2.6 Tax System

2.6.1 General

The tax system in Mexico consists of federal, state, and municipal taxes. Federal taxes include income taxes (corporate and personal), value added tax, asset tax, export and import taxes, special production and service taxes. State taxes consist of real estate and salary taxes. Municipal taxes consist of sewer charge and street light charge. For SMEs, the income taxes, the value added tax (IVA), the export and import taxes, and the asset tax are most important. From the tax revenue point of view, the income taxes and the value added tax account for two third of total. At present, there is no tax incentive for SMEs, but micro-enterprises and small-enterprises will be exempted from the asset tax in 1996 as a special treatment.

(1) Corporate income tax

The corporate income tax is imposed on Mexican enterprises established under the law of Mexico, local branches of foreign companies, and foreign companies which do not have any branch office or agent. It is therefore imposed on gross income from any corporate activity that has taken place inside and outside the country, less various deductions. Deductible items include returned products, discount, kickback, sales cost, overhead, investment, dividend, salary and wage, bonus, interest premium, and royalty. The effect of inflation is also taken into account when the corporate income tax is calculated. The tax rate was revised in 1969 to 42%, which continued up to 1988. Then, it was revised in 1989 to 34% that is still applicable.

(2) Value added tax (IVA)

The value added tax was introduced after 1980 to replace the former turnover tax (4%). It is imposed on persons who transfer or trade goods, provide service, lease goods in Mexico, and import goods or service. IVA is imposed on each stage of distribution. However, retailers pay IVA in amount due on product price, less the amount paid up to previous stages, so that consumers finally assume the tax burden. The tax rate was 10% until the first quarter of 1995 and rose to 15% after April 1, 1995.

(3) Asset tax

Enacted in 1989, the asset tax is imposed on the assets of enterprises, including those reporting ordinary loss, and was designed to secure stable tax revenues. The original tax rate of 2% was revised to 1.8% after January 1, 1995. The asset tax can be offset against the corporate income tax, i.e., the enterprise has to pay either the asset tax or the corporate income tax, whichever is larger in amount. Maquiladora enterprises are now subject to the asset tax that has been exempted up to March 31, 1995, although its enforcement schedule is negotiated between the government and industries (as of March 1996).

2.6.2 Tax Incentives in 1996

1996 amendments of taw laws include the lessening of tax burdens on industries. It is proposed as one of tax incentives to help economic recovery as well as to increase employment opportunities.

The tax incentives include exemption of the asset tax (1.8%) for small enterprises which annual sales are 7 million pesos or less and which asset value is 14 million pesos or less, applicable to 1996 only. This is expected to benefit 80% of micro-enterprises and small enterprises throughout the country.

Other incentives included in the 1996 amended tax laws are as follows:

1) The period to allow carried-over loss to set off profit is extended from 5 years to 10 years (applicable to loss in 1991 and afterwards)
2) If investment made between November 1995 and December 1996 exceeds that made between January through October 1995, the difference is annualized and maybe deducted from income tax and asset tax calculation.
3) For companies whose new employment exceeds that made between January through October 1995, the amount equivalent to 20% of the annual total of the minimum wage may be deducted per employee.
4) Tax incentives to encourage employment in the automobile and related industries:
   a) Exemption of the new automobile tax in 1996

b) Depreciation of automobiles which prices do not exceed those specified in applicable laws, up to 71%

2.6.3 Tariff System

To simplify the tariff structure and lower tariff rates, partly in relation to NAFTA, the tariff system has been revised through several steps. At present, tariff rates are generally in the range between 10% and 20%. However, the 35% tariff is imposed on some products, including textile, shoes, and apparel, to protect domestic industries from unfair trade practice. On the other hand, tariff rates on raw materials are generally low at 0 - 10%. Note that tariff item classification in the country was harmonized with HS (Harmonized Commodity Description and Coding System) in 1988 (see Table 2.6-1).

(1) Tax privileges

1) Maquiladora and PITEX

Major programs exempting import tariff in Mexico are "Export Maquiladora (Maquiladora de Exportación)" and "Temporary Import Program for Production of Export Goods (Programa de Importación Temporal para Producir Artículos de Exportación: PITEX)." The Maquiladora program has been evolving around attraction of foreign investment as a major objective. On the other hand, PITEX essentially embodies export promotion policy by inducing surplus production capacity of local manufacturers to exports. See 2.4 for detailed discussion on Maquiladora and PITEX. In this section, other programs, DRAW BACK and Regula #8, are described as follows.

2) Drawback

DRAW BACK, like PITEX, is an incentive program for exporters. The program permits the refunding of import tariff paid on materials used for manufacture of locally distributed products or sold to export industries. This means indirect exporters who supply production materials to privileged enterprises, namely Maquiladora, ECEX[1)], and PITEX, can receive the import tariff refund. However, for such indirect exporters, it

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[1)] ECEX is an enterprise who imports products from a third party under SECOFI's approval to export them later.

Table 2.6-1 Tariff in Mexico and U.S.

HS Cord	Products	Tariff	
		Mexico	U.S.
2709 00 01	Petroleum oils and oils obtained from bituminous minerals, crude	10	5.25 - 10.5 cent/bbl
2711 11 01	Natural Gas	Ex.	Free
2711 14 01	Ethylene, propylene, butylene and butadiene	10	Free
3901 10 01	Polyethylene having a specific gravity of less than 0.94	Ex.	11.3%
3903 11 01	Polystyrene expandable	15	0.5kg + Free
3911 10 01	Petroleum resins, coumarone, indene or coumarone-idene resins; Polyterpenes	10	6.1%
7201 10 01	Non-alloy pig iron containing by weight 0.5% or less of phosphorus	Ex.	Free
7202 11 01	Ferroalloys; Ferromanganese; Containing by weight more than 2% of carbon	10	1.4%
7203 10 01	Ferrous products obtained by direct reduction of iron ore	10	Free
7204 10 01	Waste and scrap of cast iron, waste and scrap of alloy steel	Ex.	Free
7206 10 01	Ingots	10	3.4%
7207 11 01	Semi-finished products of iron or non-alloy steel of rectangular (including square) cross section, the width measuring less than twice the thickness	10	3.4%
7208 10	Flat-rolled products on iron or non-alloy steel, In coils, not further worked than hot-rolled, with patterns in relief	10	3.9 - 4.8 %
7210 11 01	Flat-rolled products on iron or non-alloy steel; plated or coated with tin of a thickens of 0.5mm or more	Ex.	2.8%
8472 10 01	Duplicating machines	20	2.6%
8516 50 01	Microwave ovens	20	3.2%
8517 21 01	Facsimile machines	15	4.7%
8517 30 01	Telephonic or telegraphic switching apparatus	20	8.5%
8521 10 01	Magnetic tape-type	10	2.3%
8527 12 01	Pocket-size radio cassette players	20	2.2%
8528 12 01	Display device: non-high definition, having a single picture tube intended for direct viewing (non-projection type), with a video display diagonal not exceeding 35.56cm	20	3%

HS Cord	Products	Tariff	
		Mexico	U.S.
8532	Electrical capacitors, fixed variable or adjustable (pre-set); parts thereof	0 - 15	3.7 - 9.6 %
8533	Electrical resisters (including rheostats and potentiometers), other than heating resistor; parts itself	0 - 15	0 - 6 %
8534	Printed circuits	10 - 15	4.3%
8535	Electrical apparatus for switching or protecting electrical circuits for a voltage exceeding 1,000v	10 - 20	4.6 - 4.8 %
8539	Electrical filament or discharge lamps, including sealed beam lamp units and ultraviolet or infrared lamps, arc lamps, parts thereof:	0 - 15	0 - 6.8 %
8539 31	Fluorescent, hot cathode	15	3.2%
8540 11 01	Cathode-ray television picture tubes, having video display diagonal exceeding 35.56cm (Color TV)	15	15%
8541 10	Diodes other than photosensitive or light emitting diodes	Ex.	Free
8541 21	Transistors, other than photosensitive transistors: with dissipation rate of less than 1W	Ex.	Free
8542	Monolithic digital integrated circuits	Ex.	Free
8544	Insulated wire, cable and other insulated electric conductors	10 - 15	0 - 8.4 %
8701	Tractors (other than tractors of heading 8709)	0 - 20	0 - 4 %
8703	Motor cars and other motor vehicles principally designed for the transport of persons, including station wagons and racing car	20	2.5%
8706	Chassis fitted with engines, for the motor vehicles	10 - 15	0 - 4 %
8707	Bodies for the motor vehicles	10 - 15	0 - 4 %
8708	Parts and accessories of the motor vehicles	10 - 15	0 - 2.9 %
8708 40	Gear boxes	10 - 15	2.9%
8708 50	Drive axles with differential	10 - 15	0 - 2.9 %
8708 80	Suspension shock absorbers for tractors suitable for agricultural use	10 - 15	0 - 2.9 %
8708 91	Radiators	10 - 15	0 - 2.9 %
8708 94	Steering wheels, steering columns and steering boxes of the motor vehicles of headings 8701to 8705	10 - 15	0 - 2.9 %

takes some time to obtain an export certificate from a direct exporter. To receive the refund, an application must be filed within one year after the import of the material or within 60 days after the export of the product made from the material.

