company of the Ministry of Industry), but 0.1 -0.5 billion Rp. shares 28%, over one billion Rp. shares 16%; that means subcontracting companies include so called small/medium companies and also rather large companies.

The supply from subcontracting companies are covering all processing fields of metal and machineries as indicated by the following table. (one company may have more than 2 fields of processing, so the total number of companies is more than sample numbers.)

	Contents	Number of Companies
1)	Casting	30
2)	Forging/heat treatment	12
3)	Sheet work/welding	63
4)	Plating	13
5)	Machining	38
6)	Press work	46
7)	Non-metal	43
8)	Services	17
	Total	262

These products are supplied mostly by orders, and half of the payments is by cash, about one forth has raw materials provided by parent companies. 32 subcontracting companies (18%) are obtaining financial assistances from parent companies, of which 28 cases are credits in advance, and 5 cases in a form of equity participation. 139 subcontracting companies (77%) are receiving technical assistance from parent companies in supervising, inspection, training and management; which means that parent companies are already providing various assistances to their subcontracting companies.

On the other hand, the view from parent companies to subcontracting companies indicates that technical aspects (quality/quantity of products and technical level) are generally said to be "acceptable", however, 55% answered "delay in delivery ", and 70% answered weakness in "management" and "enterpreneur ship". They give more severe evaluation on management aspect than technical aspect.

3.2.2 Linkage-Type Industries

The questionnaire items are reclassified into the following 8 categories for further analysis. (See ANNEX IV for the detail)

Code	
10000	Basic information
20000	Production & ratio
30000	Size of enterprises
40000	Enterpreneur
50000	Linkage
60000	Operation of the company
70000	Future plan
80000	Financial aspect

(1) Basic information (10000)

1) Number of sample (10100)

Among all 219 sample companies, 212 companies (97%) are in Jawa Island. Among them, 72 companies (33%) are in East Jawa, mainly in Surabaya and its vicinity, 61 companies (28%) are in West Jawa, in Bandung, and surrounding area of Jakarta. Then 48 companies (22%) are in Jakarta, and 31 companies (14%) are in Central Jawa, in rather scattered areas as Semarang, Tegal and Solo. For outer islands, 3 companies in Sumatera (Medan), 2 companies in Kalimantan (Samarinda & Balikparan), 2 companies in Sulawesi (Ujung Pandang) were collected.

2) Number of employees (10200)

Average employees per one company is 71 employees, and 0.9 graduate engineers (1.3%), 10% are engineers graduated from senior high school.

3) Capital, sales and raw materials cost (10300-10600)

Average fixed asset amount (except land & building) per one company is about Rp.330 million and the working capital is Rp.276 million, the total (net asset amount) is Rp.605 million. On the other hand, annual sales amount is Rp.876 million, the raw materials cost is Rp.419 million. The half of raw materials and components are imported. Average year of establishment is 1974.

(2) Production & ratio (20000)

Average alue added per one company is about Rp.415 million, while Rp.3.19 million per one employee, which is less than half of the large industry. Capital-labor ratio is Rp.3.42 million per employee which is one third of the large industry. The capacity utilization ratio is 69%, higher the answer from large industry.

(3) Size of enterprise (30000)

Average employees per one company is 71 employees. Its breakdown is 31.8% for 5 - 19 employees (small industry), 45.6% for 20 - 99 employees (medium industry), 27.1% for over 100 employees. The size is comparatively smaller than the subcontracting companies being answered by parent companies (135 employees per one subcontracting company.)

As for fixed asset amount (except for land & building) per one company, 58% is less than Rp.70 million which falls in the category of small industry by the Ministry of Industry, the companies with Rp.100 to 500 million shares 29%, and 7% are more than Rp.500 million, the total average is Rp.330 million.

(4) Enterpreneur (40000)

As for former career of enterpreneurs, a half comes from trading, one fourth are from other small/medium industries, about 10% are from government/large industry. The ownership is mostly by the enterpreneur himself or his family.

(5) Linkage (50000)

Regarding the production process employed by the sample companies, 74% have machining process, 47% have sheetwork/welding, 40% have presswork, (Number of answered companies is more than the number of sample companies (219) since some employ more than one process.)

	Process	Number of Answers
1)	Casting	61
2)	Forging/heat treatment	52
3)	Sheet work/welding	102
4)	Plating	68
5)	Machining	163
6)	Press work	89
7)	Services	2
	Total	537

As for market, 34% of the companies supply directly to parent companies and 66% to general market. The components supplied by the MSIs are used to assemble the final products of automobile, agriculture machine, electrical machine and other machineries. (The number of the answer is more than that of sample companies.)

	Final Products	To Parent	To Common Market
1)	Machine tool	2	5
2)	Agricultural machine	17	23
3)	Heavy construction machine	7	7
4)	Plant equipment	10	11
5)	Electrical machine	18	39
6)	Ship building	5	4
7)	Automotive	19	40
8)	Motorcycle	7	20
9)	Others	22	85
	Total	107	234
	(Valid samples)	(76)	(179)

As for business with parent companies, any particular problems are not shown for quality and quantity aspect, but 28% replied that parent companies are very severe for delivery time and 31% replied about delay of payments. As for assistances from parent companies, 28% answered that they receive some kind of financial assistance, and 22% receive technical assistances.

(6) Operation of the company (60000)

As for machine and equipment, about one forth answered as "poor" while for production capacity, about a half answered as "not enough". As for technical level of employees, 34% replied "high", 6% as "low", and 60% as "medium". Book keeping is practiced by 3/4 of samples. As for desirable technical assistances, the majority demands technical advising from government, and quality inspection from parent companies.

(7) Future plan (70000)

As for future expansion plan, 159 companies (73%) answered "yes". On average, about Rp.0.7 billion is necessary by middle of 1987 per one company with about 10% of self-financing, 25% of loan and 65% as unknown or no definit plan. As for increase of future demand, expected average of 50% increase in 5 years, 119% in 10 years are indicated. As for request to the government, most asked for assistance for market development, finance, technical and managerial aspects.

(8) Financial aspect (80000)

The present condition of borrowings are; 135 loans from commercial banks, including 53 KMKP. The average amount is Rp.284 million since there are also loans with large amount. The interest rate is 12.0% for KIK, KMKP and KIB, while 19.5% for equipments, 33.3% for working capital; which are affected by the market interest rate. As for the handling banks, almost half of the loan is by Bank Negara Indonesia 1946, private banks, then Bank Bumi Daya.

	KIK (Equipments)	KMKP (W.C.)	KIB (Equipments)	Others (Equip.)	Others (W.C.)	Total
Number of loans	37	53	17	7	21	135
Average borrowing (Rp.million)	12.0	14.7	533	2587	472	283.6
Interest rate (%/year)	12.0	12.0	12.0	19.5	33.3	

Concerning the present financial system, the opinions by the sample MSIs are; i) for state banks, their interest rate, term and collateral requirement are mostly "acceptable" while the loan amount is not enough, ii) for private banks and other financial institutions, they provide enough amount of loan, however, the interest rate is too high (57% of the sample), term is too short (54%) and the collateral required is too severe (57%). This tendency is stronger for other informal borrowings.

Finally, as for desired borrowing conditions, the averaged figure of the answers indicates; i) for investment capital, Rp.163 million for 7 years at 9.2% p.a., ii) for working capital, Rp.234 million for 5 years at 11.3%. These figures should be referred for programming the new financial scheme.

Interest Rate (%)	Period (Year)	Amount (Rp.million)	Collateral (% of loam)
Investment capital	9.2	6.9	162.9	62.8
Working capital	11.3	5.0	234.4	0.0