Chapter 4
Technology Level of Supporting Industry

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4.1 Diagnosis Method of Technology and Assessment

In order to survey the technological level of parts/components industries in Mexico, in particular, to clarify technological problems on SMEs, visits to enterprises have been made. Technology experts who have long experience (at least 35 years) in each processing technology field have visited these enterprises. Relative and quantitative technological diagnosis using the 5 point scoring has been done by five technological experts in the Team.

4.1.1 Enterprises which Received Technological Diagnosis

(1) Number of enterprises visited and diagnosed samples

The number of enterprises visited and diagnosed samples are as follows. Since the scoring was made for each processing technology, the number of samples is more than the number of enterprises visited for some enterprises which are employing two processing technologies. On the other hand, some enterprises did not disclose the factories.

Table 4.1-1 Number of Companies Visited and Samples Diagnosed

(Unit: Nos. of enterprises)

	Visits	Diagnosis	Duplicated Process	Samples
Autoparts	65	47	2	49
Electparts	60	50	9	59
Others [1)]	10	-	-	-
Total	135	97	11	108

Note : 1) "Others" is not included in any analysis in report.
Source : JICA Team Field Survey

(2) Shareholder of enterprises diagnosed

Table 4.1-2 Share Holder of Enterprises Diagnosed

Capital	Autoparts	Electparts	Total
Mexico 100%	19	27	32
Foreign 100%	10	17	27
J/V	16	3	36
No answer	2	3	2
Total	47	50	97

Source : JICA Team Field Survey

(3) Size of enterprises diagnosed by numbers of employees

Table 4.1-3 Size of Enterprises Diagnosed by Nos. of Employees

Size (Employees)	Autoparts	Electparts	Total
Small (100 or fewer)[1)]	10	22	32
Medium (101～250)	16	11	27
Large (251 or more)	20	16	36
No answer	1	1	2
Total	47	50	97
(Average employees)	(368)	(259)	(312)

Note : 1) Micro-scale enterprises with 15 or fewer employees is included in "Small" because of small number of samples for Micro.

Source : JICA Team Field Survey

(4) Classification of processing technologies of the enterprises diagnosed

Table 4.1-4 Number of Samples by Processing Technology

Processing Technology	Automotive components	Electrical and electronic components	Total
A. Casting	7	1	8
B. Die-casting	5	0	5
C. Forging	2	0	2
D. Stamping	11	7	18
E. Plastic processing	8	17	25
F. Rubber processing	4	0	4
G. Machining	4	8	12 [1)]
H. Surface treatment	0	0	0
I. Plating	1	1	2
J. Heat treatment	1	0	1
K. Components assembling	5	11	16
L. PCB assembling	0	6	6
M. Electronic device	0	7	7
O. Others	1	1	2
	49	59	108

Note : 1) The 11 enterprises are involved in mold- and die-making.
Source : JICA Team Field Survey

(Note) Diagnosis for each processing technology in 4.2.2. applies only to technology with 5 samples or more.

4.1.2 Method for Diagnosis of Technology Levels

(1) Setting of technology level rating items

The Team classified technologies roughly into 2 categories: "production technology" and "quality control technology and assurance". Each of the 2 categories was divided into "hardware" and "software". Thus, a matrix of 4 sub-categories was constructed. The 4 sub-categories are common to all processing technologies.

Table 4.1-5 Four (4) Sub-categories of Technology Diagnosis

	A. Production	B. Quality Control & Assurance
1. Hardware	A-1. Production facilities	B-1. Equipment for quality control/assurance
2. Software	A-2. Production technology	B-2. Quality control/assurance system and its operation

Each of the 4 sub-categories, A-1, A-2, B-1, and B-2, was broken down into 5 to 10 sub-items. Note that a different set of sub-items were established for each processing technology, because evaluation items should differ among technologies.

(2) Rating criteria

The Study Team adopted 5-grade rating criteria so that there would be no difference in the results of rating among the technical experts for diagnosis. Table 4.1-6 gives the scores corresponding to the 5-grade rating criteria for sub-items, of which the highest score (5 marks) corresponds to the average technology level in industrialized countries with the lowest score (1 mark) corresponding to a cottage industry level. It should be noted that these scores are given to each sub-item individually, and do not indicate the overall technology level of the plant. For example, a plant may obtain the highest score (5 marks) in a machinery & equipment sub-item yet the lowest score (1 mark) in other machinery & equipment sub-items.

The four ASEAN countries (Thailand, Malaysia, Indonesia, and the Philippines) are used as the basis of international comparison in the table, because Mexico imports many parts and components from these countries.

Table 4.1-6 5-Grade Rating Criteria for Sub-Items

Score (mark)	Rating Criteria for sub-items	International Comparison
5	Equipment and technology are appropriate from the viewpoint of the required quality for products.	Average level of OEM parts industries in industrialized countries
4	Almost appropriate equipment and technology are used, though some of them must be improved.	Top level in ASEAN parts industries except companies with foreign capital
3	Inappropriate equipment and technology are used at a considerably high rate. Some are missing.	Average level in ASEAN parts industries except companies with foreign capital
2	Inappropriate equipment and technology are used to cause poor quality of product.	Lower level in ASEAN parts industries except companies with foreign capital
1	Obsolete and Pre-modern equipment and technology are used. Cottage industry level	The lowest level in ASEAN parts industries

(3) Visiting and diagnosing companies

Technical experts on each process (such as foundry or press work expert) visited companies, inspected their plants, and interviewed personnel responsible for plant operation and management. Then they rated technology levels of the processing technologies used in the plants by referring to a list of sub-items by processing technology and a table (Table 4.1-6) of 5-grade rating criteria common to all sub-items.

(4) Summarizing and averaging of marks and scores

The rated scores for the 4 sub-categories by plant were summarized and simply averaged. Such calculations made for each of 4 sub-categories (A-1, A-2, B-1, B-2) plantwise are used as basic data for further analyses.

1) Evaluation by processing technology
2) Technology level of Mexican parts/components industry as a whole
3) Evaluation by ownership; J/V or wholly owned by local capital
4) Evaluation by scale of enterprises
5) Production technology Average of A-1 and A-2 (Category A)
6) Quality control technology Average of B-1 and B-2 (Category B)

7)	Hardware	Average of A-1 and B-1	(Category 1)
8)	Software	Average of A-2 and B-2	(Category 2)

(5) Assessment of totalized and averaged scores (Ranking)

In this section, scores by processing technology are summed up and averaged in various manners to examine and assess these data. The averages are converted by 5-grade rating into marks, which are indicated to the first place of decimals. To assess averages, it is convenient to divide them into several grades. The study team adopted 4 grades, A, B, C and D, and set the limits of scores (averages) for each grade as well as the meaning of each grade (Table 4.1-7).

Since the rating is made by the point reduction system under which a negative point is subtracted from the full mark of 5 points for each sub-item, it is very difficult for a plant to receive the full mark on every item. On the other hand, international competitiveness can be identified on the basis of the range of the average of the scores for all the sub-items. To reflect this, grades were established according to the range of scores, as shown in Table 4.1-7.

Table 4.1-7 Grades for Assessment and Their Meanings

Rank	Range of scores	Level	Quality of products available in a plant [1)]
A	4.5 - 5.0	OEM International brand, International market	Products are on the average technology level in industrialized countries, and may be directly and indirectly exported as OEM parts (including sales to Maquiladora).
B	3.8 - 4.4	OEM International brand, Local market	Products are on the upper to top level of technology in the ASEAN area, and may be supplied as OEM parts to J/V companies with foreign capital but only for domestic market.
C	3.0 - 3.7	OEM Local brand Local market	Products are on the average level of technology in the ASEAN area, and may be supplied as OEM parts to companies (which have relatively low quality standards) other than those J/V with foreign capital only for domestic market.
D	2.9 and lower	REM Local market	Products are on the technology level on which they may be only supplied as repair parts to the Mexican after-market.

Note : 1) The range of scores are not set by considering to what markets the enterprises are now supplying their products, but by determining whether or not these plants reach a technological level which generally assures the manufacture of products meeting quality requirements in each market.

4.2 Analysis of Technology Level Diagnosis Results

Scores in 5 point method are collected and analyzed over the entire samples. Only SMEs for supporting industry promotion are then reviewed. For reference, comparison with the similar survey in Thailand is provided as necessary.

4.2.1 Technological Diagnosis for the All Samples

(1) Diagnosis by size and shareholder of the enterprise

Table 4.2-1 Summary of Diagnosis for Entire Samples

	Total Samples	Size of Enterprises[1]			Share Holder[2]		
		(Small)	(Medium)	(Large)	(Mexico 100%)	(J/V)	(Foreign 100%)
Average score	4.2	3.8	4.2	4.6	3.9	4.6	4.5
(Grade)	(B^+)	(B^-)	(B^+)	(A)	(B)	(A)	(A^-)
Nos. of enterprises by grade							
Grade A	48	4	14	28	11	15	19
Grade B	38	16	11	10	24	5	9
Grade C	20	13	7	0	17	0	1
Grade D	2	2	0	0	2	0	0
Total	108	35	32	38	54	20	29

Note : 1) No answer about size of enterprises = 3 enterprises
2) No answer about share holders = 5 enterprises
Source : JICA Team Field Survey

The average score for 108 samples in total is 4.2. The rating is middle to upper (B^+) position in Grade B. The overall industry is nearly close to internationally competitive level (Grade A level which is acceptable for direct or indirect export as OEM parts). 48 samples (44%) out of 108 are rated Grade A which is internationally competitive. From Figure 4.2-1, there is not much difference in scores for each technological field; production equipment (A-1), production engineering (A-2), quality control equipment (B-1) and quality control engineering (B-2). Balanced development of the technologies has been achieved.

As the size of the enterprise becomes large, the technology level increases accordingly. The average score for small enterprises is 3.8 (B^-) and for medium enterprises 4.2 (B^+). This figure is identical to the average score of entire samples, representing an average model in Mexican component industries. The average score for large enterprises is 4.6 (A) which is internationally competitive.

Looking at the relationship between the grade and the size of the enterprises, 83% of small enterprises are in Grade B and Grade C, 78% of medium enterprises are in Grade A and Grade B, and 74% of large enterprises are in Grade A. These figures show that the technology level improves as the enterprise size grows.

Shareholder of the enterprise (Refer to Figure 4.2-3.)Enterprises with 100% Mexican shareholders are rated 4.0 (B). The technology level is inferior to 4.6 (A) for the joint ventures and 4.5 (A-) for the enterprises with 100% foreign shareholders. Although the difference (0.1 point) between two parties is not explainable, it may be reasonable to conclude that the joint ventures and the enterprises with 100% foreign shareholders are on the same level.

(2) Diagnosis by sector

Table 4.2-2 Diagnosis Score by Sector

(Unit : Scores (Full mark = 5.0))

		No. of Sample	Score A-1	Score A-2	Score B-1	Score B-2	Average Score
Automotive Industry		**49**	**4.6**	**4.5**	**4.4**	**4.3**	**4.4**
Employee	0 - 100	10	4.2	4.1	3.9	3.8	4.0
	101 - 250	18	4.5	4.5	4.4	4.2	4.4
	251 -	20	4.8	4.6	4.7	4.5	4.6
	N.A.	1					
Ownership	Foreign	10	4.8	4.6	4.6	4.6	4.7
	J/V	16	4.7	4.7	4.7	4.5	4.6
	Mexico	21	4.3	4.3	4.1	3.9	4.1
	N.A.	2					
SME		28	4.4	4.4	4.2	4.1	4.3
Electrical/Electronic		**59**	**4.0**	**4.1**	**4.0**	**4.1**	**4.0**
Employee	0 - 100	25	3.7	3.8	3.7	3.7	3.7
	101 - 250	14	4.1	4.2	3.9	4.0	4.0
	251 -	18	4.5	4.4	4.5	4.6	4.5
	N.A.	2					
Ownership	Foreign	19	4.3	4.4	4.4	4.5	4.4
	J/V	4	4.4	4.5	4.1	4.0	4.3
	Mexico	33	3.8	3.9	3.7	3.8	3.8
	N.A.	3					
SME		39	3.8	4.0	3.7	3.8	3.8

Source : JICA Team field Survey

The average score of automotive sector is 4.4, which is higher than 4.0 of electrical/electronic sector. Among four sub-categories, the greatest difference is seen in A-1. Since the distributions of the samples in terms of enterprise size and shareholder in each sector are not the same, the comparison of the two sectors by those is necessary.

As to the size of the enterprise, the average scores of all the three different sizes of automotive sector are higher than those of electrical/electronic sector. Only in the case of large enterprises, the score of the latter, 4.5, is close to 4.6 of automotive sector.

As to the shareholder of the enterprise, for foreign, J/V, and Mexico, the technical level of automotive sector is higher than that of electrical/electronic sector by 0.3 points. The highest score of 4.7 is given to the enterprises of 100% foreign capital of automotive sector, followed by 4.6 of J/V of the same sector. The difference between these two groups is negligible. The lowest average score is 3.8 for Mexican companies of electrical/electronic sector, which is the only group with the scores less than 4.0 for all sub-categories.

(3) Comparison and analysis of the technology level with Thailand

Figure 4.2-1, Figure 4.2-2 and Figure 4.2-3 show the technology level in Thailand, giving distinct difference. The opinion of the Team for the reason of this difference is described in this section. Thailand is a medium technology level country in ASEAN countries and exporting some electronic components to Mexico.

Figure 4.2-1 shows that the general average score for technology level is 4.2 (B^+) for Mexico and 3.7 (C^+) for Thailand. The difference of 0.5 is significant. The details shows that the difference for production equipment (A-1) is not significant, however, large differences of 0.6 and 0.8 points are observed in production engineering (A-2) and quality control engineering (B-2) respectively which are software expertise. This can be explained by inexperience in industrial know-how in Thailand. Particularly, component industries have started their practical operations in 1980s. Another reason is that the number of the engineers, skilled workers and the experts is very

limited. This is the most often heard complaint from the management people in Thailand's enterprises. The shortage of personnel is causing problems not only in Thailand, but also entire ASEAN countries. Complaint like this is not heard in Mexico. Mexico is semi-developed and ASEAN countries are still underdeveloped in industry.

Figure 4.2-2 shows that the technology level in terms of enterprise size shows similar trends for both Thailand and Mexico. In general, the technology level in Thailand is lower than that in Mexico. There is no specific feature to be explained for the difference in enterprise size between countries.

Figure 4.2-3 shows the technology level in terms of shareholders. This comparison indicates that the technology level in Thailand is higher by 0.4 point than that in Mexico for the enterprises with 100% foreign shareholders. The number of samples from Thailand is only two and this may not indicate the general figure. However, increased number of samples in Thailand may lead to the same difference. Because electrical and electronic components exported from Thailand to Mexico are produced by the enterprises with 100% foreign shareholders.