3) Regula #8

In contrast to PITEX and DRAW BACK that are instruments to implement export promotion policy, "General Import Tariff Law Chapter 2 Clause 2 Item8 (Regula #8)" is a tax adjustment program to increase competitiveness of business enterprises. This rule is consist of tax incentives and simplification of import procedure in order to promote a designated industry. Enterprises in a designated industry by Regula #8 are eligible to import various parts in bulk for manufacturing under the tax code 9802 . In order to take advantage of this rule, an enterprise has to apply for SECOFI's approval in advance of importation. The tariff rate is fixed for each category of production goods, either zero or 10%. For instance, parts and components for color TVs were subject to the 6% import tariff until last year, and are now exempted under a decree issued in December 1995 (tax codes 9802.0026 and 9802.0027). If an automotive parts manufactures use the program, the tariff rate is 10% for parts required for manufacturing (tax code 9802.0032).

Under this program, production equipment is not eligible for bond or tax exemption. Similarly, the PITEX program contains export obligation and does not apply to every local manufacturer. As tariff rates on export from Maquiladora to the domestic market are lowered[2], it is increasing difficult for companies to maintain competitiveness, who manufacture products for Maquiladora, destined to the domestic market.

(2) Tariff differentials with NAFTA and the U.S.

As shown in Table 2.6-1, tariff rates in the U.S. are generally lower than those in Mexico. Take TV parts and components, for instance. The tariff rate on CRT - the largest component on a value basis - is same in the two countries,

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[2] For instance, the tariff elimination schedule on assembled TVs exported from Maquiladora to Mexico is 12% in 1995, 8% in 1996, 4% in 1997, and 0% in 1998.

while that on PCBs is nearly 10% lower in the U.S.. At present, these tariff differentials do not present a problem for manufacturers who are exempted from tariff on parts imported to Mexico under the bond system of the Maquiladora or PITEX program (see 2.4 for detail). Nevertheless, as bonded imports of raw materials, machinery and equipment are scheduled to be abolished in 2001, the tariff differentials on raw materials work against local manufacturers in price competition. Similarly the tariff differentials on machinery and equipment will adversely affect future investment in Mexico.

2.6.4 Observation on Tax Incentives

The taxation system in Mexico consists of federal, state and local taxes. Federal taxes include income taxes (corporate and personal), value added tax, asset tax, export and import duties, production and service tax. State taxes include real estate tax and payroll tax, while local taxes include sewerage service charge and streetlight construction and maintenance charge. Tax incentives to SMEs, if any, are limited to the range of tax reduction by local governments and are mainly related to new employment. Besides, local taxes are generally small in amount and their reduction does not give incentive.

There is no tax incentive involving exemption or reduction of national tax, except for some special measures such as exemption of asset tax for micro and small enterprises only in FY1996. Furthermore, the asset tax is partially credited to income tax at the end of each fiscal year, so that its reduction is equivalent to exemption of advance payment. Based on such background, the Team felt that tax incentives involving reduction or exemption of national tax (particularly corporate income tax) and targeting a specific sector, such as SMEs and supporting industries, could not be expected in Mexico. Recently, however, the government reportedly announced that tax incentives for SMEs may be considered. If this is introduced, it will serve as a great impetus for promotion of SMEs.

2.7 Development of Human Resources

2.7.1 The Framework and Executing Agency of Technical Human Resource Development in Mexico

The PND announced in 1995 may be instructive in studying Mexico's policy for human-resource development in the field of SIs. As an education policy, the PND not only aims to improve the efficiency and consolidate technological education to satisfy the needs of industrial circles, but also seeks to reinforce labor training in order to supply more skilled workers and boost productivity.

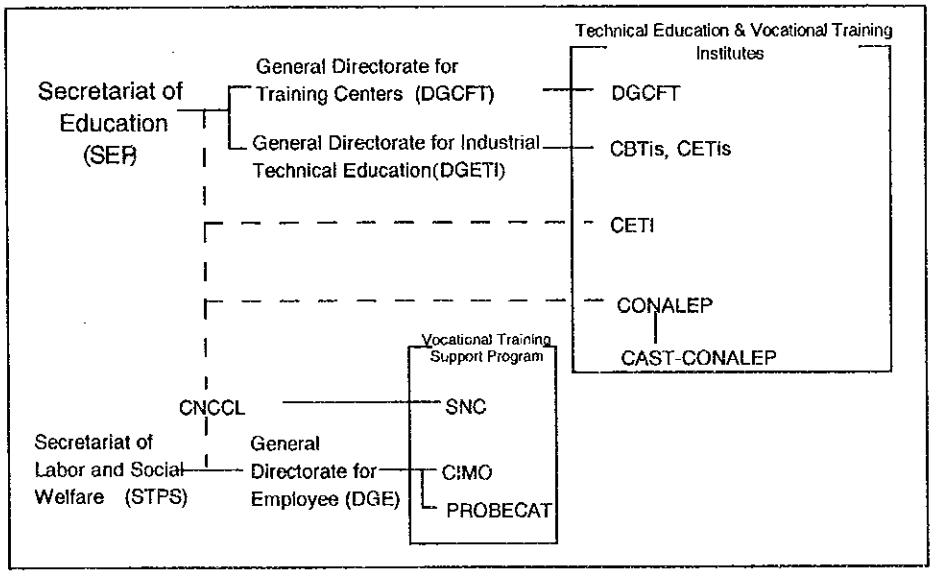

Figure 2.7-1 Technical Education / Vocational Training System for SIs

Among various human-resource development programs, technological education and off-the-job training schemes are enforced under SNET (Sistema Nacional de Educación Tecnológica)[1], which is part of the Secretariat of Education (SEP). These include technical-high-school curriculums for high-school level technical education and vocational training (CBTis, CETis, CETI and CONALEP - the latter two being independents organizations under SEP) and CONALEP) and vocational training centers (which provide vocational training courses under CECATI, CETis and CONALEP). (Refer to Figure 2.7-1) However, due to SEP's decentralization program targeting off-the-job training, quite a few vocational training centers have been taken over by local governments; in some cases, they are managed both by SEP and the State

[1] SNET covers not only technology but also agriculture and oceanography.

Government or solely by the State Government.

On the other hand, the Secretariat of Labor and Social Welfare (STPS) gives indirect support to those who undergo OJT or vocational training schemes off work, employed or unemployed. Each year, about 50,000 unemployed persons receive vocational training with a minimum wage paid under PROBECAT, a program financed by the World Bank. There are 5,000 OJT schemes enforced at some 15,000 firms per year, subsidized under CIMO, a program which is also financed by the World Bank. Furthermore, a vocational qualifications system called *Sistema Normalizado de Competencias Laborales* (SNC), aimed to boost the overall standard of workers' skills, is currently at the trial stage with the World Bank's financial support, and pilot programs to set technical level 1 standards are being executed at CONALEP, CETis, CECATI, and private firms in six industries.

In the following, we will take a brief look at technological education courses, vocational training schemes and World-Bank financed programs.

2.7.2 Technological Training

Figure 2.7-2 (Academic Structure of the National System of Education) portrays the education system in Mexico. As middle schools became compulsory under the new education law in July, 1993, graduates from middle schools are expected to total roughly 1.5 million each year. High schools and special schools admitting middle-school graduates are as follows.

Table 2.7-1 School after Compulsory Education

Name of School	Period	No. of Students	No. of Graduates	Entrance Restrictions	Note
General High School	3 years (6 terms)	4,000,000	1,000,000/year	Middle-school graduates only	Graduation: 55%
Technical Specialist	4 years (8 terms)		500/year	Middle-school graduates only	Only 1 school (in Guadarajara)
Technical High School	3 years (6 terms)	600,000	150,000/year	Middle-school graduates only	Access to university Graduation: 50%
CONALEP	3 years (6 terms)	130,000	40,000/year	Middle-school graduates only	Access to university Graduation: 68%
	(Admission to university permitted in 1996)				
Technical Basic	1 year (2 terms)	10,000	5,000/year	Middle-school graduates only	New school (3 years old)