In late 1980s, the Thai government has approved 100% foreign investments for enterprises who can export 80% of their products and granted the maximum tax benefits. This resulted in large investments from Japanese enterprises, etc. to build export bases in Thailand. Mass production factories for electrical and electronic components are included in these investments. Some examples of electrical and electronic enterprises with 100% Japanese shareholders are: Sony Semiconductor (Thailand) (1989), Sony Magnetic Products (Thailand) (1988), Rohm Appolls Electronics (1988), OTG Thai (1988), OKI (Thailand) (1991), NEC Technologies (Thailand) (1988), Matsushita Refrigeration (1989), Fujitsu (Thailand) (1989), Fujikura (Thailand) (1985), Daikin Industries (Thailand) (1991), Amagasaki Pipe (1992).

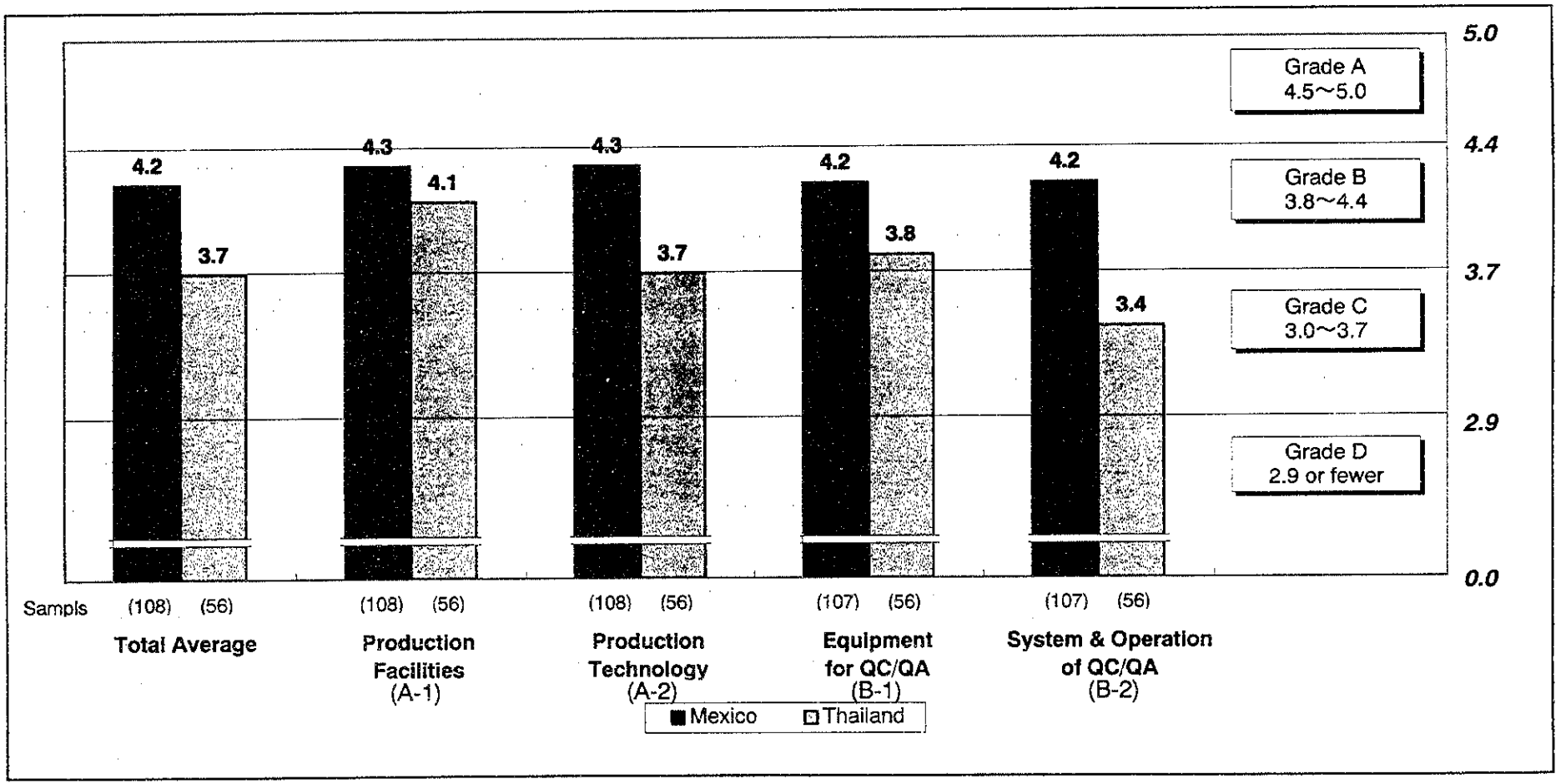

Figure 4.2–1 Averaged Score by Technical Area – Total Samples

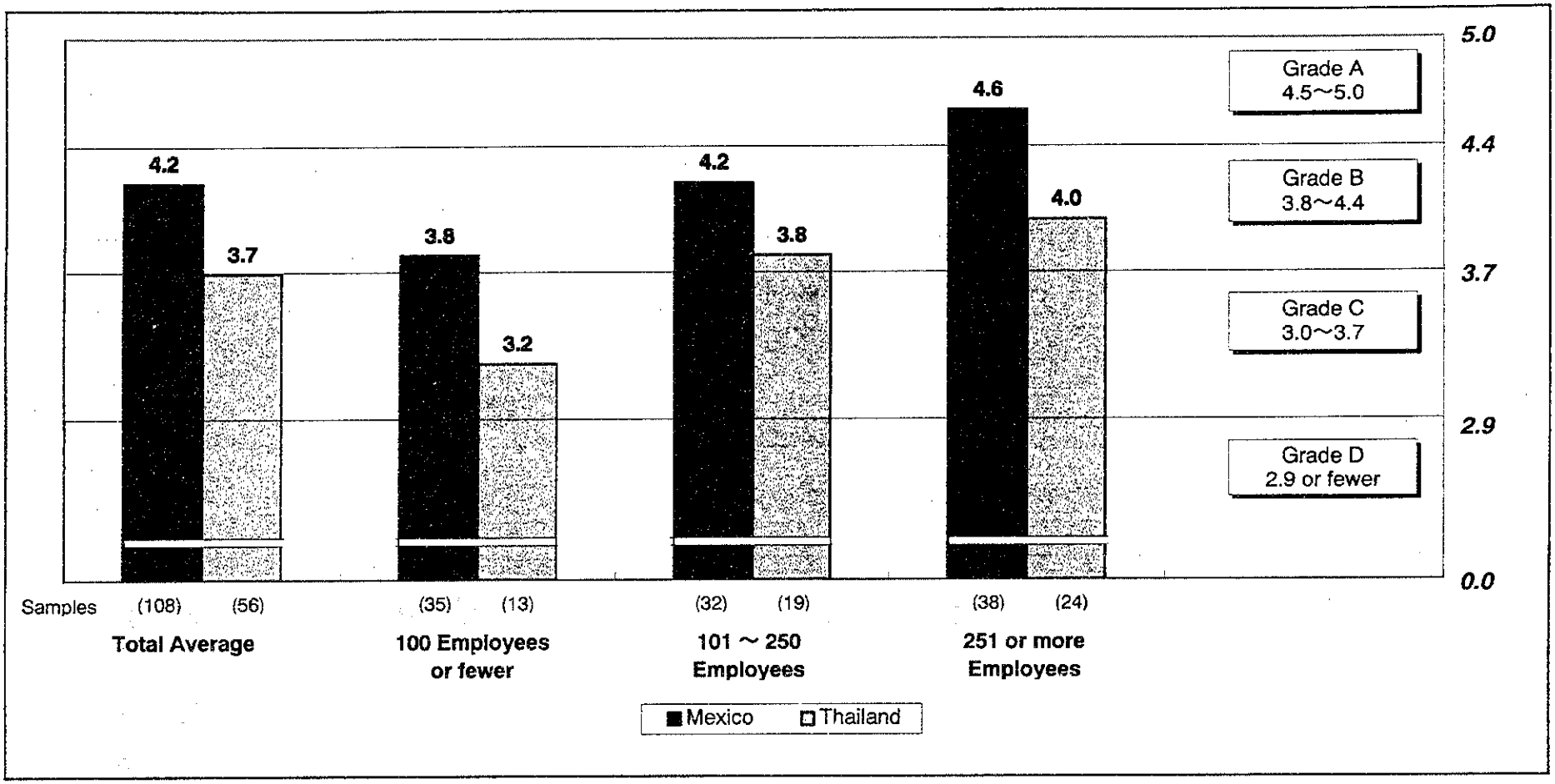

Figure 4.2–2 Averaged Score by Size of Company

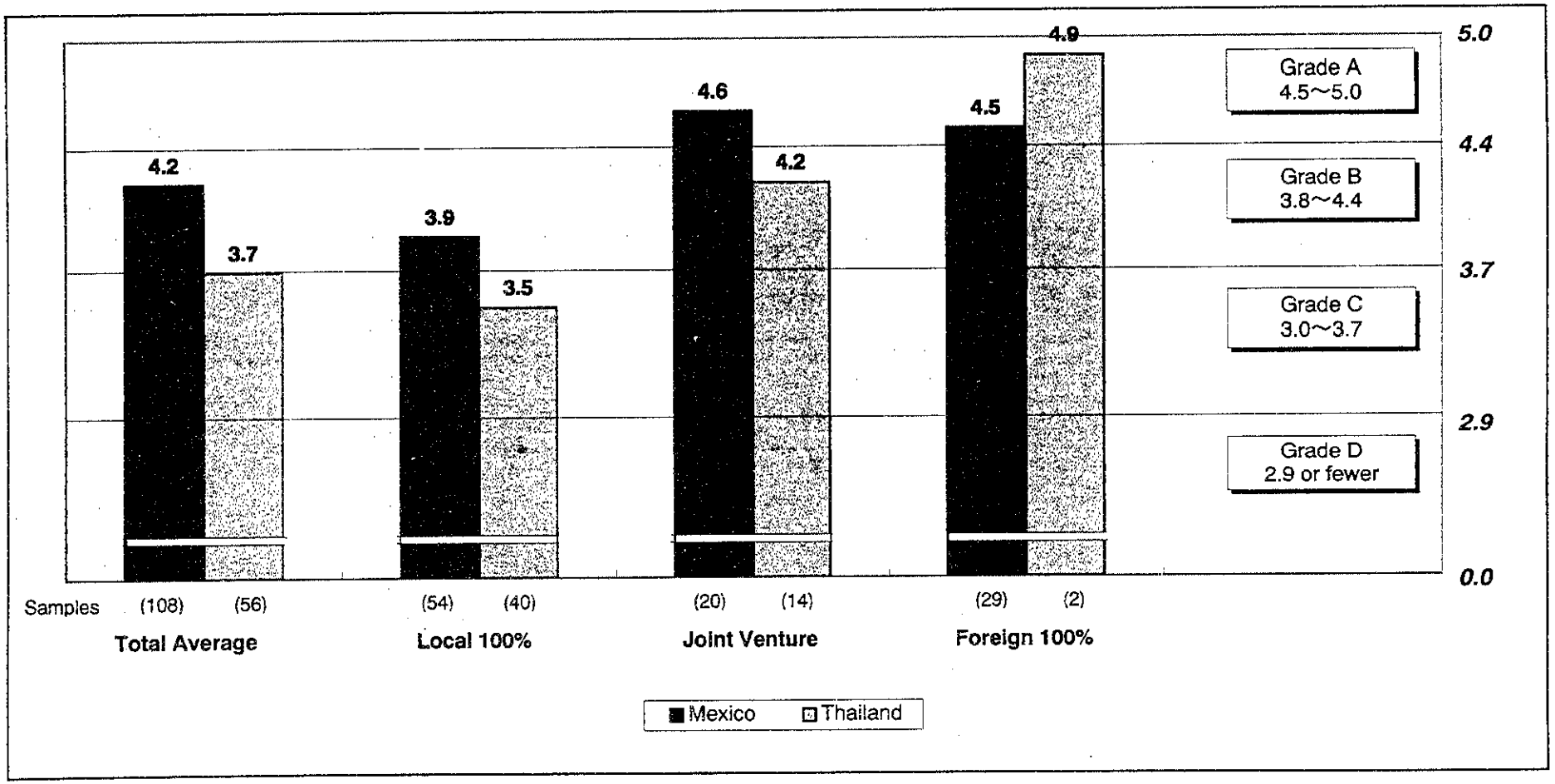

Figure 4.2-3 Averaged Score by Share Holder

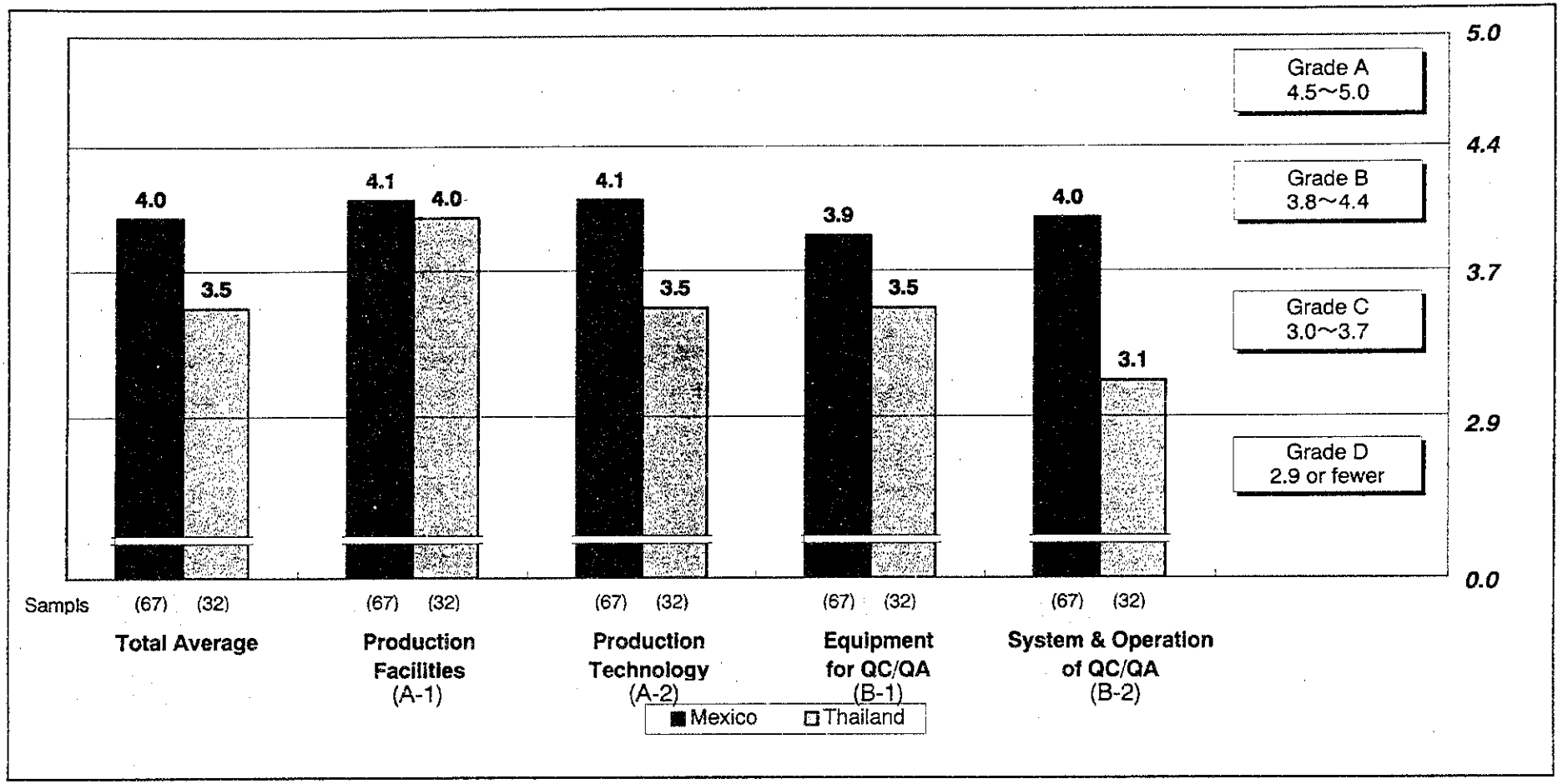

Figure 4.2–4 Averaged Score by Technical Area – SMEs (Employee : 250 or fewer)

4.2.2 Comparison of Scores by Processing Technology

Technologies which indicated less scores than the average are plastic processing, machining(mold- & die-making), plating and electronic component manufacturing. Technologies which indicated higher scores than the average are die casting, electronic component assembly, casting, forging and stamping.