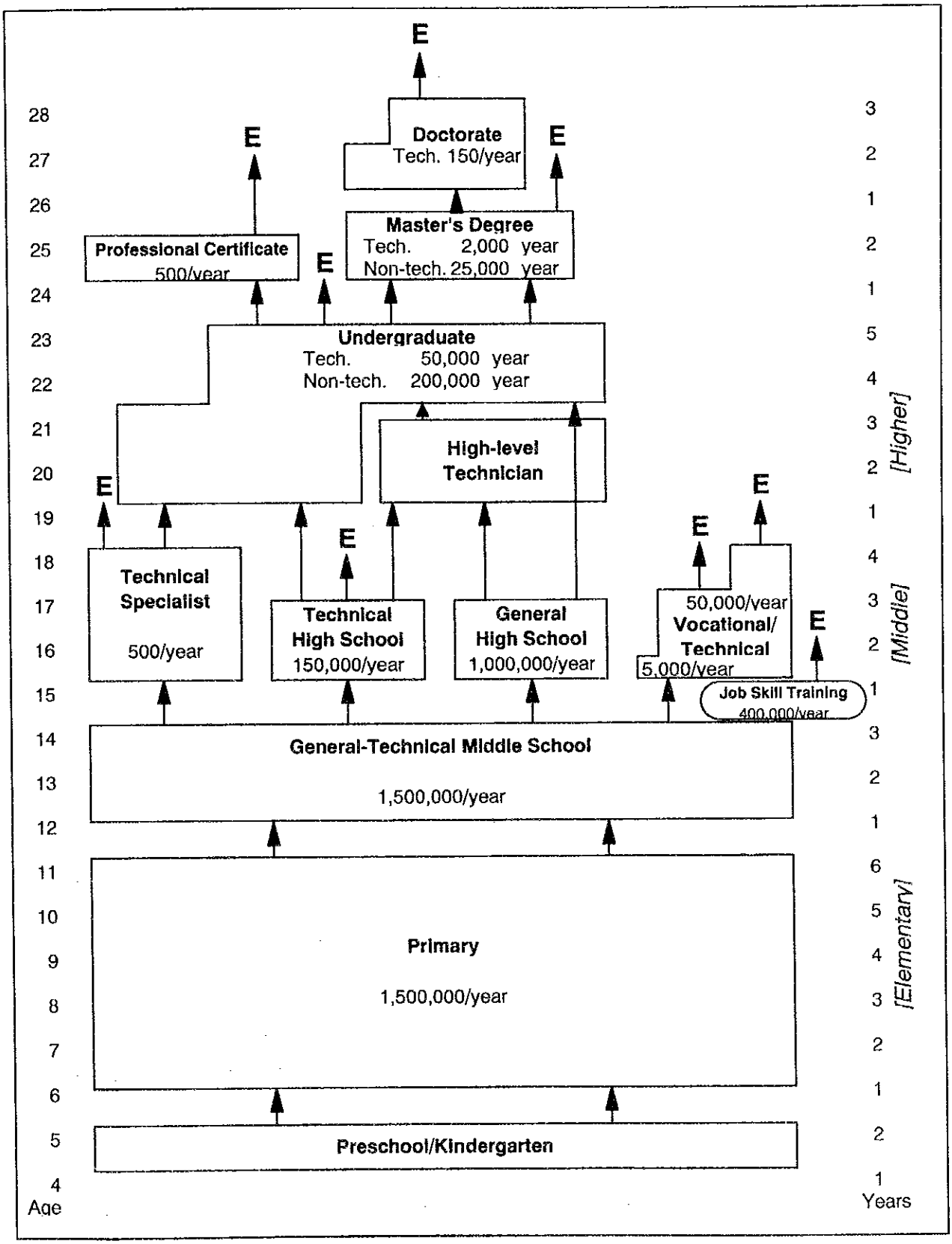

Figure 2.7-2 Academic Structure of the National System of Education

According to Table 2.7-1, about 200,000 technicians are being supplied to the labor market each year, other than graduates from general high schools. Although technological education is basically directed by the General Directorate for Industrial Training Education (DGETI), CONALEP —which manages vocational education schools— is governed by SEP and adopts a self-supporting program. There is one self-supporting technical specialist school in Guadalajara named Centro de Enseñanza Técnica Industrial (CETI), also governed by SEP. No students have graduated from CETI yet, as the school has a very short history. University-level technical specialist schools are as shown in Table 2.7-2, pumping out some 50,000 potential engineers and 200,000 would-be office workers.

Table 2.7-2 High Technical Education

Name of School	Period	No. of Students	No. of Graduates	Entrance Restrictions
Technical college (including junior college)	5 years (10 terms)	230,000	50,000/year	High-school graduates only
Technical postgraduate school (Professional certificate)	1 year (2 terms)	500	500/year	College graduates only
Technical postgraduate school (Master's degree)	2 years (4 terms)	4,300	2,000/year	College graduates only
Technical postgraduate school (Doctorate)	3 years (6 terms)	500	150/year	Master's degree holders only
Non-tech college	5 years (10 terms)	1,200,00	200,0000/year	High-school graduates only
Non-tech postgraduate school		50,000	25,000/year	College graduates only

(1) Technical high schools (governed by DGETI)

Across the nation, there are 424 technical high schools governed by the General Directorate for Industrial Training Education (DGETI), most of which offer 3-year (6-term) courses. There are 4-year courses in some schools, such as CETis No.115 (with which Japan cooperated over the 5-year period starting 1982) and CETis No.6 (which runs a dual system in cooperation with the German GTZ). In the early days, DGETI-run technical high schools meant Centro de Bachillerato Tecnológico Industrial y de Servicios (CBTis), providing technical-high-school course for those wishing to enter into college, and Centro de Estudios Tecnológicos Industrial y de Servicios (CETis),

serving as vocational training schools. Today, the two have become rather similar to each other since CETis began to offer technical-high-school courses, which resulted in a growing number of people wishing to undergo them.

At present, more than 80% of students select technical-high-school courses, the key to enter into colleges. However, in the case of CETis where we have visited for this study, the ratio of students going on to colleges heavily depended on the institute to which they belonged; the ratio was approximately 5% at CETis No.6, whereas that at CETis No.8 was around 80%. The ratio of successful graduates is extremely low; for instance, merely 50% of students complete their courses at CETis No.6, and only 33% at CETis No.8. This is due to the fact that school hours at technical high schools total 35 hours per week, compared to 22-25 hours at general high schools, and because science courses tend to be difficult. In addition, technical exercise is compulsory in both technical-high-school and vocational-training courses. Employment is virtually guaranteed for CETis graduates, nevertheless. Tuition fees are 120 pesos per term (under the 5-term system), and the instructors are full-time employees.

(2) Vocational education schools (governed by CONALEP)

CONALEP (Colegio Nacional de Educación Profesional Técnica) is an organization under the command of SEP. As 83% of its operating expenses are covered by SEP subsidies, CONALEP is aiming to boost the self-financing ratio from the existing 17% to 42% in the long run. Across the nation, there are 260 vocational education schools under CONALEP, offering 3-year, full-time vocational education courses to develop supervisors and technicians (note: there are 6 terms, the number of students total 130,000, and tuition fees are 2.5 times as much as the minimum wage).

CONALEP aims to train 2 million individuals during the 5-year period between 1996 and 2000, in which ordinary workers are to account for 40% (skill-training), technicians for 40% (supervisor level) and advanced technicians for 20% (chief-supervisor level). This ratio was set to meet the high demand for technicians.

Curriculums at full-time vocational education schools have been thoroughly

consolidated in September, 1996. Following the revision of common subjects and the abolition of subjects with a low demand, the number of courses were reduced from 146 to 29, concentrating on 9 subjects (i.e. machinery, metallurgical technology, automobiles, telecommunication, maintenance, information, commerce, medicine, and tourism). The ratio of theory to practice in each course is 40% to 60 %, and students are obliged to perform factory work and social services before getting any job, both amounting to 480 hours (for 6 months). Upon the preparation of curriculums, each state establishes a committee consisting of members from the private sector and CONALEP to analyze the case; hence, the scope and curriculum of vocational education depend on the state.

Among all graduates from full-time vocational education schools, 62% find employment immediately. Even the remaining 38% of graduates find employment within the following 6 months. The employment rate happens to be much higher in Maquiladora. In each school, two employment advisors are posted to introduce jobs to students and follow up how they are doing at their new workplaces.

Instructors at CONALEP total 22,000, and are required to have experience in the private sector. As the instructors' remuneration is low compared to the private sector, 90% of instructors work in the private sector on the side — only the remaining 10% concentrate on work as instructors. Out of all instructors, 5% are Master's degree holders, 40% are college graduates, 40% are specialized technicians, and 15% are technicians with creditable business experience. Despite the low salary, it is not so difficult to find instructors since there are no restrictions on side business.

2.7.3 Vocational Training

Vocational training is generally subject to the General Directorate for Training Centers (DGCFT). As shown in Table 2.7-3, roughly 400,000 people undergo vocational training every year.

Table 2.7-3 Vocational Training Centers under DGCFT

Name of School	Training Period	No. of Students	No. of Graduates	Entrance Restrictions	Note
Vocational training center	1 week – 3 months	400,000	400,000/year	None	

Other than vocational training centers, CONALEP and CETis also offer short- and long-term vocational training courses. Now we shall take a look at vocational training centers under DGCFT and vocational training courses given by CONALEP in detail.

(1) Vocational training centers (governed by DGCFT)

There are 198 vocational training centers (CECATI) under the General Directorate for Training Centers (DGCFT) throughout Mexico. Mexico City has the largest number of CECATIs (32 centers), whereas Baja California Sur and Tabasco has the fewest (2 centers, respectively). In addition to these, mobile vocational-training units are available.

The curriculum is standardized nationwide, consisting of 51 subjects and 205 modules, out of which information processing, clothing, secretarial, automotive repair, cosmetic, electronics, foreign language and metallurgical technology courses were highly popular in 1993.

Some modules are as short as 40 hours, while some even add up to 600 hours. Most modules, however, are approximately 250 hours, meaning that it takes about 3-4 months to complete the course if one undergoes 2-hours training each day. The ratio of theory to practice is 20% to 80%. According to this module system, which was introduced 8 years ago, a module certificate is issued upon the completion of each module, and a course certificate is issued upon the completion of all modules within the faculty, which usually amounts to 4 courses. The national average drop-out rate, which marked 17.5% in 1991, has slightly decreased to 14.4% in 1994. Instructors at CECATI are all full-time public servants of SEP.

According to a survey based on random sampling, merely 25.9% of individuals completing CECATI training courses in 1994 managed to find employment within 6 months, compared to 44.6% in 1991, reflecting the

deterioration of the Mexican economy. By state, the figure exceeded 40% in Baja California Sur (54.3%), Chiapas (53.6%), Coahuila (44.1%) and Guanajuato (42.0%), whereas the figure was less than 20% in Querétaro (9.2%), Tlaxcala (9.4%), Ciudad de México (10.6%), Guerrero (11.3%), Veracruz (14.9%), Hidalgo (17.8%) and Morelos (18.4%).