Table 4.2-3 Technology Level by Processing Technology[1)]

Processing Technology	(Samples)	Total Average	A. Production		B. Quality Control	
			A-1 Facilities	A-2 Technology	B-1 Facilities	B-2 Technology
1. Casting	(8)	4.3	4.6	4.5	4.6	3.8
2. Die-casting	(5)	4.5	4.9	4.3	4.4	4.2
3. Forging	(2)	4.6	5.0	4.7	4.5	4.0
4. Stamping	(18)	4.3	4.3	4.4	4.2	4.3
5. Plastic processing	(25)	4.0	4.1	4.1	3.9	4.1
6. Rubber processing	(4)	4.2	4.1	4.4	4.0	4.3
7. Machining (Mold-& die-making)	(12)	4.0	3.9	4.1	3.9	3.9
7. Mold-& die-making	(12)	4.0	3.9	4.1	3.9	3.9
8. Plating	(2)	3.9	4.0	3.9	3.9	3.9
9. Heat treatment	(1)	5.0	5.0	5.0	5.0	5.0
10.Components assembly	(16)	4.5	4.4	4.5	4.5	4.5
11.PCB assembly	(6)	4.2	4.2	4.0	4.3	4.2
12.Electronic device	(7)	4.1	4.1	4.1	4.1	4.1
13.Other	(2)	4.7	4.5	4.7	4.8	4.7
Average	(108)	4.2	4.3	4.3	4.2	4.2

Note : 1) Includes any scale of enterprises with any shareholder.
Source : JICA Team Field Survey

4.2.3 Technology Level of SMEs with Mexican Shareholders

The target group on this survey is SME secondary or subsequent suppliers. Many of them are established by local shareholders. The following table explains the technology level of SMEs by shareholder.

Table 4.2-4 Technology Level of SMEs by Shareholder

Shareholder	(Samples)	Total Average	A. Production		B. Quality Control	
			A-1 Facilities	A-2 Technology	B-1 Facilities	B-2 Technology
Mexico 100%	(42)	3.8	3.9	4.0	3.7	3.8
J/V	(12)	4.4	4.5	4.6	4.4	4.3
Foreign 100%	(10)	4.4	4.4	4.4	4.5	4.4
Average	(67)[1)]	4.0	4.1	4.1	4.0	4.0

Note : 1) Includes 3 enterprises for which the shareholder is not available.
Source : JICA Team Field Survey

The average score of SMEs with 100% Mexican shareholders is 3.8 (B^{-}). It is significantly less by 0.6 point than the score of joint ventures or the enterprises with 100% foreign shareholders. Scores of SMEs with 100% Mexican shareholders are (A-2; 4.0) for production engineering, (A-1; 3.9) for production equipment, (B-2; 3.8) for quality control engineering and (B-1; 3.7) for quality control equipment, in the order of high scores. In particular, scores of equipment (hardware) in A-1 and B-1 are lower than those of engineering (software) in A-2 and B-2. Renewal of equipment seems to be slow.

4.3 Qualitative Assessment of Production Technology

4.3.1 Iron and Aluminum Alloy Foundries

(1) Outline of the foundry industry

The Team visited 8 iron foundries and 7 aluminum alloy foundries to assess their technology levels. Together with information obtained from interviews with users and other related parties, the following findings were obtained from the field survey. Note that the following discussion is concerned with the foundry industry making automotive parts, since electrical and electronic industries use few castings.

1) Production of automotive castings dates back to the early 1960s during which GM and Ford started in-house production of cylinder blocks and heads, and other products. As a result, foundry technology in the country is mainly originated in the U.S.

2) Modern foundry technology has been widely disseminated in the country and its level is much higher than that in ASEAN countries. In particular, foundry technology of large enterprises is of a world class.

3) Castings for engines and transmissions are internally manufactured by assemblers who also import them in large quantities. Primary suppliers mainly produce parts around engines and related to suspensions. In fact, most of automotive castings are locally produced, as listed below:

- Cylinder blocks	- Cylinder heads	- Locker cover
- Pistons	- Piston rings	- Crank shafts (casting)
- Flywheels	- Intake manifolds	- Exhaust manifolds
- Transmission cases	- Drum brakes	- Disk brakes
- Calipers for disk brake	- Wheel hubs	

(2) Current technology levels and major issues

1) Production facilities

Iron foundry and aluminum alloy foundries generally consist of the following facilities:

- Sand mold making facilities

- Melting facilities
- Die-casting machine
- Fettling & cleaning facilities
- Heat treatment facilities

First of all, sand mold making facilities are combined with molding sand treatment and reclamation and are mainly used for iron casting. Most of foundries making automotive parts, visited by the Team, have high pressure, high speed automated molding machines or non-bake mold making machines. Core making machines use the shell mold process, cold box process or hot box process.

Melting facilities for iron foundries mainly use induction furnaces. Some of large foundries use the dual melting method in combination of a large cupola and an induction furnace. On the other hand, aluminum alloy foundries mainly use crucible furnaces or reverberatory furnaces using petroleum gas fuel.

Main aluminum alloy castings made at the foundries are die casting alloys, particularly pressure die casting products. Die casting machines used at foundries surveyed are largely in the middle size ranging from 200 tons to 1,100 tons in rated locking force. Die casting machines of this size cannot manufacture large parts such as cylinder blocks.

While there are few iron foundries which do heat treatment, many aluminum alloy foundries (except for pressure die casting) have heat treatment facilities to improve mechanical properties, such as solution heat treatment.

Overall, most of foundry facilities seem to be at international levels, except for some old equipment and processes requiring automation. In particular, aluminum die casting facilities are considered to be at fairly high levels.

2) Production technology

Critical check points in sand mold casting technology are capabilities related to making casting plans, and, design, manufacture and repair of

patterns. Most foundries have these functions and technology levels are considered to be close to those of industrialized countries.

As for aluminum die casting, however, metal molds are mostly imported, except for small ones with simple designs. Difficulty in technology transfer and a small market size seem to be major factors for delayed localization of mold making.

3) Quality control equipment

Critical factors in quality control of the foundry process are the management of properties of molten metal and molding sand. As for properties of molten metal, the foundries visited have sufficient equipment and perform proper check before pouring. To manage properties of casting, it is important to control properties of molding sand, and sand laboratory should be equipped with various types of laboratory equipment specialized for the purpose. However, few foundries have complete set of these equipment.

Most of foundries are equipped with the following quality control equipment.

- Three-dimensional coordinate measuring machine
- Granite plate
- Height gauge
- Profile projector
- Optical microscope
- Hardness tester
- Amsler universal testing machine
- Eddy current flaw detector
- X-ray inspection apparatus
- Spectrometer

4) Quality control system

The primary rejection rate at foundry prior to shipment is estimated at 3-5%, which is fairly high (in Japan, it is controlled below 1% in general). A major cause seems to be the lack of total quality control system. Also, the overall rejection rate could be much higher if the secondary rejection rate - cast defects found by users during machining - is added. An insufficient system to control molding sand and the lack of penetration of TQC system seem to be major causes for this.

4.3.2 Forging

(1) Outline of the forging industry

The Team visited only three forging shops who belong to automotive parts group companies. Based on information obtained from interviews with shop engineers as well as users and other related parties, major findings are as follows:

1) INA and other directories list a few forging shops other than visited, which addresses are not clear. As the Team heard from various persons in related industries, there are around ten companies in the country, who can manufacture automotive parts on an OEM basis.

2) Users of forgings, who do not have forging shops within group companies, entirely rely on imports. Products such as crank shafts, connecting rods, axles and knuckle joints for truck are mainly imported from Japan, the U.S., Brazil, Hungary, and India.

3) Purchased forgings are processed to parts or components, most of which (50% - 95%) are exported to automobile assemblers or component manufacturers in the U.S., UK and other countries.

(2) Current technology levels and major issues

Three forging shops visited by the Team started operation in the early 1960s. They have presumably introduced original technology from the U.S. Judging from the fact that their primary market is OEM or export, their technology level seems to be fairly high.

1) Major production facilities

Billet heaters employ induction heating and gas heating systems. Forging presses are of air drop hammer and of mechanical type. Mechanical presses are used in trimming and piercing processes. Although equipment is not latest, it is kept in good operating condition through proper maintenance.

2) Production technology

All of the three forging shops design and manufacture forging dies within their facilities, together with repair and maintenance. It should be noted, however, that products manufactured by these shops are not complex in shape. Nevertheless, as they supply products to OEMs or industrialized countries, their technology seems to be at satisfactory levels for products they currently manufacture.

3) Quality control and assurance facilities

With some exception, QC and QA facilities and equipment are well provided. In particular, non-destructive testing equipment such as a magnetic flaw detector, which plays a vital role in detecting defects in forgings, are owned by forging shops as well as their customers such as assemblers and/or component manufacturers.

4) QC and QA systems and their operation

Automotive parts manufacturers supplying their products to the big three (GM, Chrysler, Ford) are required to get the certificate of QS9000, by the end of 1997 in many cases. Many manufacturers of forgings and other products are currently working hard to obtain the certificate. In addition, many suppliers have adopted Japanese-style QC and QA systems which were introduced via the U.S., so that QC/QA organizations and manuals are well developed.

5) Major issues

The forging shops seem to be well positioned so far as they supply automotive parts which are currently localized. However, if they produce currently imported parts, such as crank shafts and connecting rods, and those with a complicated shape, such as knuckle joints, they must compete with suppliers in other countries including India. They also have to compete with different materials. During the field survey, the Team learned that two foundry companies planed to produce cast crank shafts (ductile cast iron).

The forging shops visited by the Team revealed that their QC efforts were

limited to statistical quality control (SQC) and had still to initiate TQC. This is clearly reflected in a relatively high rejection rate at 3.3%. In fact, the situation is not limited to the forging industry, and not many automotive parts manufacturers in Mexico have introduced TQC methodology.

The Team was impressed by the fact that production management and quality control systems developed in Japan were widely used, together with technical terms related thereto (e.g., 5S and kaizen). However, it is often questionable if they are truly understood by management. If the industry goes on without further efforts, it may face competition from foreign manufacturers as well as different materials. What they need is R&D efforts in the areas of production and production management technologies by a single company and the industry as a whole.

(Note) "Different materials" suggest the possibility to manufacture a part or component from various processed materials. A part or component can be made in a variety of methods, such as stamping, iron casting, aluminum alloy casting, forging, sintering, and plastic molding. A general trend is the shift toward a low-cost method, e.g., from a plastic part to a stamping part.

4.3.3 Stamping

The 18 stamping shops were visited. Having some variation in technology levels, they have common characteristics and problems which are described below.

(1) Outline of the stamping industry

Among stamping parts for automobiles, large products such as outer panels are manufactured by assemblers themselves. Since they require large dies and presses to make with large investment, they are generally made by assemblers as a part of in-house production in many countries. Medium-sized parts are to be manufactured by primary suppliers. But, in Mexico, they are produced by assemblers or several parts manufacturer groups.

Small stamping parts are also manufactured by the autoparts manufacturer groups, but their supply capacity is not sufficient to meet demand. Secondary suppliers need to be developed.

In the electrical and electronic parts industry, there is a shortage of manufacturers of precision stamping parts which need to be produced in volume, and these parts are mainly imported. High speed presses, precision dies, and high quality materials are required to meet demand.

(2) Current technology levels and major issues

1) Production facilities

A typical stamping shop of primary suppliers, which are classified as large enterprises in Mexico, has three lines consisting of 6-7 500-ton presses, and 30-40 small presses. In future, they should focus on large press work while transferring small press work to secondary suppliers. Presses owned by stamping shops are generally old but well maintained. They should be gradually automated in consideration to a possible increase in labor cost.

Large dies are made by outside manufacturers, while small ones are designed and manufactured by stamping shops. Their quality seems to be at an acceptable level. Die maintenance facilities are provided within shops and do not have any problem.

2) Production technology

Many stamping shops have sub-assembly lines using stamping parts they make. They assembly individual parts into functional components, an important operation with high value added. However, the sub-assembly line seems to require improvement in many aspects including production technology and practice.

First of all, plant layout is not appropriate at many shops. They should be redesigned to ensure consistent flow from delivery of stamping parts to the assembly line, process flow in the line, product storing and shipment. In particular, many shops have a potential problem in product flow which impedes the flow of goods in stockyard and product shipment zones. Also, there is excessive stock of materials.

Jigs, tools, and dies are well maintained with high levels of technology.

Generally, stamping shops maintain high production skills. In future, an emphasis should be made for education and training on "improvement of die setting methods," "fundamental knowledge on die design and making," "production management," and "safety awareness."

3) Quality control and related equipment

All the companies have necessary equipment including three-dimensional coordinate measuring machines and universal testing machines. They also manufacture adequate jigs and tools.

4) Quality control system and operation

Key elements of the quality control system are well designed and operated, including the planning of the inspection process, quality control on steel plates, inspection and testing on procured parts, display of inspection standards, design and management of packaging, and training of inspection personnel. Several problems found are; 1) some products require deburring by using a file, and 2) the lack of awareness in need for the inspection standards and proper keeping of inspection records.