(2) Vocational training at CONALEP

Vocational training courses currently offered by CONALEP (focusing on the development of supervisors and technicians) include: module-type courses (post-employment training), undertaken by 20,000 students; and a pilot program of the British National Vocational Qualifications (NVQ), to which 2,000 students are subjected.

Modular-type training courses, in which students learn only the theoretical side in vocational education schools while taking part in practical exercises in factories, are being enforced according to the needs of the private sector.

Other than vocational education schools, there are 9 technical centers (CAST) under CONALEP, offering technical services to the private sector. CAST facilities are financed by loans from the World Bank. CAST, which adopts a self-supporting system as an organization independent of vocational education schools, not only provide training and commission-based training but also undertakes production on consignment (Refer to section 3.3.3.) Although CASTs located in regions with a high concentration of Maquiladora-oriented firms are fully operating, those in the suburbs of Mexico City are rather redundant as there is a low demand for training and consignment production in those areas where firms are having financial difficulties.

2.7.4 World Bank's Human-Resource Development Program

World Bank's PCMO, a complex support service program for SMEs and micro-enterprises, was primarily launched as a project to develop human resources. However, the scope of the program was expanded to promote SMEs since many of them went bankrupt following the market deregulation in 1985, making it increasingly important to guarantee employment first before developing human resources. The outline and the background of the program

are as follows.

1. PCMO (a technical training project, Proyecto de Capacitación de Mano de Obra) 1987-1992 (World Bank: 159M US$)
   1) PROBECAT (Programa de Becas de Capacitación para Trabajadores): Short-term training (3-4 months) under the national program for the vocational training of unemployed persons enforced in 1984: This serves as the largest component.
   2) CIMO: Development of human resources in industries, targeting employed persons
   3) PFI: STPS's institution building
2. PMMT (a project to modernize the labor market, Proyecto de Modernización de los Mercados de Trabajo) 1993-1997 (World Bank: 355M US$)
   1) PROBECAT: Vocational training of unemployed persons
   2) CIMO: Development of human resources in industries, factory inspection/consultation
   3) FI: Structural reinforcement of STPS
3. PMMT II 1997-2001 (World Bank, IDB: 700M US$)
   1) PROBECAT: Development of human resources in local industries (accounting for 60% of the budget)
   2) CIMO: Qualitative improvement and modernization of micro-enterprises and SMEs (accounting for 30% of the budget)
   3) FI: Structural reinforcement of the STPS, establishment of a nationwide network (accounting for 10% of the budget)

It should be remembered that SNC aims to not only upgrade the "quality" of workers but also improve the quality of programs by preparing training programs in conformity with SNC. Recently, pilot programs to introduce SNC have been launched in some vocational education schools, technical high schools and vocational training centers, of which the results are to be utilized to establish SNC.

(1) CIMO program (Programa de Calidad Integral y Modernización) (enforced by DGE, STPS)

The scope of the CIMO Program, which was first launched to provide

vocational training to employed persons, has been expended to cover factory inspection/consultation and make qualitative improvements. At present, the CIMO Program focuses especially on (1) the training of factory workers, (2) the training of directors/managers of SMEs, and (3) the reinforcement of SMEs (e.g. quality control, technical consultation).

Regarding (1) and (2), the need to train factory workers and director/managers of SMEs is second to none as far as the accounting of micro-enterprises is concerned, because it is often difficult to judge whether the firm is run as a corporation or a family. In addition, there is a high demand for the training of employees to minimize defects, to make management policies strike roots within the firm, and to enhance their sense of belonging to the company. As for product quality, there is a great demand for advisory and consultation services on the quality standards which the buyers specify. As a large percentage of persons change their occupation in Maquiladora, where many firms concentrate, it is essential take flexible measures, say, shorten the length of programs in the region, considering various ways to make factory workers loyal to the firm and stabilize the management of companies.

With respect to (3), factory/management inspection, SMEs are analyzed to find out what really needs to be done and improved. On the basis of the findings, firms employ private consultants and make investments in training and to improve the product quality. Both factory/management inspection are subject to subsidies from CIMO, by which 70% of the costs may be covered. Consultant fees varies from case to case, but are generally 250 pesos/hour.

The ratio of consultation in the CIMO Program has been increasing every year; the rate of increase has been outstanding considering that there were 5,715 training schemes and 5,325 consultation cases in 1994, compared to 4,189 schemes and 1,539 cases in 1993. The total figure of training schemes and consultation cases has rapidly increased, from 5,728 in 1993, 11,040 in 1994, to 30,014 in 1995.

In 1995, individual firms and business groups which were subjected to the CIMO Program totaled 25,000 (out of which 70% were micro-enterprises), and the number of trainees amounted to 368,111. The CIMO Program is

executed by the UPC (Unidades Promotras de la Capacitación: a human-resource development promotion unit) in liaison with a firm or a group of companies suffering from similar problems. There are 60 UPCs across the nation. In every state, although the strategies to enforce the CIMO Program and the scope of training are determined by an executive committee consisting of members from UPC and business representatives, in practice, the firm or the business group in question is allowed to decide the subject of the training scheme and select the instructors at discretion. Subsidies are available upon the execution of training schemes, amounting to 70% of the costs in the case of micro-enterprises and 35% in the case of SMEs. UPC's fixed costs (such as rent and telephone charges) are to be rendered by the local business association.

(2) PROBECAT

Under PROBECAT (vocational training of unemployed persons), the following 5 programs are being enforced.

1) Payment of a minimum wage to unemployed persons undergoing vocational training
2) A program which encourages firms to accept unemployed persons as trainees; the minimum wage is financed by the program during the training period, but the firm is obliged to employ more than 70% of such trainees.
3) Improvement of the productivity of local micro-/small enterprises
4) A program which encourages micro-enterprises to train unemployed persons; in this case, the firm has no obligation to employ the trainee.
5) A program to develop the skill of workers in local medical institutions

Under PROBECAT's program, unemployed persons receive training at CONALEP and DGCFT. In DGCFT, for instance, there are some 10,000 trainees receiving a minimum wage under PROBECAT.

(3) SNC

In Mexico, the vocational qualifications system (including certification methods and standards) are about to be established under CNCCL's leadership.

CNCCL was established very recently, as a council dealing with vocational and technical training. The budget for the SNC program is set at 418 million US$, including loans from the World Bank (which amount to 265 million US$ over 4 years). Currently, CNCCL is enforcing a pilot project with the Secretariat of Education (SEP) and the Secretariat of Labor and Social Welfare (STPS) to establish the technical level 1, using the British National Vocational Qualifications system (NVQ), and is planning to set the standards for three sectors (tourism, sugar and railroads) by the end of this year, or at least by the beginning of next year. Other than these, CNCCL executes pilot programs for individual firms with regard to textiles, construction, leather, toys, furniture, waterworks, and electrical/electronics (e.g. telecommunications, TV stations, computers).

The qualification system is to be managed by three agencies, each dealing with the stage of supervision, certification, examination and evaluation, respectively. The idea is to establish a certification agency with joint investments by CNCCL and industrial associations, and ultimately privatize it in the future. The role of the organizations may be summarized as follows.

1. CNCCL is to decide the outline of certification methods and standards, and give instructions to the certification agency. Its technical staff members are to demonstrate their skills and techniques.
2. The certification agency's role is limited to the issuance of certificates, and will have no examination facilities.
3. In practice, examination and evaluation will be performed at educational research institutes and companies.

In Mexico, the existing vocational training institutes merely cover technical levels 1 and 2, and there are no institutes which cover those beyond level 3[2)]. Moreover, as there are no standards for vocational-education high schools under CONALEP, international standards are being directly applied to set the levels. Hence, the issue at stake is to rearrange them into the Mexican criteria. From October, preparations will be made to establish standards for

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[2)] Level 1: The worker is capable of performing a task.
Level 2: The worker is skilled enough to perform several tasks.
Level 3: The worker is at a technician level, capable of supervising production lines.

tourism, sugar and railroad sectors and produce a curriculum according to the new standards.

2.7.5 Challenges to the Development of Human Resources

1) Under the former administration, CONALEP surveyed the demand and supply situation regarding technicians and prepared a blueprint for the future, yet they cannot used in its original form due to changes in the environment resulting from the economic crisis. We need to produce a master plan for the development of human resources in the technical field.
2) The development of human resources is insufficient in the field of electronics, mechatronics, computers, computer programming, automation and machinery, where the demand for skilled workers are especially high in the private sector. Yet, the employment rate is generally low, indicating the disequilibrium between supply and demand. In addition, training subjects tend to become outdated in relation to fields where technological innovation progress at a rapid rate, such as electronics.
3) Regional disequilibria are found to some extent, in that electronic technicians are being supplied to Oaxaca where there is virtually no demand for such technicians, while Maquiladora is in great need.
4) With the introduction of SNC, vocational training centers are expected to assume a greater role. In response, DGETI is planning to boost the number of students at vocational training centers from the current 400,000 to 1,500,000 within the next 4-5 years. CONALEP is also aiming to increase the number of graduates from vocational education schools (currently amounting to 40,000/year) and post-employment trainees (20,000/year) to 2,000,000 during the 5 year period between 1996 and 2000 (that is, 400,000/year).
5) Practical exercises tend to be undermined due to the expensiveness of laboratories, equipment, and other facilities. Consequently, vocational training courses are forced to rely on theoretical education.

Chapter 3

Industrial Standardization in Mexico and Technical Support Organizations

Chapter 3 Industrial Standardization in Mexico and Technical Support Organizations

3.1 Industrial Standardization

3.1.1 History of Industrial Standardization in Mexico

(1) 1920s - 1950s

In 1927, the Mexican government expressed the importance of industrial standards at World Metrology Conference held in Paris and started activity toward the establishment of its national standardization organization. In 1933, Standards Section was established within Commerce Division, Department of Economy (Dirección Comercio de la Secretaría de la Economía Nacional) and Proposed Industrial Standards (Anteproyectos de Normas Industriales) for general consumer goods were announced. At the same time, the intent and scope of standardization to be promoted by the federal government, as well as promotion plans are compiled into a report.

By the end of 1942, Standards Division (DGN: Dirección General de Normas) was established as national standards organization, and most of its functions were determined, including the development of national standards, selection of products subject to standardization, and promotional and educational activities.

In December 1945, Industrial Standards Law was promulgated to set forth DGN's functions in a more specific way. Pursuant to the provisions of the law, the Standards Committee was organized by representatives of Ministry of Commerce and Industry Promotion (SECOFI: Secretaría de Comercio Fomento Industrial), Chamber of Commerce and Industry (Cámaras Industriales), and manufacturing industries. Furthermore, DGN was entrusted to establish Mexican Standards Association (NORMA: Normas Mexicanas Asociadas).

However, the committee, commissioned to prepare for the standardization process, did not function at all and thus failed to give birth to NORMA. As a result, a limited number of standards in non-critical areas was produced under

Industrial Standards Law. The lack of understanding and coordination among related departments contributed much to this failure. Later, DGN continues its activities, including participation in International Standardization Organization (ISO) as its founding member, but the full progress of industrial standardization in Mexico had to wait until 1960.

(2) 1960s - 1970s

As DGN became one of ISO's founding members established in 1946, it was increasingly recognized that new laws and regulations needed to be introduced to catch up with an accelerating pace of industrial development. In December 1960, General Law for Standards, and Weights and Measures (Ley General de Normas, y Pesas y Medidas) was promulgated to clearly define basic concepts of standardization. In particular, the law mandated the establishment of Consultation Committee for Standardization (Comités Consultivos de Normalización) for the purpose of facilitating protection of human safety and health, unification of quality standards for export products, standardization of domestic products, and distribution of goods and service. At this point, a framework for methodology to promote standardization was clarified.

(3) 1980s - 1990s

During the 1980s, a major focus was placed on guidance and research related to industrial standardization, and for the first time, small- and medium-sized enterprises became subject to industrial standardization. During the period, standardization efforts were limited to manufacturing industries, especially quality assurance of products.

In April 1980, National Laboratory Accreditation System (Sistema Nacional de Acreditamiento de Laboratorios de Prueba) was established to accredit facilities satisfying specific standards as official laboratories. For these accredited laboratories to conduct proper testing and measurement services for products made by private enterprises, they must be equipped with calibration equipment and measuring instruments. For this purpose, National Calibration System was launched and National Metrological Center (CENAM: Centro Nacional de Metrología) was established.

Meanwhile, National Standardization Prize (PNN: Premio Nacional de Normalización Integral) was created in 1973 to encourage standardization efforts at a national level, but increased costs became financial burdens. In 1989, DGN launched National Quality Prize (PNC: Premio Nacional de Calidad) pursuant to an official gazette in 1986 and under cooperation of large enterprises. The prize was awarded to enterprises who made outstanding efforts in quality improvement of industrial products and service. At the same time, DGN started Quality Week (Semanas de Calidad) in each state, which was co-sponsored by large enterprises, state governments, and universities.

In 1992, Federal Metrology and Standardization Law was promulgated to set the foundation of a new framework in Mexico. According to the Law, Mexican Standard consists of mandatory standard (Normas Oficiales Mexicanas) and voluntary standard (Normas Mexicanas). Formally, both mandatory and voluntary standards were mixed in one standard system (Normas). A general outline of the law is described in the following section.

3.1.2 General Description of Federal Metrology and Standardization Law

This law, promulgated in July 1, 1992, forms the latest legal foundation for industrial standardization and its general contents are as follows.

Part 1 Outline (General Provisions)

- Scope
- Objective
- Explanation of Terms
- Role of Secretariat (SECOFI)

Part 2 Metrology

Chapter 1 Units of Weights and Measures

- To use international unit systems (sistema intemacional de unidades : SI).
- In the case of trade with a country which does not adopt SI unit systems, SECOFI specially approves the use of a non-international unit system.

Chapter 2 Measuring Instruments and Equipment

Chapter 3 Mandatory Measurement in Business Transaction

- For any business transaction based on quantity (e.g., weight and length), adequate measuring instruments must be used.
- SECOFI is responsible for determining accuracy of measuring instruments.

Chapter 4 National Calibration System

Chapter 5 National Metrology Center
(CENAM: Centro Nacional de Metrología)

Part 3 Standardization (Establishment of Standards)

Chapter 1 General Provisions

- Areas and Scope of Standardization
- Role of SECOFI

Chapter 2 NOM (Normas Oficiales Mexicanas) - Mandatory Standard

- Purpose of NOM
- Information required to provided at the time of NOM notification
- A proposal by Consultation Commission for National Standard (CCNN) must be accompanied by the result of analysis and evaluation.

Chapter 3 Compliance with NOM

- Every product, process, method, equipment, and service must comply with NOM.
- For a product for which NOM is not available, it must be shown that it satisfies requirements in its country of origin before import.

Chapter 4 National Commission for Standardization
(CNN: Comisión Nacional de Normalización)

- The major purpose of the commission is to promote standardization policy and coordinate activities of related organizations (discussed later).

Chapter 5 Consultation Commission for National Standard
(CCNN: Comités Consultivos Nacional de Normalización)

- The major purpose of the commission is to establish and disseminate NOM (discussed later).

Chapter 6 National Organization for Standardization
(ONN: Organismos Nacionales de Normalización)

- ONN is a private standardization organization accredited by SECOFI and establishes voluntary standards (NMX). (discussed later)

Part 4 Accreditation and Certification

Chapter 1 General Provisions

Chapter 2 Official Certification

Chapter 3 Official Seals and Marks

- For a product satisfying NOM, SECOFI issues a mark and seal under cooperation of a responsible regulatory organization.

Chapter 4 Laboratories

Chapter 5 Verification Unit

Part 5 Monitoring and Verification

Chapter 1 Monitoring and Verification

Part 6 Prize and Penalties

Chapter 1 National Quality Prize

Chapter 2 Penalties

Chapter 3 Administrative Measures

Transitional measures

The law becomes effective 15 days after notification on the official gazette. The laws related to weights and measures and standardization published on the official gazette dated January 26, 1988, will be abolished.

3.1.3 Instruments and Procedures for Establishment of Industrial Standards

Under the Law for Weights and Measures and Standardization of 1992, national standards in Mexico are organized as follows:

(NORMA : standard)

- NOM (Norma Oficial Mexicana)
  - mandatory standard or technical regulation
- NMX (Norma Mexicana)
  - voluntary standard

Among standardization activities in Mexico, the present national system related to the establishment (including amendment) of standards is summarized in Figure 3.1-1. Within this framework, institutional setup and procedures are described as follows.

(1) National Commission for Standardization (CNN: Comisión Nacional de Normalización)

CNN was established to promote standardization policy in Mexico and coordinate activities of various organizations involved in standardization. CNN's functions are defined as follows:

1) Approval of the national standardization program and the monitoring of its progress
2) Establishment of coordination rules for related government authorities, private organizations, and others
3) Development and proposing of standards
4) Resolution of discordance at CCNN
5) Submission of opinion related to accreditation on standardization of a national organization
6) Encouragement of merging of research and testing organizations, including guidance
7) Proposing of measures and devices for promotion of proper standardization
8) Instruction on framework of CCNN
9) All the other activities required for implementation of 1) through 8)

Based on the information from SECOFI, CNN consists of 44 members authorized by DGN, representing related government authorities, private certification organizations, testing and research organizations, trade associations, university associations, and consumer organizations (see Table 3.1-1). It is chaired by each minister of related departments rotationally for every six months, and DGN of SECOFI serves as permanent secretariat. According to DGN, CNN holds meeting every three months that lasts around two hours.