4.3.4 Plastic Processing

Since most plastic parts are injection molded, plastic processing in this report refers to injection molding unless otherwise specified. The Team visited 26 injection molding shops. Based on the result of the visits, together with hearings from users and other related parties, the result of technical assessment is summarized as follows.

(1) Outline of the plastic processing industry

1) The percentage of plastic parts purchased from local suppliers is estimated at around 30% in both the automotive, and electrical and electronic industries. Imports have the largest share. In-house production has the share less than 30%.

2) Major sources of automotive parts are summarized as follows:
Very large parts (such as bumpers)
In-house production in consideration to transportation costs and

possible damage during transportation

Large parts (such as dashboards, console boxes, and door trims)

Generally procured from subcontractors partly due to the need for incorporation with instruments

Medium-sized parts (such as table lamps, armrests, battery containers, wheel caps, and radiator fans)

Mainly procured from subcontractors in consideration to the need for secondary processing, surface treatment, and mounting

Small parts (e.g., side view mirrors, handles, and stop signs)

Mainly procured from subcontractors in consideration to the need for secondary processing, surface treatment, and mounting

Small precision parts (such as hooks, meter pointers, and gears)

Mainly imported

3) Major sources of electrical and electronic parts are summarized as follows:

Very large parts (such as inner cabinets of 200 liter or larger refrigerators, vacuum molding, urethane foaming, and insulation materials)

Mainly by in-house production

Large parts (e.g., TV cabinets, back covers, washing and rotary tanks of washing machines, air-conditioner's front panels)

Subcontracted

Medium-sized parts (such as crisper and water trays of refrigerators, pulsators, covers and control panels of washing machines, and vacuum cleaner housings)

Subcontracted

Small parts (such as ice trays, name plates, and buttons)

Subcontracted

Small precision parts (such as connectors and gears)

Imported

4) Injection molding machines are mainly imported from the U.S. and Europe, followed by those from Japan, Korea, and Taiwan. Molds are mostly imported.

(2) Current technology levels and major issues

1) Production facilities

Many molding machines are old and require replacement, but replacement progresses very slowly. Equipment modernization is hindered by high interest rates and uncertainty about foreign exchange rates. Molds are said to govern 70% of finish quality of plastic products. At the factories the Team visited, inadequate mold design and manufacture result in many products with burrs, and workers are assigned to deburring work. Modern factories must do molding without burrs, which can be accomplished by improving precision and strength of molds, while stabilizing molding conditions. The latter factor is determined by performance of an individual molding machine. For the molding shops concerned, equipment renewal is called for. Other problems are excessively large mold sprue and runner diameters. On the other hand, most molding shops have mold maintenance shops which are rated well.

2) Production technology

Workers are highly skilled and seem to make up for old molding machines. Possible areas of improvement are found in the process around molding operation, i.e., maintenance and control of proper molding temperature, pretreatment and injection of materials, and collection of molded products. In addition, plant layout does not follow the flow of goods as molding machines were installed as they purchased. Finally, an in-house mold maintenance system is well operated, but maintenance technology and know-how of molding machines need to be retained within the company.

A major challenge in the next step is to develop own technologies, including parts design, selection of resin materials, and the setting of molding conditions.

3) Quality control equipment

Many factories do not have a complete set of measuring instruments. Inspection is mainly carried out visually or by using a vernier caliper. Few factories have advanced measuring instruments such as three-dimensional coordinate measuring machine. There are a limited number

of companies having equipment to measure mechanical properties of raw materials. Also, there is no evidence that calibration of measuring instruments is carried out on a regular basis.

4) Quality control system and operation

Documentation is not well prepared, including quality standards, boundary samples, and inspection standards. Quality assurance is in most cases made by total inspection of final products prior to shipment. There is little recognition on importance of in-process quality control, i.e., efforts to eliminate defectives during processes.

4.3.5 Mold and Die Making

Manufacture of molds for plastics and stamping dies are essentially in the same method. The manufacturing process of molds for plastics which is relatively complex in terms of technology is described below. Note that major issues identified here are basically applicable to stamping dies.

(1) Outline of mold making for plastics

The Team visited nine mold manufacturers, of which three companies were specialized in mold making, while other six were captive repair and manufacturing shops annexed to plastic molding factories. Major findings are summarized as follows.

1) The mold making industry in Mexico is lagged behind in terms of quality and quantity. Usually, buyers of plastic parts procure molds and rent them to molders (same practice as widely done in industrialized countries).

2) Most of molding shops have a machine section to repair and maintain molds rented by their customers.

3) There are some factories which make simple molds by using machine tools at captive repair shops during idle hours. They also make molds for other companies on a contract basis as far as time is allowed.

4) There are a limited number of independent mold makers in the country, all of which are small. As a result, most of molds, particularly precision molds are imported. This area needs to be strategically developed in the long run.

(2) Current technology levels and major issues

1) Production facilities

Captive machine sections attached to plastic molding shops have mainly general machine tools (lathes, milling machines, and radial drilling machines) only for maintenance work. Their manufacturing capabilities are usually limited as investment is done only to meet requirements for repairing and maintenance work.

On the other hand, independent mold making companies have modern machine tools, including CNC machines, machining centers, electric discharge machines, wire cut EDMs with CAD/CAM systems, and three-dimensional coordinate measuring machines.

Considering these factors, in order to promote the mold-making industry in Mexico, it is difficult to expect a lot from machine sections attached to molding shops due to the limited equipment. Independent and specialized mold manufacturers need to be nurtured.

2) Production technology

Machine operators seem to have sufficient skills. However, cutting conditions are not standardized and work standards have still to be established. Also, molds are normally manufactured on the basis of product drawings (acceptable for a mold of simple construction). But CAD-based drawings are highly desirable. One reason for this seems to be a limited number of workers, which makes manpower allocation to the production technology department very difficult.

3) Quality control equipment

As pointed out earlier, while independent mold making companies have three-dimensional coordinate measuring machines, those attached to

molding shops have only simple measuring instruments such as vernier calipers. At least, tool maker's microscope and surface roughness gauge should be used. The level of accuracy in the country is limited to a 0.01mm level, while international levels reach a micron (0.001mm) range.

4) Quality control system

Mold making sections attached to molding shops do not have a quality assurance system as they mainly make molds for captive use. One specialized mold making company has molding machines to test molds, which is a very good practice.

Chapter 5
Analysis of the Result of the Questionnaire Survey

Chapter 5 Analysis of the Result of the Questionnaire Survey

5.1 Analysis of the Result of the Questionnaire Survey by Interview

5.1.1 Objective and Methodology

To identify the current state of supporting industries supplying automotive and electrical/electronic parts and components, problems facing them, and their needs, the interview survey was conducted by a local consultant on the basis of a questionnaire prepared by the Team. It was conducted apart from the visiting survey by the Team and was contracted to Macro Asesoría Económica, S.C. while the Team prepared criteria for selecting enterprises for visit in addition to the questionnaire.

The questionnaire survey for Maquiladora companies was conducted separately. Refer to 5.2.

(1) Questions

The questionnaire covered the following nine areas from corporate profiles to major problems faced.

A. Corporate profiles

Year of incorporation, the number of employees, ownership, etc.

B. Processing Technology, Products, and Procurement

The number of products, their local contents, and processing technologies used for three leading products, and to which finished products these products are incorporated. Then, sources of raw materials and parts purchased, and their evaluation on quality (Q), cost (C), and delivery (D).

C. Product Market and Linkage with Customers

Breakdown of product market by the domestic market, direct export (including country name), and Maquiladora, followed by the number of customers, and linkage with them, both present and future prospect.

Further the breakdown of market, OEM or aftermarket (REM). Generally, OEM parts are required to maintain high quality. Interviewees were asked to identify if they intend to increase share of OEM production for the future, and if so, what are major problems they would face.

As for export, the same question was asked, i.e., to what extent they plan to increase their exports to which country, and what factors prevent them from doing so.

D. Machinery and Equipment

The rejection rate in the existing production process; major causes for rejection according to their own analysis; industrial standards applied; and how they deal with quality control. Interviewees to indicate appropriate answers from the list given.

As for machinery and equipment: self-evaluation on equipment conditions and production capacity; the need for purchasing new equipment, and if so, major obstacles; and the interest in purchasing second-hand machinery and equipment.

E. Technology Transfer from Overseas

In C. above, the linkage with customers including technical aspect was asked. Here, interviewees were asked to indicate if they receive technology transfer from overseas, regardless of whether they are customers or not, both current situation and future outlook, by specifying from which country and the method.

F. Technical Support Currently Provided

The question is designed to find out what kind of technical support small- and medium-sized enterprises receive from public organizations, universities, and private organizations, together with if they have any obstacles to receive it.

G. Employees and Management

The average age of employees; the average years of service; personnel

problems viewed from the management; education and training methods.

Background of the managing director: how he was appointed i.e., by promotion, dispatched from the parent company, including foreign company, spin-out from other company or a government/public organization; and the interest in participation to training programs for managers.

H. Financial Source

Interviewees were asked to identify major financial sources, the need for fund, and if so, the purpose, any obstacles to funding, and interest in machinery leasing that is not common in Mexico.

I. Urgent Problem to Solve

The final question asked the most urgent and serious problem related to corporate management faced by each interviewee.

(2) Preparation of the list of enterprises to be visited

The following considerations were made in preparing the list of enterprises to be visited for the purpose of this survey:

1) Target group of survey: Enterprises engaged in manufacture of automotive parts or electrical/electronic parts, regardless of ownership type and structure
2) The list mainly consists of small- and medium-sized enterprises under official classification in Mexico based on the number of employees, but not necessarily excluding large enterprises with more than 250 employees and MEs with 15 or less employees, because the target group of survey is defined as secondary and tertiary parts suppliers, which do not necessarily agree with company size.

Major directories employed for making the list are as follows:
Directory of INA
Directory of CANIECE
Directory of CANAME
Directory of CANACINTRA
Directory of ANFAD

As for automotive parts suppliers, a list of enterprises made from a survey conducted by BANCOMEXT was used in addition to INA directory.

(3) Survey methodology

A Total of 793 enterprises were picked out from the above directories, and they were contacted by telephone to check accuracy of information given in the directories and to make appointment for visit. SECOFI's introductory letter and questionnaire were sent to enterprises who had accepted the interview, followed by actual visit. Note that there were many enterprises which were dropped out of the list due to incorrect information given in the directory. Also there were enterprises who rejected the interview, or who were already visited by the Team, or who accepted the interview and did not respond well. Nevertheless, valid responses were obtained from 316 enterprises in excess of the target number of 300.

5.1.2 Corporate Profiles

Based on responses to the questionnaire, general profiles of 316 enterprises are summarized as follows.

(1) Type of business

According to classification by the directories from which the enterprises were listed:

Automotive parts supplier	178
Electrical parts supplier	37
Electronic parts supplier	101
	316

They can also be classified according to the type of product to which their parts are incorporated:

Automotive parts supplier	187
Electrical parts supplier	31
Electronic parts supplier	90
Other	8
	316

Among eight (8) enterprises in "Other" category, four (4) enterprises manufacture lighting parts and components, which are out of scope of the Study, but they were not excluded from the list in consideration of the purpose of the survey to grasp the overall picture of supporting industries. It should also be noted that 227 enterprises (72% of total) produce two types or more of products, and many secondary and tertiary suppliers cannot be clearly distinguished according to industry subsectors, automotive or electrical/electronic. Compared to the classification based on entry in the directories, some of enterprises classified to the electrical and electronic industry manufacture automotive electrical and electronic parts. Nevertheless, the situation does not last permanently, and for this reason, the analysis relied on the classification by directories when it is necessary to analyze separately automotive parts suppliers and electrical and electronic parts companies.

(2) Location by state

Geographical distribution of the enterprises by state is summarized in Table 5.1-1.

Table 5.1-1 Location by State

Autoparts		Electrical / Electronics	
Baja California	3	Baja California	0
D.F.	41	D.F.	81
México	33	México	26
Jalisco	34	Jalisco	17
Morelos	4	Morelos	0
Nuevo León	33	Nuevo León	12
Puebla	24	Puebla	2
Querétaro	5	Querétaro	0
Tlaxcala	1	Tlaxcala	0
Total	178	Total	138

(3) Year of establishment

The enterprises were classified according to the year of establishment that was grouped into ten years, as follows.

Table 5.1-2 Establishment Year

Establishment Year	Total		Auto		E/E	
	No. of Companies	(%)	No. of Companies	(%)	No. of Companies	(%)
1990 onward	68	21.5	43	24.2	25	18.1
1980 - 1989	93	29.4	48	27.0	45	32.6
1970 - 1979	64	20.3	33	18.5	31	22.5
upto 1969	91	28.8	54	30.3	37	26.8
Total	316	100.0	178	100.0	138	100.0

Note : Auto : Autoparts, E/E : Electrical/Electronic

The average year of establishment for all the enterprises (316) was 1796, while that for 40 enterprises which foreign capital owns more than 50% was 1983, indicating that foreign-affiliated companies were more recently established.

(4) Company size

The enterprises were classified according to the definition given in Table 5.1-3, as shown in Table 5.1-4.

Table 5.1-3 Definition of Company Size

	No. of Employee (E)
Micro	$E \leqq 15$
Small	$15 < E \leqq 100$
Medium	$100 < E \leqq 250$
Large	$250 < E$

Table 5.1-4 Company Size

Company Size	Total		Auto		E/E	
	No. of Companies	(%)	No. of Companies	(%)	No. of Companies	(%)
Micro	47	14.9	18	10.1	29	21.0
Small	197	62.3	114	64.0	83	60.1
Medium	44	13.9	31	17.4	13	9.4
Large	28	8.9	15	8.4	13	9.4
Total	316	100.0	178	100.0	138	100.0

Small- and Medium-sized enterprises (SMEs) account for 76.2% of total, micro-sized enterprises (MEs) 14.9% and large enterprises 8.9%. The average number of employees for all the enterprises is 117.7.

(5) Ownership structure

Table 5.1-5 Ownership

Ownership	Total		Auto		E/E	
	No. of Companies	(%)	No. of Companies	(%)	No. of Companies	(%)
Foreign 100%	31	9.8	18	10.1	13	9.4
J/V (50%<F<100%)	9	2.8	8	4.5	1	0.7
J/V (50%/50%)	5	1.6	3	1.7	2	1.4
J/V (0%<F<50%)	21	6.6	16	9.0	5	3.6
Mexico 100%	250	79.1	133	74.7	117	84.8
Total	316	100.0	178	100.0	138	100.0

The above table classified the enterprises according to foreign capital participation (F). The 85.7% of total have foreign capital of less than 50% (majority owned by local), and the 79.1% are wholly owned by local capital. There is no significant difference observed between automotive parts suppliers and electrical/electronic parts suppliers. There are 18 automotive parts manufacturers wholly owned by foreign capital, of which 9 are U.S. and 6 are German companies. On the other hand, 13 electrical and electronic parts manufacturers are wholly owned by foreign capital, and 12 of which are U.S. companies.

As mentioned earlier, the average number of employees for all the enterprises is 117.7, which is far exceeded by that for 40 enterprises with majority owned by foreign capital (261.3) and for 31 enterprises wholly owned by foreign capital (293.4). But, of 31 companies, the number of large enterprises with more than 250 employees are only 10.

(6) Processing technology adopted

The questionnaire asked three leading products (parts) of each respondent based on sales amount, and processing technology required for production of each product. Frequency distribution of processing technologies responded (Note: Not all the enterprises cited three products) is shown in the table below, with % denoting the percentage share of total responses.

Table 5.1-6 Processing Technology

Processing Technology	Total		Auto		E/E	
	No. of Answers	(%)	No. of Answers	(%)	No. of Answers	(%)
Casting	66	9.4	49	12.3	17	5.6
Forging	26	3.7	21	5.3	5	1.7
Stamping	196	28.0	123	30.9	73	24.3
Plastic Processing	95	13.6	59	14.8	36	12.0
Rubber Processing	11	1.6	9	2.3	2	0.7
Machining	40	5.7	25	6.3	15	5.0
Heat Treatment	17	2.4	10	2.5	7	2.3
Surface Treatment/ Electroplating	10	1.4	3	0.8	7	2.3
Glass Working	7	1.0	5	1.3	2	0.7
Sheet Work/Welding	28	4.0	17	4.3	11	3.7
Assembling of Parts/ Components	158	22.6	47	11.8	111	36.9
Printing	6	0.9	3	0.8	3	1.0
Others	39	5.6	27	6.8	12	4.0
Total	699	100.0	398	100.0	301	100.0

Usually, two or more processing technologies are required for manufacture of any product, while enterprises specialized in one technology are rather exceptional. Among the responses, frequently cited technologies were stamping among automotive parts suppliers, while assembling, stamping, and plastic processing among electrical and electronic parts suppliers.

5.1.3 Result of the Questionnaire Survey and Analysis

Responses to the questionnaire and major characteristics observed are summarized as follows.

a. Current situation and plan for future

Current situation of the enterprises in terms of machinery and equipment, product sales, production, employee training, financial source, and technical support, etc.. In addition, plan and strategy for future on machinery and equipment, product market and other aspects of management are identified.

b Major problems

Major problems related to future strategy and outlook, and obstacles anticipated

c. Urgent problem to solve

The most urgent and serious problems perceived by the parts suppliers

(1) Current situation and strategy for future

1) Machinery and equipment

a. Current condition

self-assessment on existing machinery and equipment by the enterprises is summarized as follows. The 84.2% consider that their equipment is above the average level of modernization.

Table 5.1-7 Self-assessment of Machinery and Equipment

M & E	No. of Companies	(%)
Modernized Enough	83	26.3
Medium Level	183	57.9
Still Low	50	15.8
Total	316	100.0

As for self-assessment of current production capacity, the 41.8% consider "appropriate", while the similar percentage responded as "overcapacity". This suggests that existing machinery and equipment is not fully utilized due to small orders.

Table 5.1-8 Self-assessment of Production Capacity

Production Capacity	No. of Companies	(%)
Over	133	42.1
Appropriate	132	41.8
Short	51	16.1
Total	316	100.0

b. Plan for future

Regarding the purchase plan of machinery and equipment, the following two questions were asked:

- Any plan for purchasing new machinery or equipment
- Any intent for purchasing second-hand equipment

The results was classified according to company size, as follows.

Table 5.1-9 Intention of M & E Purchase

New	Second -hand	Total		Micro		Small		Medium		Large	
		No. of Companies	%	No. of Companies	%	No. of Companies	%	No. of Companies	%	No. of Companies	%
Yes	Yes	117	37.0	17	36.2	72	36.5	17	38.6	11	39.3
	No	46	14.6	6	12.8	23	11.7	5	11.4	12	42.9
No	Yes	90	28.5	17	36.2	61	31.0	10	22.7	2	7.1
	No	63	19.9	7	14.9	41	20.8	12	27.3	3	10.7
Total		316	100.0	47	100.0	197	100.0	44	100.0	28	100.0

Overall, the 51.6% of the respondents plan to purchase new machinery or equipment (37.0% + 14.6%), while the 14.6% are not interested in second-hand equipment. On the other hand, 90 enterprises (28.5%) do not have any plan to purchase new equipment but have interest in second-hand equipment. In total, 65.5% (37.0% + 28.5%) show interest in second-hand equipment.

Comparing percentage distribution of enterprises who responded that "We have a plan to purchase new machinery or equipment but are not interested in second-hand equipment," and that of enterprises who "have no plan to purchase new equipment but are interested in second-hand equipment" (in the shaded area of the table above) reveals that large enterprises tend to prefer new equipment, while smaller enterprises show stronger interest in second-hand equipment.

2) Product market

a. Current situation

The breakdown of their product market in 1995 to two segments, OEM (original equipment manufacturing) and REM (replacement equipment

manufacturing or aftermarket) was questioned. The following table shows average figures for all the respondents. Comparing automotive and electrical/electronic parts, the aftermarket for automotive parts seems to be more active.

Note: OEM parts tend to be mass produced with lower margins and require relatively a high level of production technology. On the other hand, REM parts can be sold at a higher margin, while quality requirements are less severe.

Table 5.1-10 Market Ratio between OEM and REM (Total)

Market	Total	Auto	E/E
OEM	56.0 %	49.8 %	63.9 %
REM	44.0 %	50.2 %	36.1 %
Total	100.0 %	100.0 %	100.0 %

Note: In the above table, OEM accounted for only 63.9% in the electrical and electronic parts market which should be dominated by OEM, suggesting that there may be some confusion among the respondents about the definition of OEM.

Comparing the average value for 40 enterprises with majority owned by foreign capital (26 automotive parts suppliers and 14 electrical/electronic parts suppliers) with the overall average, the former shows a higher OEM ratio.

Table 5.1-11 Market Ratio between OEM and REM (Foreign Capital > 50%)

Market	Total	Auto	E/E
OEM	78.2 %	82.3 %	70.4 %
REM	21.8 %	17.7 %	29.6 %
Total	100.0 %	100.0 %	100.0 %

Then, the respondents were classified according to the percentage share of OEM in their production. The 48.3% of automotive parts suppliers produce more than 50% of products for the OEM market, 63.7% of electrical and electronic parts manufacturers, and 55.1% for the both. On

the other hand, 27.5% of all the enterprises do not supply any to the OEM market.

Table 5.1-12 Ratio of OEM Market

% of OEM	Total		Auto		E/E	
	No. of Companies	(%)	No. of Companies	(%)	No. of Companies	(%)
100	97	30.7	47	26.4	50	36.2
50<OEM<100	77	24.4	39	21.9	38	27.5
0<OEM<=50	55	17.4	33	18.5	22	15.9
0	87	27.5	59	33.1	28	20.3
Total	316	100.0	178	100.0	138	100.0

Then, breakdown of the product market by domestic market, direct export, and Maquiladora is summarized and shown in Table 5.1-13 as the average for all the enterprises and the two segments.

Table 5.1-13 Market Ratio among Domestic-Export-Maquiladora (Total)

Market	Total	Auto	E/E
Domestic Market	81.3%	80.4%	82.5%
Export	13.9%	14.9%	12.7%
Maquiladora	4.8%	4.7%	4.8%
Total	100.0%	100.0%	100.0%

Finally, the percentage distribution for 40 enterprises with the majority owned by foreign capital reveals that the export share is 37.3%, way above the overall average of 13.9%.

Table 5.1-14 Market Ratio among Domestic-Export-Maquiladora (Foreign Capital > 50%)

Domestic Market	55.0%
Export	37.3%
Maquiladora	7.7%
Total	100.0%

b. Plan for future

Of 174 enterprises who are currently supplying more than 50% of their

products to the OEM market, 155 (89.1%) intend to increase OEM supply. Similarly, of 142 enterprises whose OEM supply is less than 50% at present, 108 (76.1%) have the same intent toward the OEM market.

There are 85 enterprises who do not supply to the OEM market, of which 25 enterprises (28.7%) do not show interest in production of OEM parts. The 10 of them consider themselves to have overcapacity in the question of self-assessment in "Machinery and Equipment" section. Thus, these ten (10) enterprises are not interested in OEM production despite of low operation rate.

As for export, 88.3% of the respondents (279 enterprises) wish to export their products or increase the current export share.

3) Defect/rejection rate and quality control

The question was about the defect/rejection rate which combines the percentage of defects detected by internal inspection (primary defect rate) and the percentage of products rejected by customers (secondary defect rate).

Table 5.1-15 Rejection Rate

R=Rejection Rate	No. of Companies	%
0%	86	27.2
0<R<=2%	145	45.9
2%<R<=4%	34	10.8
4%<R<=6%	28	8.9
6%<R<=8%	8	2.5
8%<R<=10%	9	2.8
10%<R	6	1.9
Total	316	100.0

The 73.1% of the enterprises indicate less than 2% of rejection rate, with the average rate of 2.02%, which emulates the levels in industrialized countries.

Note: The 27.2% (86 enterprises) respond zero defect which is unrealistic answer in the manufacturing industry. The average rate of 2.02% may be due to misunderstanding of the definition of the defect rate or others may simply

have wanted to "decorate" their figures. This average rate does not agree with the observation of the technical experts of the Team.

The responses to the question on possible causes for defect do not show distinctive characteristics. The number of respondents to blame software related to production and quality control is larger than those who cite hardware including machinery and equipment.

Then, actual quality control practice was asked. Comparing large enterprises and other enterprises (SMEs and MEs with 250 or less employees), the percentage of enterprises having inspection and QC sections is 96.4% for the former and 41% for the latter. The percentage of those having full-time inspectors is 67.9% and 44.4% respectively. The 61.8% of SMEs and MEs perform inspection on final products, while only 43.4% conduct "in-process inspection" which is a critical part of modern quality control practice. Finally, QC circles are organized by 42.9% of large enterprises and 18.1% of other enterprises, and employee suggestion systems for quality improvement are operated by 57.1% and 30.2% respectively.

4) Industrial Standards

The question was asked to find out what types of industrial standards are applied to quality control, the results is as shown in the table below (note that the percentage (%) was obtained by dividing the number of responses by the total number of respondents (316 enterprises in total, 178 automotive parts suppliers, and 138 electrical/electronic parts suppliers). Although not seen in the table, the 32 enterprises (23 automotive and 9 electrical/electronic) do not apply any of the top four standards of the table, i.e. International, Foreign, Mexican, and Customer's Standards.

Table 5.1-16 Application of Industrial Standards (Total)

Industrial Standards	Total		Auto		E/E	
	No. of Answers	(%)	No. of Answers	(%)	No. of Answers	(%)
International (ISO, IEC)	124	39.2	78	43.8	46	33.3
Foreign Standards	71	22.5	43	24.2	28	20.3
Mexican Standards	141	44.6	56	31.5	85	61.6
Customer's Standards	173	54.7	107	60.1	66	47.8
Own Standards	175	55.4	106	59.6	69	50.0
None	5	1.6	2	1.1	3	2.2
Total No. of Companies	316		178		138	

Comparing 97 enterprises supplying 100% of their products to the OEM market and 87 with no OEM supply, as shown in Table 5.1-17, the largest difference is observed among those adopting international standards.

Table 5.1-17 Application of Industrial Standards (OEM Market 100%／0%)

Industrial Standards	OEM 100%		OEM 0%	
	No. of Answers	%	No. of Answers	%
International (ISO, IEC)	48	49.5	14	16.1
Foreign Standards	22	22.7	11	12.6
Mexican Standards	41	42.3	39	44.8
Customer's Standards	49	50.5	40	46.0
Own Standards	48	49.5	59	67.8
None	2	2.1	2	2.3
Total No. of Companies	97		87	

5) Local content

The respondents were asked to indicate the local content on a product (parts) net cost basis. The average figure for automotive parts suppliers is 10% higher than that for electrical and electronic parts companies to reflect the presence of local value added requirements for finished cars under the Automobile Decree.

Table 5.1-18 Local Content

Local Content	Auto	E/E
	No. of Companies	No. of Companies
80%-100%	90	55
60%-79%	25	20
40%-59%	31	24
20%-39%	16	12
0%-19%	16	27
Total	178	138
Average	68.60%	58.40%

6) Education and training

The question was about types of education and training provided for factory labors. Answers were given by choosing multiple answers and the percentage is based on the total number of respondents (316 enterprises). Most enterprises provide OJT and nearly a half of all the enterprises organize seminars and workshops.

Table 5.1-19 Training of Employee

Training	No. of Answers	%
OJT	304	96.2
Seminar/Workshop	148	46.8
Outside School/Centers	68	21.5
Overseas	54	17.1
Total No. of Companies	316	

7) Profiles of managing director

To find out profiles of managing directors of suppliers, their background, expertise, and willingness to participate in the training programs for corporate management were asked.

As for background, the largest percentage of them was promoted within the same company, followed by spin-out from other companies. Note that the percentage is based on the total number of responses (382), because some of the respondents gave two or more answers.

Table 5.1-20 Background of Managing Director (Total)

Background	Total		SM & Micro		Large	
	No. of Answers	%	No. of Answers	%	No. of Answers	%
Dispatched from foreign company	33	8.6	26	7.5	7	19.4
By promotion	199	52.1	185	53.5	14	38.9
Succeeded family business	47	12.3	46	13.3	1	2.8
Spin-out from foreign company	33	8.6	28	8.1	5	13.9
Spin-out from domestic company	65	17.0	56	16.2	9	25.0
Spin- out from governmental/public institution	5	1.3	5	1.4	0	0.0
Total	382	100.0	346	100.0	36	100.0

The same analysis was made for SMEs and MEs which were divided into two groups according to the year of establishment, 1980 and after (151 enterprises) and before 1980 (137 enterprises)

Table 5.1-21 Background of Managing Director (Excl. Large Companies)

Background	Up to 1979		1980 Onward	
	No. of Answers	%	No. of Answers	%
Dispatched from foreign company	7	4.4	19	10.2
By promotion	87	54.4	98	52.7
Succeeded family business	30	18.8	16	8.6
Spin-out from foreign company	9	5.6	19	10.2
Spin-out from domestic company	24	15.0	32	17.2
Spin- out from governmental/public institution	3	1.9	2	1.1
Total	160	100.0	186	100.0

While the number of managing directors who succeeded family business declines, cases of "dispatched from foreign company" and "spin-out from other companies" are on the rise.

The responses on expertise are summarized as follows.