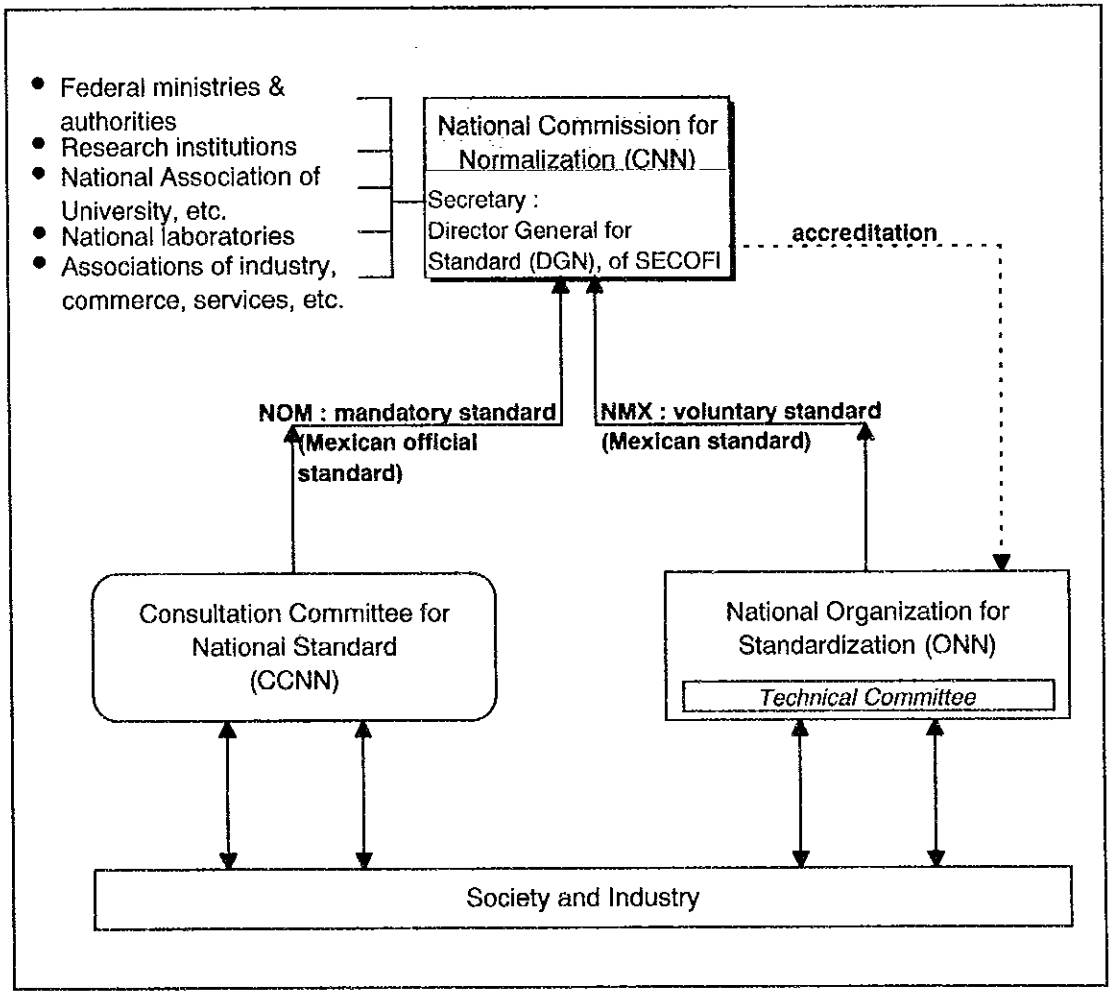

Figure 3.1-1 National System for Standardization in Mexico

Table 3.1-1 Members of National Commission for Normalization (CNN)

Secretaría de Hacienda y Crédito Público (SHCP)
Secretaría de Desarrollo Social (SEDESOL)
Secretaría de Comercio y Fomento Industrial (SECOFI)
Secretaría de Agricultura, Ganadería y Desarrollo Rural
Secretaría de Comunicaciones y Transportes (SCT)
Secretaría de Salud (SS)
Secretaría del Trabajo y Previsión Social (STPS)
Secretaría de Turismo (SECTUR)
Secretaría de Medio Ambiente, Recursos Naturales y Pesca
Confederación de Cámaras Industriales de los Estados Unidos Mexicanos (CONCAMIN)
Confederación de Cámaras Nacionales de Comercio Servicios y Turismo (CONCANACO)
Cámara Nacional de la Industria de Transformación (CANACINTRA)
Cámara Nacional de Comercio de la Ciudad de México
Consejo Nacional Agropecuario
Procuraduría Federal del Consumidor
Comisión Federal de Competencia
Dirección General del Centro Nacional de Metrología (CENAM)
Consejo Nacional de Ciencia y Tecnología (CONACYT)
Comisión Nacional del Agua
Instituto Mexicano de Tecnología del Agua
Asociación Nacional de Universidades e Instituciones de Educación Superior
Sociedad Mexicana de Normalización y Certificación,S.C. (NORMEX)
Instituto Mexicano de Normalización y Certificación, A.C. (IMNC)
Asociación Nacional de Normalización y Certificación del Sector Eléctrico, A.C.(ANCE)
Instituto Nacional de Normalización Textil, A.C. (INNTEX)
Consejo Técnico del Organismo Nacional de Normalización y Certificación de la Construcción y Edificación, A.C. (ONNCCE)
Normalización y Certificación Electrónica, A.C. (NYCE)
Secretaría de Educación Pública (SEP)
Secretaría Ejectiva del Consejo de Normalización y Certificación Laboral

Source: SECOFI

(2) Establishment of NOM - Consultation Commission for National Standard (CCNN)

NOM as mandatory standard or technical regulation is established according to the following procedures:

1) Pursuant to National Program for Standardization, a draft standard to be added to NOM is prepared by a government authority responsible for an area of industry which the standard is related to.
2) The draft standard is submitted to CCNN, which submits its opinion within 75 days after the submission.
3) The government authority that prepared the draft standard is required to respond to CCNN's opinion within 30 days after receiving it.
4) The standard is announced on the official gazette published daily by the federal government. The interested parties should submit comments to CCNN within 90 days.
5) CCNN considers comments submitted by the interested parties and modifies the draft standard, as required, within 45 days after reception. Response to the comments or modification should be announced as soon as possible.
6) The standard that has completed CCNN's review is published on the official gazette by the minister of the responsible department and is reported to DGN for registration.

CCNN is an organization established to develop and promote NOM. It is organized for each area of industrial and is chaired by a department in charge of the area. Its members are representatives and technical persons of 1) responsible government authorities, 2) industrial organizations, 3) the distribution industry, 4) manufacturers, 5) research and testing organizations, 6) universities, and 7) consumer organizations. Final decision at CCNN is made by majority.

According to DGN, NOM statistics up to 1995 are summarized as follows:

- Total number of NOMs established up to 1995 : 458
- Established/revised in 1995 : 164
  (revision accounts for around 50%)
- NOMs related to SECOFI (of 458) : 56
  (of 56, 2 are in the field of electricity, 1 electronics, and 3 automobile)

(3) Establishment of NMX - National Organization for Standardization (ONN)

NMX as voluntary standard is established by National Organization for Standardization (ONN) that is a private organization. ONN is accredited by SECOFI in each area of industry. As of 1995, 6 organizations were accredited, and two additional organizations are scheduled to obtain accreditation by the end of 1996 [1] (see Table 3.1-2).

An organization intending to obtain the ONN accreditation (including a private enterprise) is required to submit a document to SECOFI, specifying 1) an area of industry it wants to establish NMX; 2) a nationwide network system it maintains; 3) technical and financial capabilities; and 4) financial plan to maintain the ONN status.

An accredited ONN must organize Technical Committee consisting of representatives of the interested parties in its area of specialization in order to ensure fairness in establishment of NMX. More precisely, the committee members are technical persons representing manufacturing industries in the related area, distribution, commerce and service industries, consumer organizations, advanced education and scientific organizations, technical colleges, and other interested groups, all of which must be national-level organizations.

The accredited ONN is expected to assume various obligations to maintain fairness and manage a data base:

1) It must accept participation of the interested parties in the NMX establishment process.
2) It must submit all the relevant records to SECOFI upon request.
3) It is required to publish each NMX established.
4) It must conclude an agreement with SECOFI concerning the recording and maintenance of NMX information.
5) It must accept a representative of SECOFI as a member.

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[1] ONN is also accredited as a product certification organization as mentioned later.

Table 3.1-2 ONN for NMX Formulation

	Name of Organization (Establishment)	Sector in Charge
1	NORMEX (8.12.93) Sociedad Mexicana de Normalización y Certificación, S.C.	Toys, Furniture & Potable water
2	IMNC (1.3.94) Instituto Mexicano de Normalización y Certificación, A.C.	System of quality, tourism and metrology
3	ANCE (8.4.94) Asociación Nacional de Normalización y Certificación del Sector Eléctrico, A.C.	Electrical products and home appliances
4	INNITEX (25.11.94) Instituto Nacional de Normalización Textil, A.C.	Fiber and textile
5	ONNCCE (30.11.94) Organismo Nacional de Normalización y Certificación de la Construcción y Edificación, S.C.	Products & materials for construction, Materials and system for plastic, aluminum, glass and electricity
6	NYCE (25.9.95) Normalización y Certificación Electrónica, A.C.	Electronics, telecommunication and information
●	CRT (within 1996) Consejo Regulator de Tequila, A.C.	Tequila (alcoholic beverages)
●	CNCP (within 1996) Consejo Nacional Calidad Plástico	Plastic products

Source : JICA Team's summary through various documents and hearing.

6) It must create and maintain a system for identification and classification of standards.

Note that NMX in an industrial area where no accredited ONN exists is established and revised by a responsible government authority. The government intends to increase accredited ONNs gradually to delegate the NMX establishment process to the hands of private organizations.

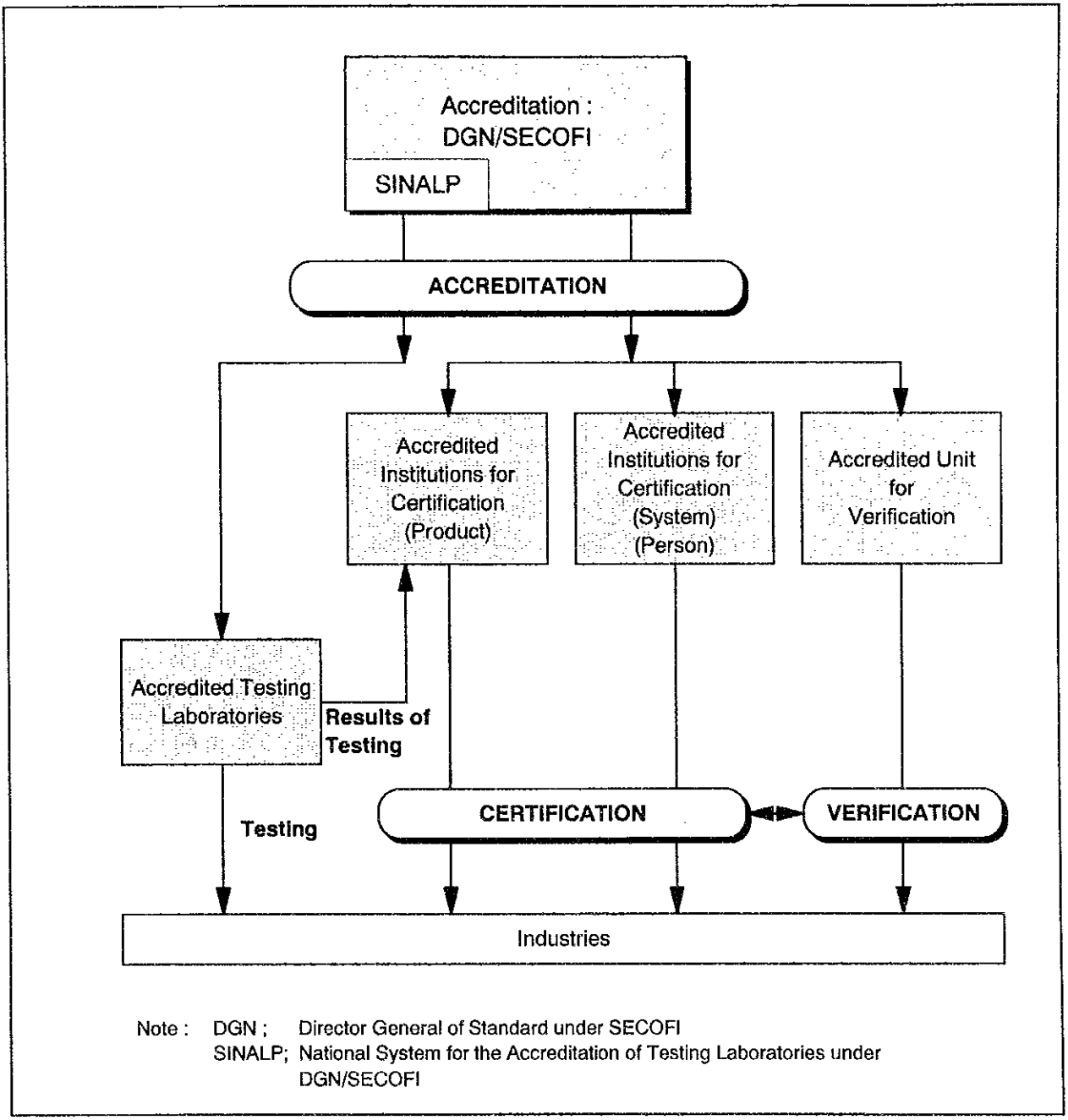
According to DGN, NMX statistics up to 1995 are summarized as follows:

- Total number of NMXs established up to 1995 :5,339
- Established in 1995 : 32
- NMX related to electricity and electronics (accumulated total) : 308 (of 5,339)
- NMX related to automotive parts (accumulated total) : 234 (of 5,339)

3.1.4 Accreditation and Certification System

Certification is an act of "testing and inspection" an industrial product or a production system to see if it complies with NOM (law) and/or NMX (standard), followed by "evaluation and certification" based on the result. A product of a company not certified must be followed up periodically if it is subject to NOM (mandatory standard), thus requiring "verification." At the same time, the certification system must be supported by "accreditation" organizations and system to endorse that, from a neutral position, an organization performing "testing and inspection," "evaluation and certification," and "verification" is actually doing so by applying an appropriate method and/or using proper facilities and equipment. Also required are an organization and a system to provide periodical calibration service to check if the "testing and inspection" organization uses measuring instruments having sufficient accuracy. The calibration system is discussed later.

Based on Figure 3.1-2, a general outline of the accreditation and certification system in Mexico is described below.



Note : DGN ; Director General of Standard under SECOFI
SINALP; National System for the Accreditation of Testing Laboratories under DGN/SECOFI

Figure 3.1-2 National System for Accreditation and Certification

Accreditation of organizations related to standardization is conducted by SECOFI's DGN. DGN accredits, in addition to ONN, certification institutions, testing laboratories, calibration laboratories, and verification units including individuals and corporations. Organizations and individuals accredited by DGN are authorized to evaluate and certify that a company provides a product or service that complies with specific standards, or adopts a compliance process or system. Organizations certifying products are the same as ONN that is responsible for establishing NMX. Organizations certifying a process or a system of quality control include IMNC and CALMECAC.

Product certification is conducted by an accredited testing laboratory which tests and analyzes the product and submits the test result to an accredited institution for certification. The accredited institution checks the test result to see if it complies with an applicable standard, and if so, it issues a certificate. If the applicable standard is NOM, a seal and/or a mark is approved as required.

The testing laboratory is accredited under the National Testing Laboratory Accreditation System (SINALP: Sistema Nacional de Acreditamiento de Laboratorios de Pruebas) established within DGN. According to DGN, there are 219 testing laboratories accredited by SINALP throughout the country at the end of 1995, of which 61 are related to the fields of electricity and electronics, and 68 metalworking and parts. On other hand, 870 testing laboratories are not accredited, of which 630 are related to electricity and electronics, and 240 metalworking and parts. To obtain the SINALP certification, testing equipment and measuring instruments must have received calibration at an accredited calibration institution (discussed later).

Government authorities are required to monitor and verify that, in industry sectors they are responsible for, production is carried out in accordance with specifications based on applicable NOM, mandatory standard. In particular, verification is conducted by verification units that have been accredited by SECOFI/DGN, provided that accreditation should be preceded by the approval of a responsible authority.

Verification units may be individuals or corporations and are accredited through specified application procedures followed by SECOFI's review

process. Verification is conducted by means of visiting each enterprise on a periodical, spot or as-required basis. Accredited verification units are required to conduct visual inspection of products subject to NOM, as well as testing and analysis of samples. The latter must be carried out at an accredited laboratory.

3.1.5 Calibration System

(1) Calibration organization

Measuring instruments are used for measurement and metering by accredited testing laboratories to check if products conform to their specifications or by companies to examine materials and/or products on their own. To obtain reliable results, accuracy of measuring instruments must be assured by checking them against standards and correcting any error. This is called calibration. Calibration must be done on a periodical basis.

Figure 3.1-3 illustrates a general outline of the national calibration system in Mexico, which is supplemented as follows.

Under SECOFI/DGN, National System for Calibration (SNC: Sistema Nacional de Calibración) has been created, and Evaluation Committee has been established to accredit calibration laboratories. The committee is organized by representatives of government authorities responsible for a particular industrial sector, universities and other academic institutions, research institutes, National Metrology Center (CENAM), and accredited calibration laboratories.

CENAM is the primary level, accredited calibration laboratory and is responsible for calibration of measuring instruments owned by secondary-level, accredited calibration laboratories, while providing calibration service for private enterprises. Needless to say, measuring instruments of testing laboratories conducting certification tests for NOM or NMX must be calibrated by accredited laboratories on a periodical basis.