Table 5.1-22 Expertise of Managing Director (Total)

Expertise	No. of Answers	%
Technical/Production	217	41.0
Sales	142	26.8
Administration/Accounting	152	28.7
Legal	18	3.4
Total	529	100.0

As for the question asking the willingness of participation in training programs for corporate executives, 67.9% of managing directors of large enterprises responded yes, and as much as 81.3% of those at SMEs and MEs.

8) Financing

a. Current situation

Financial sources outside the company are dominated by loans from commercial banks for SMEs and MEs, followed by state banks and informal financing (investment by family and friends). As for large enterprises, the primary source is overseas, followed by commercial banks, both for working capital and equipment purchase. In addition, five in the category of SMEs and MEs cited supplier's loans for both working capital and equipment purchase. Multiple responses allowed and the percentage is based on the total number of respondents/companies.

Table 5.1-23 Source of Funds for Working Capital

Source of Fund	Total		SM & Micro		Large	
	No. of Answers	%	No. of Answers	%	No. of Answers	%
State Banks	37	11.7	33	11.5	4	14.3
Commercial Banks	138	43.7	127	44.1	11	39.3
Non-bank Financial Corporation	25	7.9	22	7.6	3	10.7
Governmental Institutional Credit	9	2.8	9	3.1	0	0.0
Informal Financing	52	16.5	52	18.1	0	0.0
Overseas	36	11.4	24	8.3	12	42.9
Total No. of Companies	316		288		28	

Table 5.1-24 Source of Funds for Machinery Purchase

Source of Fund	Total		SM & Micro		Large	
	No. of Answers	%	No. of Answers	%	No. of Answers	%
State Banks	45	14.2	40	13.9	5	17.9
Commercial Banks	121	38.3	111	38.5	10	35.7
Non-bank Financial Corporation	21	6.6	18	6.3	3	10.7
Governmental Institutional Credit	14	4.4	14	4.9	0	0.0
Informal Financing	40	12.7	40	13.9	0	0.0
Overseas	46	14.6	30	10.4	16	57.1
Total No. of Companies	316		288		28	

b. Plan for future

In response to the question on the need for new fund, 52.8% of SMEs and MEs (152 enterprises) replied yes, compared to 32.1% of large enterprises (9 enterprises). The 161 enterprises with the positive answer were further asked to indicate the use of the new fund, as summarized below. Note that the percentage is based on the total number of 161 enterprises, 9 large enterprises, and 152 SMEs and MEs. (Multiple responses allowed.) The highest percentage cites working capital followed by equipment purchase.

Table 5.1-25 Use of New Funds

Use of New Fund	Total		SM & Micro		Large	
	No. of Answers	%	No. of Answers	%	No. of Answers	%
Working Capital	117	72.7	110	72.4	7	77.8
Machinery Purchase	114	70.8	108	71.1	6	66.7
Inspection/Measuring Equipment Purchase	43	26.7	38	25.0	5	55.6
Land acquisition	12	7.5	12	7.9	0	0.0
Building Construction	26	16.1	23	15.1	3	33.3
Expenditure for R&D	30	18.6	28	18.4	2	22.2
Factory Site Relocation	13	8.1	13	8.6	0	0.0
Waste Treatment Facilities Purchase	5	3.1	4	2.6	1	11.1
Total No. of Companies	161		152		9	

On the other hand, the percentage of enterprises showing interest in equipment leasing was 113 out of 316 (35.8%), which can be divided into 100 SMEs and MEs (34.7%) and 13 large enterprises (46.4%).

9) Linkage with customers

Customers for primary suppliers are assembly manufacturers (assemblers) and for those secondary or tertiary suppliers are primary or secondary suppliers. The question asked about the linkage with these customers, present and future. (Multiple responses allowed.)

Table 5.1-26 Linkage with Customers

Linkage with Customers	Now		Future	
	No. of Answers	%	No. of Answers	%
Technical Assistance	109	34.5	106	33.5
Financial Support	44	13.9	89	28.2
Managerial Assistance	26	8.2	35	11.1
Training	45	14.2	58	18.4
Supplies	59	18.7	76	24.1
Total No. of Companies	316		316	

Note : Supplies include materials, parts, and molds furnished by customers.

10) Technical support

The question was about technical support from public organizations, universities and/or private research institutes and other organizations. The 155 enterprises, 49.1% of total, have received technical support, of which 19 (67.9%) are large enterprises and 136 (47.2%) SMEs and MEs. The percentage of SMEs and MEs is lower than that of large enterprises.

Those who have received technical support were asked to identify organizations and the type of technical support. The number of enterprises for each type of technical support is indicated in the table below. The number of enterprises who have received support in inspection and testing dominates, followed by education and training, and technical consultation.

Table 5.1-27 Objective of Technical Support

Inspection/Testing	101
Education/Training	48
Technical consultation/Clinic services	44
Calibration/Standardization	26
R&D	24
Technical information	17
Marketing	7
Managerial assistance	2

The following table lists organizations providing technical support in the top ten rankings as well as the top four items cited for each organization.

Table 5.1-28 Technical Support Organization

Organization		Main objective
ITESM	22	R&D Education/training Technical consultation/clinic service Inspection/testing
UNAM	20	Inspection/testing Education/training Technical consultation/clinic service R&D
CANIECE	16	Calibration/standardization Inspection/testing Technical consultation/clinic service Marketing
UANL	12	R&D Technical consultation/clinic service Technical information Inspection/testing
U. DE G.	9	Inspection/testing Education/training Technical consultation/clinic service Marketing
IPN	8	Inspection/testing Education/training Technical consultation/clinic service Calibration/standardization
SECOFI	7	Education/training Technical consultation/clinic service Technical information Calibration/standardization
CANACINTRA	6	Technical information Education/training Technical consultation/clinic service
ANCE	6	Calibration/standardization Inspection/testing Technical consultation/clinic service
BANCOMEXT	6	Education/training Marketing Technical consultation/clinic service

11) Technology transfer

The question asked about experience in technology transfer from overseas, directly or via foreign companies in Mexico, as well as any plan in future.

Table 5.1-29 Technology Transfer from Overseas (Auto - E/E)

	Total		Auto		E/E	
	No. of Companies	(%)	No. of Companies	(%)	No. of Companies	(%)
Now - Yes	137	43.4	84	47.2	53	38.4
Future - Yes	97	30.7	63	35.4	34	24.6
Total No. of Companies	316		178		138	

Clearly, automotive parts suppliers show higher figures than electrical and electronic ones. The U.S. is a dominant country to provide technology transfer for the both suppliers, present and future, followed by Germany.

Comparing SMEs/MEs and large enterprises, the percentage of the latter far exceeds that of the former.

Table 5.1-30 Technology Transfer from Overseas (SM & Micro - Large)

	Total		SM&Micro		Large	
	No. of Companies	(%)	No. of Companies	(%)	No. of Companies	(%)
Now - Yes	137	43.4	115	39.9	22	78.6
Future - Yes	97	30.7	83	28.8	14	50.0
Total No. of Companies	316		288		28	

The respondents were then asked to cite the content of technology transfer received, and the desirable content for the future, two answers for each. Note that the percentage is based on the total number of enterprises (316).

Table 5.1-31 Contents of Technology Transfer from Overseas

Technology Transfer	Now		Future	
	No. of Answers	%	No. of Answers	%
Seminar for new/modern technologies	50	15.8	83	26.3
Workshop for production and QC technologies	32	10.1	85	26.9
Training of key personnel in overseas	29	9.2	40	12.7
Training of key personnel in training centers of Mexico	26	8.2	56	17.7
Extension advisory services	12	3.8	20	6.3
Permanent advisory services or in-house consultant	5	1.6	5	1.6
Advisory services as temporarily required	24	7.6	46	14.6
Licensing and know-how for production	17	5.4	31	9.8
Technological information supply	19	6.0	37	11.7
Total No. of Companies	316		316	

(2) Problems

The respondents were asked to identify current problems in several management aspects. Two (2) responses were allowed for questions 1), 3) ~6). All the applicable responses were allowed for question 2). The percentage is calculated by dividing the number of responses by the total number of respondents/companies (316), except for 4).

1) OEM production

The question asked about major problems related to the increase or start of production of OEM parts to be incorporated by assemblers into their final products.

Table 5.1-32 Problems in OEM Production

Problems in OEM Production	No. of Answers	%
They have already established a business group, so that penetration is not easy.	108	34.2
Lack of companies information on potential customers	95	30.1
Insufficient production capacity to cope with big amount of orders	57	18.0
We don't know how to contact with the potential customers.	43	13.6
Lack of customers liquidity (cashflow)	36	11.4
Customers have low purchasing ability	36	11.4
Lack of competitiveness of our products in terms of quality, cost and delivery	30	9.5
Lack of capability in sales activities	26	8.2
Total No. of Companies	316	

The respondents who chose "Other" were asked to specify the problems. Of total, four respondents cite prejudice of assemblers against local products which makes them prefer imported parts.

2) Export

What would be the major problems when they intend to boost export.

Table 5.1-33 Problems in Exportation

Problems in Exportation	No. of Answers	%
Marketing	155	49.1
Financial problem (lack of working capital)	117	37.0
Procedures for external trade	97	30.7
Contract (legal matters, guarantee)	70	22.2
Severe requirements in QCD	67	21.2
Insufficient production capacity	47	14.9
Spot-order	39	12.3
Intangible barriers	28	8.9
Total No. of Companies	316	

3) Equipment purchase

What would be the major problems or obstacles when they intend to purchase new machinery and equipment.

Table 5.1-34 Problems in M&E Purchase

Problems in M&E Purchase	Total		SM&Micro		Large	
	No. of Answers	%	No. of Answers	%	No. of Answers	%
High interest rates of loans	160	50.6	160	51.4	160	42.9
Difficulty to get financing sources	157	49.7	149	51.7	8	28.6
Too expensive to buy M&E	55	17.4	52	18.1	3	10.7
Insufficient market size for installation of the modern M&E	47	14.9	43	14.9	4	14.3
Insufficient information such as catalogues on modern M&E	12	3.8	12	4.2	0	0.0
Lack of after-services	9	2.8	8	2.8	1	3.6
Lack of capability and knowledge to operate the modern M&E	7	2.2	6	2.1	1	3.6
Total No. of Companies	316		288		28	

4) Technical support

The 155 enterprises who have received technical support were asked if they had any problems in the process. The percentage was calculated by dividing the number of responses by the total number of respondents (155 enterprises).

Table 5.1-35 Problems Experienced in Receiving Technical Support

Problems Experienced in Receiving Technical Support	No. of Answers	%
Expensive in service charges	42	27.1
Lack of information about the services & functions they provide	34	21.9
Time consuming for services (not quick services)	30	19.4
Complicated procedures in application to assistance	18	11.6
Those institutions are far in location.	10	6.5
Obsolete equipment and technologies in the institutions	9	5.8
Total No. of Companies	155	

5) Personnel management and education

The question asked about major problems related to recruitment and labor relations. Responses were divided into two groups, SMEs/MEs and large

enterprises.

Table 5.1-36 Problems in Personnel Management

Problems in Personnel Management	Total		SM&Micro		Large	
	No. of Answers	%	No. of Answers	%	No. of Answers	%
Difficulty in training and education	93	29.4	85	29.5	8	28.6
Difficulty to recruit highly educated persons	91	28.8	80	27.8	11	39.3
Lack of discipline and moral for job	62	19.6	57	19.8	5	17.9
Job-hopping	62	19.6	55	19.1	7	25.0
Increase in salaries and wages	54	17.1	48	16.7	6	21.4
Labor dispute	8	2.5	7	2.4	1	3.6
Total No. of Companies	316		288		28	

6) Financing

What would be the major problems related to getting finance from banks or other sources. Responses were divided into two groups, SMEs/MEs and large enterprises.

Table 5.1-37 Problems in Fund Raising

Problems in Fund Raising	Total		SM&Micro		Large	
	No. of Answers	%	No. of Answers	%	No. of Answers	%
Banks' passive attitude to finance small- and medium-scale enterprises	102	32.3	100	34.7	2	7.1
The complicated procedure, the requirements for documentation and requirement for evacuation of your application	101	32.0	94	32.6	7	25.0
Insufficient mortgage or collateral to meet your loan requirement	87	27.5	83	28.8	4	14.3
High interest rate	52	16.5	49	17.0	3	10.7
Lack of official credit guarantees system to compliment the insufficient mortgage	33	10.4	31	10.8	2	7.1
Banks don't finance the full amount of loan requirements, for example 80% of total requirements is a limit of the loan.	14	4.4	12	4.2	2	7.1
Total No. of Companies	316		288		28	

(3) Urgent problems

Finally, the respondents were asked to identify the problems which must be solved most urgently from the overall management point of view.

By this question the comparative seriousness of the following nine (9) problems was asked..

1) Finance 2) Modernization of equipment 3) Export promotion
4) Subcontracting 5) Quality control 6) Technology transfer
7) Stuff training 8) Training program for managers
9) Technical support organizations

Each respondent was allowed to choose two from the listed. The percentage is based on the total number of respondents.

Table 5.1-38 Urgent Problems to Solve

Urgent Problems to Solve	Total		SM&Micro		Large	
	No. of Answers	%	No. of Answers	%	No. of Answers	%
Financial Support by institutional credit facilities	138	43.7	130	45.1	8	28.6
Modernization of machinery and equipment	123	38.9	110	38.2	13	46.4
Promotion of direct export of parts/components	115	36.4	102	35.4	13	46.4
Promotion of match-making and subcontracting business	84	26.6	78	27.1	6	21.4
Up-grading of quality control Technology	46	14.6	41	14.2	5	17.9
Transfer and modernization of production technology	45	14.2	41	14.2	4	14.3
Up-grading of capabilities of manpower	44	13.9	42	14.6	2	7.1
Education of management/entrepreneurs	15	4.7	13	4.5	2	7.1
Strengthening of various technical institutions	8	2.5	7	2.4	1	3.6
Total No. of Companies	316		288		28	

For SMEs and MEs, "Finance" and "Modernization of equipment" come in the first and second places. The problem of the modernization of equipment in most cases is caused by lack of financial support for SMEs. These two are strongly related. Both "Export promotion" and "Subcontracting" in the third and fourth places imply the need of new market of the products.

5.2 Analysis of the Result of the Questionnaire Survey for Maquiladora Companies

5.2.1 Purpose and Methodology of the Questionnaire Survey

Maquiladora companies represent a huge potential market for supporting industries in Mexico. The questionnaire survey was conducted to identify the current state and future policy of Maquiladora companies concerning procurement of raw materials and parts from local sources.

As the interview survey in 5.1 covered the supplier side, namely enterprises belonging to the supporting industry, the questionnaire survey to be discussed in this section is complementary by focusing on major potential buyers for SIs.

(1) Survey items

The questionnaire principally contained the following questions:

- Market for Maquiladora companies
- Expecting ratio to increase local procurement
- Intention to increase procurement from Non-Maquiladora companies (domestic market)
- For companies who have intention to increase local procurement
  - Currently desired parts and components
  - Major reason for present low percentage of local procurement
  - Parts and components to be procured in future
- Reasons for no local procurement (companies who have no intention to increase local procurement)

(2) Methodology

Of 3,133 companies registered in SECOFI's Maquiladora database, 432 companies in electrical and electronics fields (Rama 53, 54) were selected for the survey. Having excluded 206 companies whose address is not known and 56 companies which were unable to contact due to insufficient data, 170 companies were selected in the final list and request was made. The questionnaire was sent and the response was recovered by facsimile. There were 78 responses, of which 73 responses were considered as valid.

5.2.2 The Result of the Questionnaire Survey and its Analysis

(1) Market for Maquiladora products

Respondents were asked to identify their markets by export, other Maquiladora, domestic market in terms of percentage share. Naturally, the domestic market includes sales of parts and components to non-Maquiladoras. The number of valid responses is 69, and the summary is presented in Table 5.2-1.

Table 5.2-1 Market of Maquiladora

	No. of Companies					
Sales Market	0%	1 - 49%	50 - 99%	100%	Total	Average
Export	1	2	12	54	69	93.7%
Other Maquiladora	60	7	1	1	69	3.9%
Domestic Market	62	6	1	0	69	2.4%
					Total	100.0%

54 out of 69 companies (78.3%) export all of their products. As for sales to other Maquiladoras, only one company cites 100% (inter-Maquiladora) while 60 companies do not sell to other Maquiladoras, accounting for 3.9% on average. While Maquiladoras are originally intended to import raw materials and parts in a bonded area, without selling products locally, they are increasingly accessible to the domestic market partly in consequence of NAFTA. In the questionnaire survey, an average 2.4% of respondents sells their products to the domestic market.

(2) Procurement sources of parts and components

Again, procurement sources of parts and components were asked by import, in-house production, other Maquiladora, and domestic market according to respective percentage breakdown, as shown in Table 5.2-2. There were 69 valid responses.

Table 5.2-2 Procurement of Parts/Components

Procurement Source	%
By Import	90.9%
By In-house Production	3.0%
From Other Maquiladora	3.1%
From Domestic Market	3.0%
Total	100.0%

Since Maquiladoras are located within a bonded processing zone, they primarily rely on import for procurement of parts and components. This is reflected in the responses to the question. While 28 out of 69 respondents (40.6%) make local procurement, the remaining 41 companies do not, resulting in an overall average rate of 3.0%. An average percentage of local procurement among the 28 companies is 7.4%. On the other hand, imports account for 90.9% of total, so that the remaining 9.1%, including in-house production, is locally procured.

(3) Intention of local procurement

The respondents were asked if "they have intention to increase procurement from the domestic market". The result is summarized in Table 5.2-3. Note that the present percentage of local procurement is shown next to the respective group. The number of valid responses was 73.

Table 5.2-3 Intention to Increase Procurement from Domestic Market

	No. of Companies	%	Present % of Procurement from Domestic Market
Yes	47	64.4	4.1%
No	23	31.5	0.8%
No Idea	3	4.1	
Total	73	100.0	

The average rate of local procurement obtained from the responses to the above (2) is 3.0% (69 valid responses), while the rate among the 47 companies which have intention to increase local procurement is 4.1%. The rate among the 26 companies with the negative response is 0.8%. In other words, many of enterprises who make local procurement at present intend to boost it further, whereas those who have no intention to increase local

purchase are procuring few local parts and components at present. In fact, 24 out of 28 companies who are currently making local procurement, as shown in (2), intend to increase procurement from the domestic market.

As for the future level of local procurement indicated by the 47 companies with intention to increase it, an average among 44 companies (3 companies did not respond the target number of percentage) is 25.4%. If the 44 companies boost local procurement to the target level while other 29 companies remain unchanged, the average rate of local procurement among the 73 companies will become 15.5%.

(4) Parts and components desired for local procurement

The 47 companies who intend to increase local procurement, as the response to question (3) above, were further asked to cite parts and components they want to procure from local sources, five at maximum, with corresponding processing technologies required for their production. Table 5.2-4 classifies the result by processing technology in order of the number of answers.

Table 5.2-4 Desired Parts/Components from Domestic Market by Maquiladora

Processing Technology	No. of Answers	%	Parts/Components
Assembling	29	18.4%	Telephone cards, Printed wire boards, Glass, Voice coils, Fiber glass, Capacitors, Magnet wire, Molding fabricate, Pumps, Motors, etc.
Metal presswork/stamping	27	17.1%	Die tools, PCBs, Molding forms, Cups, Baskets, Plates, Yokes, Aluminum tubes, Steel, Springs, etc.
Plastic processing	27	17.1%	Bobbins, Housing/inserts, Antistatic plastic packaging, Frames, Bases, etc.
Machining	19	12.0%	Small motors, Metal components, Winding forms, Heat sink, Casing, Shaft/busings, etc.
Others	18	11.4%	Glass tube, Chemicals, Packing, Electrode, Card board, Tapes, Yarn, Fabrics, Clay, Solder, Lamination, etc.
Plating	9	5.7%	Magnet wire, Pins, Covers, PCBs, Heat sink, Shaft/bus, etc.
Rubber	8	5.1%	Silicone, Molding compound, Housing plate, Wire-cables, Rubber parts, etc.
Casting	7	4.4%	Chassis, Ferrite cores, Terminals, Brass & bronze ingot, Heat sink, etc.
Die-casting	6	3.8%	Aluminum & Zinc casting, Metal parts, Molds & dies, etc.
Heat treatment	5	3.2%	Sheet metal, Aluminum/steel,
Surface treatment	2	1.3%	Magnetic brackets, Heat exchanger aluminum/steel
Forging	1	0.6%	Tool room-Sheet metal
Total	158	100.0%	

Top three product groups cited by Maquiladoras are as follows:

- Assemblies
- Stamping parts
- Plastic parts

(5) Major problems related to local procurement

The 47 companies who had intention to increase local procurement were asked to select three reasons to identify why their present local procurement is small. And the 23 companies with no intention to increase local procurement were asked to select three reasons from the list given below:

1. Low quality of local product
2. High price of local product
3. Unreliable delivery
4. Insufficient production capacity of local suppliers to meet our order in volume
5. Incapability or inflexibility of local suppliers to follow our order changes in design and volume
6. Business attitude of local suppliers inclined to sellers' market
7. Insincerity of local suppliers to contracts
8. Lack of information about local suppliers
9. No local suppliers of parts and components we need
10. Our procurement network is already established based on the long-term contracts.
11. With the procurement policy of so-called "Single Souring", we prefer less number of suppliers for simple transaction of procurement.
12. Customer's requirement or parent company's instruction to use imports in stead of local products
13. We prefer in-house production because of a better flexibility and controllability of volume and quality of products.

Top five reasons cited are shown in Table 5.2-5. Note that the percent in the table represents the ratio of the number of companies who selected each answer to the total.

Table 5.2-5 Reasons of Present Low Percentage of Local Procurement despite of Intention of Increase

Reasons	%
9.local suppliers of parts and components we need	63.3%
3.Unreliable delivery	46.9%
2.High price of local products	40.8%
1.Low quality of local products	32.7%
8.Lack of information about local suppliers	30.6%
No. of Companies	47

The objective of the question is to identify the reason why they do not or are

not able to purchase local parts and components even though they wish to.

Among reasons, "no local suppliers" is most frequently cited, followed by delivery (D), cost (C), and quality (Q). Presumably, "lack of information about local suppliers," ranked fifth, is one of reasons behind "no local supplier."

Finally, companies having no interest in increasing local procurement were asked for reasons, which are summarized in Table 5.2-6.

Table 5.2-6 Reasons of No Interest in Increasing Local Procurement

Reasons	%
12. Customer's requirement or parent company 's instruction to use imports instead of local products	52.2%
9. No local suppliers of parts and components we need	47.8%
10. Our procurement network is already established based on long-term contracts	34.8%
2. High price of local products	34.8%
11. With the procurement policy of so called "Single sourcing", we prefer less number of suppliers for simple transaction of procurement.	17.4%
4. Insufficient production capacity of local suppliers to meet our order in volume	17.4%
13. We prefer in-house production because of a better flexibility and controllability of volume and quality of products.	17.4%
No. of Companies	23

The most frequent answer is "customer's requirement or parent company's instruction to use imports instead of local products". This is the peculiar reason of Maquiladora when they do not show interest in local procurement, unlike other reasons such as "procurement network is already established," "procurement policy of single sourcing," and "preference for in-house production." As discussed in analysis of responses to question (3), many enterprises do not and will not make local procurement. Clearly, local procurement is limited by external conditions.

Again, nearly a half of enterprises points to "lack of local suppliers."

5.3 Analysis of the Result of Visiting Survey by the Team

Concurrently with the questionnaire survey in 5.1 and 5.2, the Team visited automotive and electrical/electronic parts suppliers to assess their technology levels. In the course of the survey, the suppliers were interviewed using a questionnaire similar to that used in the questionnaire survey in 5.1. The number of enterprises from which responses were obtained during the first or second field survey is summarized as follows:

Automotive parts suppliers	57 (Maquiladora 4)
Electrical/electronic parts suppliers	44 (Maquiladora 21)
Others	8 (Maquiladora 0)
Total	109 (Maquiladora 25)

The eight (8) enterprises in "Other" category produce neither automotive nor electrical/electronic parts. However, they were not excluded from the analysis since the survey is designed to investigate, and collect the needs of, small- and medium-sized enterprises (SMEs).

5.3.1 Profiles of Responding Enterprises

(1) Company size (valid response from 106 enterprises)

Table 5.3-1 Company Size

Company Size	Non-maquiladora		Maquiladora	
	No. of Companies	(%)	No. of Companies	(%)
Micro	4	4.8	1	4.3
Small	27	32.5	6	26.1
Medium	25	30.1	3	13.0
Large	27	32.5	13	56.5
Total	83	100.0	23	100.0

(2) Ownership structure (valid response from 107 enterprises)

The respondents were classified according to the percentage of foreign capital (F), as shown in Table 5.3-2. Non-Maquiladora enterprises with majority owned by foreign capital account for 32.5% of total, while 66.3% with majority owned by local capital.

Table 5.3-2 Ownership

Ownership	Non-maquiladora		Maquiladora	
	No. of Companies	(%)	No. of Companies	(%)
Foreign 100%	19	22.9	15	62.5
J/V (50%<F<100%)	8	9.6	0	0
J/V (F=50%)	1	1.2	0	0
J/V (0%<F<50%)	14	16.9	0	0
Domestic 100%	41	49.4	9	37.5
Total	83	100.0	24	100.0

5.3.2 Result and Analysis

(1) Product market

The enterprises responded breakdown of product market by OEM and REM (aftermarket), as shown in the table below that indicates the average value among valid responses from 97 enterprises.

Table 5.3-3 Market Ratio between OEM and REM

Market	Auto		E/E		Other	
	Non-maq.	Maq.	Non-maq.	Maq.	Non-maq.	Maq.
OEM	79.4%	73.5%	82.6%	94.3%	0.0%	-
REM	20.6%	26.5%	17.4%	5.7%	100.0%	-
No. of Companies	51	4	20	21	1	-

Note : Non-maq. : Non-maquiladora, Maq. : Maquiladora

The export share is also shown in the average value among valid responses from 106 enterprises.

Table 5.3-4 Export Share

Export Share	Auto		E/E		Other	
	Non-maq.	Maq.	Non-maq.	Maq.	Non-maq.	Maq.
Export Share	28.3%	57.5%	35.9%	87.0%	0.5%	-
No. of Companies	51	4	23	20	8	-

Although the number of answers is only 4, the result suggests that automotive parts of Maquiladora companies are not only exported, but sold to domestic assemblers.

(2) Procurement of materials and parts

The question asked about sources of raw materials and parts to manufacture their products (valid responses from 88 companies).

Table 5.3-5 Procurement of Parts/Components (Auto - E/E - Other)

Procurement Source	Auto		E/E		Other	
	Non-maq.	Maq.	Non-maq.	Maq.	Non-maq.	Maq.
Import	18.3%	93.3%	19.7%	79.8%	2.0%	-
In-house production	64.7%	1.7%	54.4%	12.1%	88.0%	-
Local	16.9	5.0%	26.0%	8.1%	10.0	
No. of Companies	49	3	21	10	5	-

Then, the average figures for Non-Maquiladora companies (75) and Maquiladora companies (13) are summarized as follows.

Table 5.3-6 Procurement of Parts/Components (Non-maquiladora - Maquiladora)

Procurement Source	Non-maquiladora	Maquiladora
Import	17.6%	82.9%
In-house production	63.4%	9.7%
Local	19.0%	7.4%
No. of Companies	75	13

Maquiladora companies operating in the export processing zone mainly import parts and components they need, and the percentage of local procurement is generally estimated at around 2%. Although the sample size is small, the survey result shows the local procurement rate of 7.4% (17.1% if in-house production is included), thus Maquiladora companies at present seem to procure relatively a larger portion of parts requirements locally.

Then, apart from the actual situation above, the Team asked their basic policy for procurement of raw materials and parts, and the results are summarized in Tables 5.3-7 and 5.3-8 (valid responses from 100 enterprises).

Table 5.3-7 Basic Policy on Procurement of Parts/Components (Auto - E/E - Other)

Procurement Policy	Auto		E/E		Other	
	Non-maq.	Maq.	Non-maq.	Maq.	Non-maq.	Maq.
Import	12.2%	25.0%	15.9%	65.0%	0.0%	-
In-house production	64.3%	25.0%	38.6%	10.0%	80.0%	-
Local	23.5	50.0%	45.5%	25.0%	20.0	
No. of Companies	49	4	22	20	5	-

Table 5.3-8 Basic Policy on Procurement of Parts/Components (Non-maquiladora - Maquiladora)

Procurement Policy	Non-maquiladora	Maquiladora
Import	12.5%	58.3%
In-house production	57.9%	12.5%
Local	29.6%	29.2%
No. of Companies	76	24

The result that Non-maquiladora companies are directed to in-house production, and Maquiladora companies are directed to import substantiate the present situation. However the percentages for local product are greater than the present values, which implies strong intention for local procurement of materials and parts. In case of Maquiladora, the 35% of Maquiladora companies in the electrical and electronic sectors have the policy to increase local procurement including in-house production. The percentage exceeds 40 for all Maquiladora companies as those in the automotive sector who show a stronger inclination toward local procurement are included. The 58.3% of Maquiladora companies cite import as the basic policy for procurement of material and parts.

The reasons cited are;

For local products

Procurement from nearby is convenient.
Free from exchange risk
Free from import duties
More flexibility in negotiation
Less transportation cost
Less cost for purchase
To comply with NAFTA requirements
Less investment cost
Better controllability

For in-house production	Better quality control
	Better flexibility
	No suppliers available
	To increase plant productivity
	Less cost
	Production line already constructed
For import	No suppliers in Mexico
	Material/Parts strictly specified
	No information about local suppliers, because of the plant newly constructed

To find out how they evaluate raw materials and parts supplied in Mexico as well as local suppliers, the respondents were asked to identify two important problems related to local supplies by selecting appropriate answers from the list given. Of 85 responses (62 Non-maquiladora and 23 Maquiladora), 18 chose only one answer. Table 5.3-9 summarizes the number of enterprises who selected each item as a percentage of total respondents.

Table 5.3-9 Problems with Local Supplies

Problems with Local Supplies	Non-maquiladora	Maquiladora
Low quality	43.5%	21.7%
High price	48.4%	34.8%
Unstable delivery	37.1%	56.5%
Insufficient production capacity	29.0%	13.0%
Communication gap	0.0%	0.0%
Insincerity to contracts	1.6%	4.3%
No problem so far	8.1%	13.0%
Others	14.5%	26.1%
No. of Companies	62	23

For both Non-maquiladora and Maquiladora companies, quality (Q), cost (C), and delivery (D) rank in the top three. The 56.5% of Maquiladora companies cited the problem of delivery. The 24.7% of respondents (21 out of 85 enterprises) cite insufficient production capacity of lower-tier suppliers.

(3) Quality control (this question was asked only to enterprises visited during the second field survey)

The respondents were asked to indicate the level of participation in quality control activities and contests conducted in Mexico. Three (3) questions were asked to select one answer for each from the three below, A, B and C:

A. We have participated in it.
B. We know it, but we have not participated yet.
C. We have not heard of it.

Table 5.3-10 Participation to Quality Control

		Auto		E/E		Other	
		Non-maq.	Maq.	Non-maq.	Maq.	Non-maq.	Maq.
PNC	A	5	3	2	4	2	-
(Premio Nacional de Calidad)	B	26	1	6	12	2	-
	C	1	0	1	4	0	-
No. of Companies		32	4	9	20	4	
Semanas de Calidad	A	7	2	1	4	0	-
	B	20	2	5	8	2	-
	C	4	0	3	8	2	-
No. of Companies		31	4	9	20	4	
CNCCC (Concurso	A	3	1	0	5	0	-
Nacional de Círculos	B	24	2	6	9	2	-
de Control de Calidad)	C	5	1	3	6	2	-
No. of Companies		32	4	9	20	4	

The percentage of each answer of the total number of valid responses is summarized as follows.

Table 5.3-11 Participation to Quality Control - Summary

	A	B	C
Premio Nacional de Calidad	23.2%	68.1%	8.7%
Semanas de Calidad	20.6%	54.4%	25.0%
Concurso Nacional de Círculos de Control de Calidad	13.0%	62.3%	24.6%

Approximately 25% of enterprises do not know of the activities except National Quality Award (PNC: Premio Nacional de Calidad). Overall, the number of enterprises who know the activities but have not participated is approximately three times that of enterprises who have participated. In addition, some automotive parts suppliers participate in QC contests held by assemblers, and some have received certificate for quality control.

Next, the question on ISO 9000/QS 9000 was asked to obtain the following responses. The respondents were asked to select one of the following three answers:

A. Our company has been certified.
B. We are now under preparation for application.
C. No idea so far.

Table 5.3-12 Approach to Certificate of ISO9000/QS9000

	Total	Auto		E/E		Other	
	(%)	Non-maq.	Maq.	Non-maq.	Maq.	Non-maq.	Maq.
A	17.8%	5	0	1	6	1	-
B	78.1%	29	4	8	13	3	-
C	4.1%	1	0	1	1	0	-
No. of Companies		35	4	10	20	4	-

(4) Linkage with assemblers and parts manufacturers

What kind of linkages the enterprises have with upper-tier parts suppliers or assemblers, also with lower-tier parts suppliers. (Multiple responses allowed.) The result is summarized as follows.

Table 5.3-13 Linkage with Other Companies

	Non-Maquiladora				Maquiladora			
	Giving	(%)	Receiving	(%)	Giving	(%)	Receiving	(%)
1 Technical assistance	36	46.8%	48	62.3%	9	36.0%	17	68.0%
2 Managerial assistance	8	10.4%	13	16.9%	4	16.0%	9	36.0%
3 Supply of materials	19	24.7%	26	33.8%	5	20.0%	17	68.0%
4 Supply of molds and die	22	28.6%	30	39.0%	6	24.0%	13	52.0%
5 Lending of production facilities	3	3.9%	6	7.8%	2	8.0%	4	16.0%
6 Loan	2	2.6%	7	9.1%	1	4.0%	6	24.0%
7 Participation of capital	1	1.3%	17	22.1%	1	4.0%	6	24.0%
8 Dispatch of management	1	1.3%	5	6.5%	1	4.0%	4	16.0%
9 Training in Mexico	20	26.0%	23	29.9%	7	28.0%	8	32.0%
10 Training in overseas	2	2.6%	23	29.9%	1	4.0%	9	36.0%
Total No. of Companies	77				25			

(5) Processing technologies to be promoted

"In order to strengthen the supporting industry in Mexico, which processing technology should be given the priority for promotion". The responses are considered to reflect the viewpoints of both buyers and suppliers.

The respondents were asked to select three appropriate technologies from the list given and to assign lst through 3rd ranks according to the order of priority.

The point table for each technology, giving three points for the first rank item, two points for the second, and one point for the third, is shown below.

Table 5.3-14 Processing Technologies to Promote

Order	Processing Technology	Points
1	Metal Presswork/Stamping	101
2	Plastic processing	79
3	Machining	71
4	Components Assembly	40
5	Die-casting	36
6	Plating	28
7	Forging	23
8	Casting	22
9	Rubber processing	20
10	Heat Treatment	20
11	Surface treatment	14

The top three technologies are metal stamping, plastic processing, and machining.

(6) Management problems

What are serious managerial problems at this moment. Three appropriate answers from the list were allowed and the percentage is based on the total number of respondents/companies.

Table 5.3-15 Serious Problems - Non-maquiladora

Serious Problems	No. of Answers	%
Unstable economy including fluctuation of the exchange rate	57	73.1
Difficulties in borrowing of loans or financing	36	46.2
Unstable purchasing order of customers	31	39.7
Severe requirements of customers for quality, cost and delivery	18	23.1
High import duties of raw materials, intermediates or parts	17	21.8
Obsolescence of production technology and/or facilities	17	21.8
Low capability of employees	12	15.4
Job-hopping of employees	6	7.7
Increase in salaries and wages of employees	5	6.4
No. of Companies	78	-

Table 5.3-16 Serious Problems - Maquiladora

Serious Problems	No. of Answers	%
Unstable purchasing order of customers	9	36.0
Difficulties in borrowing of loans or financing	7	28.0
Low capability of employees	6	24.0
Job-hopping of employees	6	24.0
Severe requirements of customers for quality, cost and delivery	6	24.0
Unstable economy including fluctuation of the exchange rate	6	24.0
Obsolescence of production technology and/or facilities	5	20.0
Increase in salaries and wages of employees	3	12.0
High import duties of raw materials, intermediates or parts	1	4.0
No. of Companies	25	-

Among Non-maquiladora companies, the most enterprises cited "Unstable economy", followed by "Difficulties in financing" and "Unstable purchasing order of customers". "Unstable economy" and "Unstable purchasing order of customers" make it difficult for them to establish long-term business plans.

For Maquiladora companies of in-bond export processing operation, "Import duties" is not a major issue. The number of Maquiladora companies which cited "Unstable economy" is smaller than that of Non-Maquiladora companies. Devaluation of Peso favors the export. The ratio of the total number of responses representing problems to the number of enterprises is smaller for Maquiladora companies, indicating that Maquiladora companies face less managerial problems than Non-maquiladora companies.

5.4 Overall Analysis of the Results of the Questionnaire and Visiting Surveys

5.4.1 Geographical Distribution of Enterprises

The questionnaire survey by interview was conducted for enterprises randomly sclected from the applicable directories. However, since parts suppliers tend to be located near assembly plants, geographical distribution of the enterprises interviewed concentrates on the states where the automobile industry and/or the electrical/electronics industry are more active. Automotive parts suppliers are mainly found in Mexico (including D.F.), Jalisco, Nuevo León, and Puebla, while 77.5% of electrical/electronic parts suppliers (107 enterprises) are located in Mexico (including D.F.), followed by Jalisco and Nuevo León. Note that Maquiladora companies were not included in the questionnaire survey by interview.

5.4.2 Machinery and Equipment

According to the questionnaire survey by interview, 84.2% of respondents consider that the level of modernization of their machinery and equipment is on or above the average. However, experts of the Team report that many enterprises use old machinery and equipment that is not seen in industrialized countries, except for some autoparts companies who belong to large company groups and serve as primary suppliers to assemblers. Thus, the result of the questionnaire survey does not go beyond subjective evaluation by themselves. This is evidenced by the fact that 70.8% of enterprises who want new funds cite equipment purchase as the primary reason, and that the most urgent management problem perceived by them is financing, followed by modernization of machinery and equipment.

As for production capacity, 83.9% of respondents consider their production capacity as appropriate or excessive, which may reflect the domestic market which, even being in the recovery process, has yet to overcome the economic crisis. In other question, however, many enterprises cited small production capacity and the lack of ability to meet orders in volume as a major reason for sluggish OEM production or export. This was reported to the Team in the form of complaints by assemblers to local suppliers, and was substantiated by the result of the visiting survey. Also, it was one of alleged causes for several

unsuccessful match-making attempts in the past. The high percentage (83.9%) of enterprises who consider their production capacity as adequate or excessive may reflect actual situation of order and production at this moment. But capacity expansion needs to be considered side by side with factory modernization.

As for equipment purchase, only 19.9% gave a negative answer to new and second-hand equipment. In other words, the 80.1% plan to purchase equipment. Furthermore, the percentage of respondents having interest in purchase of second-hand equipment is higher than that for the purchase of new equipment. This is particularly clear with SMEs and MEs. The 30.6% of them have interest in purchase of second-hand equipment although they have no plan to purchase new equipment.

At present, there is no tax incentive for the purchase of equipment by SMEs. The above responses suggest that such tax incentives would help modernize production equipment of SMEs and MEs. In addition, a mechanism to provide market information on second-hand equipment needs to be considered.

5.4.3 Lack of Market Information

While 83.2% of the respondents want to increase OEM production, various problems were cited in relation to entry to the OEM parts market. The two predominant problems are:

1) The OEM market is already under control of groups of companies, then, the penetration to the market is not easy; and
2) Lack of customer information prevents effective marketing.

First of all, particularly in the automotive industry, assemblers and primary suppliers form several groups, centered around foreign enterprises. Nevertheless, the interview survey conducted by the Team reveals that the grouping of lower-tier suppliers is not rigidly fixed. In the electrical and electronic industry, much less primary suppliers are captive of specific assemblers, who are always looking for suppliers capable of meeting their requirements. Thus, secondary and tertiary suppliers in both automotive and electrical/electronic industries who cited the problem 1) above may have come

to hold such opinion due to the lack of information, as pointed out in 2). Various initiatives have been made under the leadership of SECOFI since 1995, such as accumulation of information, the establishment of data base, and setup of match-makings between assemblers and suppliers. Also, state-based efforts are made by state governments and also by CANACINTRA. The above situation implies that these efforts should be further reinforced.

The fact that OEM parts must achieve higher industrial levels in quality than aftermarket products is evident and substantiated by responses to the questionnaire. The higher the percentage of OEM production becomes, the more the enterprise's application of international standards. The result of the survey clearly indicates that SMEs and MEs are lagged behind large enterprises in quality control that is the prerequisite to the success in the OEM market. However, the number of enterprises who recognized the need for quality control was less than one third those who cited others as problems in OEM production. Many enterprises who want OEM production do not realize that they must first work with quality improvement. It is doubtful if they have actually had contact with customers.

5.4.4 Financing

One of the urgent managerial problems for SMEs and MEs is smooth fund raising. The primary source most cited is commercial banks. SME loans by NAFIN are actually executed by private financial institutions, partly explaining the high percentage of commercial banks. Major problems related to financing are reluctance of banks toward SME loans, complicated procedures, insufficient collateral, and high interest rates. Commercial banks are often reluctant to SME loans because of risks involved. To encourage SME loans, there must be an institutional mechanism to reduce risks for commercial banks through loan guarantee, etc.

5.4.5 Technical Support

More than 50% of SMEs and MEs have never received technical support from various technical organizations, and more than 60% have never received technology transfer from overseas. This indicates that there is few access to modern technology for SMEs and MEs in Mexico. In reality, however, there

are many cases where SMEs and MEs need technical support in a wide range of areas such as product inspection and testing, equipment calibration, and quality control. The analysis of the survey results indicates that major problems in the current technical support system lie in high cost, lack of information, and complicated procedures.

5.4.6 Local Procurement Rate of Maquiladora

With the exception of Nuevo León where local procurement by Maquiladoras reportedly reaches a nearly 30% level, imports account for a dominant procurement source for Maquiladoras in most regions and the procurement from local non-Maquiladora companies is estimated at around 2% on average.

Under the questionnaire survey for Maquiladora companies, the figure stands at 3.0% among the 69 companies. The visiting survey indicates an average of 7.4% for 13 companies. While the latter result may include the purchase from other Maquiladoras, the local procurement rate exceeds the generally estimated 2%. While there is no data to show how these figures have changed over a five-year or ten-year period, one of Maquiladora associations in a border state explained to the Team that local procurement gradually grew to a present level. Nevertheless, the figure is still low and according to the interview survey, products purchased by Maquiladoras from the domestic market are mainly packaging materials and other sub-materials, while few functional parts and components are purchased from local suppliers.

However there are a large number of Maquiladoras who intend to increase local procurement in order to meet the NAFTA requirements. More than 60% of Maquiladoras which responded to the questionnaire survey show willingness to increase local procurement by indicating quantitative targets. Clearly, there is a huge potential market for local suppliers. In fact, initiatives have been launched in some areas to foster, attract, and encourage subcontracting with local suppliers under leadership of Maquiladoras which have established ad-hoc committees, e.g., Ciudad Juárez, Chihuahua.

Aside from the lack of local suppliers, as pointed out by many Maquiladoras, both the questionnaire survey and the visiting survey indicate that the inability of local suppliers to meet delivery schedule is the most serious complaint on

the buyer's side, compared to quality and cost. This suggests the importance of management education to raise awareness of contract obligation and business practice.

Finally, the fact that more than a half of Maquiladoras (52.2%) who have no intention to increase local procurement cite customer's or parent company's requirements as a major reason should be noted. This raises a complex issue involving broad-based confidence in Mexican products, in addition to industrial standards.