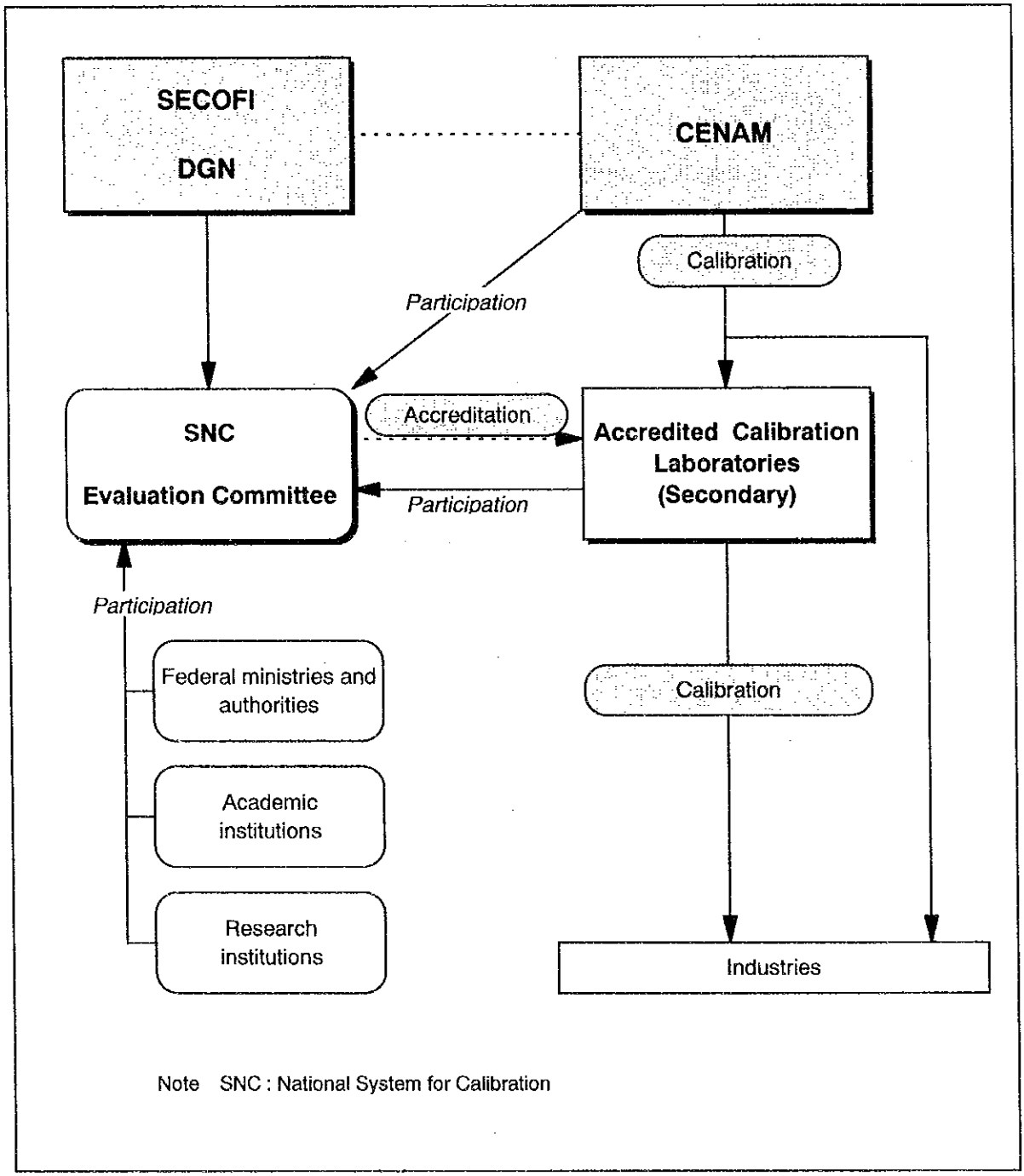


Figure 3.1-3 National System for Calibration

(2) National Metrology Center (CENAM)

CENAM originated in an academic center established in 1980 to meet the needs derived from National System for Calibration (SNC) and became independent as the present organization in 1994. Today, CENAM is equipped with latest equipment including standards and measuring instruments purchased under assistance of World Bank.

Major objectives of CENAM are as follows:

1) To maintain standards as the primary-level calibration laboratory and, based on which, provide metrology and calibration service for industries;
2) To evaluate secondary-level calibration laboratories and calibrate their measuring instruments;
3) To help establish secondary-level calibration laboratories nationwide, provide necessary guidance and assistance, and contribute to the rise in technical level of small- and medium-sized industries; and
4) To contribute to the establishment of national standards and metrology standards.

CENAM consists of 6 departments, Electrical Metrology, Physical Metrology, Material Metrology, Mechanical Metrology, Technical Support and General Affairs/Accounting. It employed 230 persons as of March 1996.

(3) Secondary-level calibration laboratories

According to CENAM, the current state of second-level calibration laboratories is as follows. As of 1996, there are 37 secondary-level laboratories in the country, many of which belong to large enterprises in major industries such as petrochemical, electricity, and automobile, with geographical concentration in some areas. As a result, the scope of calibration service is limited to certain areas, and only a handful of laboratories are providing service for the public. At present, the federal government and CENAM are jointly constructing secondary-level laboratories in six areas, Querétaro, Aguascalientes, Mérida, León, Guadalajara, and Saltillo, which will start commercial operation a year later.

3.1.6 Promotional Activity for Industrial Standardization

As mentioned earlier, DGN sponsors "Quality Week" in various areas under participation of major corporations in each state and co-sponsorship of local SECOFI offices, state government's industrial development force, educational institutions, local manufacturers and distributors. A similar activity is National Quality Prize (PNC) that was established pursuant to Section 110 of the federal law of 1992.

NOM is actively promoted by DGN that makes established and revised standard known to the public through its PR publications, which are widely available in Mexico City. Promotion of NMX is left to organizations who establish it. Although established NMX is notified to government and related organization, e.g., ANCE distributes 500 copies, there is the lack of promotion to rural areas. NYCE's activities include display and presentation on NMX at a computer show in Guadalajara, and special seminars (10 times/year) upon request. Also, access to DGN's NOM and NMX library can be inquired by facsimile.

3.1.7 Major Issues Related to Industrial Standardization in Mexico

Basic elements of industrial standardization are establishment of standards, disseminative activities, and the development and upgrading of inspection and certification organizations as well as metrology and calibration centers. Private enterprises are not satisfied with the current level of service, because there are a limited number of inspection and certification organizations as well as metrology and calibration centers, resulting much time and cost required in rural states, and certification organizations are inflexible in providing service. On the other hand, the government complains that private enterprises do not comply with standards. Another problem is that Mexican companies are forced to use dual metrologies as the U.S. market - the largest market for Mexico - is slow in shifting to the metric system despite of its early decision. This places Mexican companies in a unfavorable situation where they are unable to divert U.S.- bond products to other countries using the metric system. Major problems in this area are summarized as follows.

(1) Establishment of standards

Classification of NOM and NMX is unclear, and within each category, some duplication is seen in interface between government authorities and between organizations. Also, long-term plans for standards establishment have not been defined.

(2) Service for SMEs

1) The draft NMX is established by the technical committee of the accredited organization that is in charge of a specific industrial sector. However, corporate members of the committee are dominated by representatives of large corporations, making it doubtful if it can establish NMX that adequately covers activity areas of small- and medium-sized enterprises.
2) Secondary-level calibration laboratories mainly belong to large corporations in specified industrial sectors, with some geographical concentration as well as deviation in type of measuring and testing equipment. There is the lack of secondary-level laboratories that can be used by SMEs.

(3) Disseminative activity

1) The 25% of 69 enterprises visited by the Team during the second field survey answered that they did not know of "Quality Week". (See 5.3.2 (3).) Disseminative activity on a national level should be further prompoted. Another initiative backed up by law, "National Quality Prize," mainly recognizes efforts of large enterprises at present.
2) NOM and NMX are not easily accessible, particularly in rural regions where many publications are not available.

(4) Issues identified by CENAM

1) Insufficient budget
2) Lack of trained personnel in the area of standardization
3) Delay in dissemination of standards and standardization initiatives on a national level
4) Reluctance of industry circles toward adoption of standards and participation in standardization efforts

5) Lack of consistency among government authorities in viewpoint and position on standards and standardization

3.2 The Present State of Quality Control (QC) and the QC Promotion System

3.2.1 History of QC Activities in Mexico

(1) Before 1960s

Quality-control (QC) activities in Mexico have developed in a similar steps to the U.S., Japan and other industrialized countries. Before 1960, the focus was set at process control and greater operational efficiency, such that studies merely covered some statistical methods of quality control.

In 1949, a group led by Domingo López, the manager of the Mexico branch of the American Society for Quality Control (ASQC), began to research into the sampling inspection methods based on the MIL-Standard(U.S. military standard). While some of its members were imprisoned as the authorities wrongly assumed that the group's activities were associated with political crime, Domingo Lópes and the others compiled the research findings, sparking off activities to promote statistical quality control (SQC) in Mexico as a result. Between 1960 and the beginning of 1970, SQC was the major subject of inspection.

While a Mexican student studying in Japan underwent a QC training course managed by the Union of Japanese Scientists and Engineers (JUSE) in 1967, professor Deming -an authority of QC in the U.S.- visited the Instituto Technológico de Estudios Superiores de Monterrey (ITESM) and advised the importance of introducing Japan's total quality control (TQC) principle for the popularization of QC in Mexico. In response, professor Ishikawa, an authority of TQC in Japan, held a lecture in Mexico in 1967, inducing Mexican QC activities to shift its base from SQC to TQC.

(2) 1970s

In 1973, GM and Ford instructed subcontractors as part of their business-expansion strategies in Mexico, which helped them gain a clearer understanding on the importance of quality control and promoted the application of QC in addition to different QC methods at stages of designing, purchasing, production process and product inspection.

QC circle activities (small-group activities), which are effective in improving production processes, started in 1973 following Japan's example. By the end of 70s or the beginning of 80s, 362 QC circles consisting of some 3,500 persons were active in 21 firms in 6 cities, namely, Mexico city, Monterrey, Guadalajara, Cuernavaca, Puebla and San Luis Potosí. In 1978, the first QC circle congress was held in Mexico by Agapito Ganzález Hernández and José F. González Prado, known as the QC promoters in Mexico and the latter is the representative of the standing Mexican Institute of Quality Control (IMECCA). In around 1986, the number of QC circles exceeded 10,000 in the whole country, of which the majority belonged to large businesses, amid the favorable economic environment created by the oil boom.

(3) 1980s

In the beginning of the 1980s, QC specialists/consultants took part in QC guidance/promotion activities on various levels, from their respective standpoints, in different parts of Mexico.

JUSE began to dispatch Japanese specialists to ITESM in 1979, in response to the Mexican government's request. The TQC seminar they held then was the first one ever in Mexico. Although JUSE continued to hold seminars and give guidance to companies on a regular basis, they turned out to be rather fruitless.

In 1983, Ford prepared a series of textbooks and a program of seminars on QC/SQC with ITESM (based in Nuevo León), with the aim to develop Mexican SMEs that are capable of passing Q101 (Ford's QC standards), following professor Deming's advice they received upon launching operations in Chihuahua on a full scale. This led to the beginning of intensive activities to promote TQC in Nuevo León and Chihuahua.

Many QC circle activities, which had been brisk up until the beginning of the 1980s as mentioned before, began to suffer from companies' instructions which undermined their object following the economic crisis in 1982, diminishing the spirit of volunteers in the front line. As a consequence, the number of QC circles across the nation dropped to 500-1,000 by 1988, equivalent to the level of 1978. Nevertheless, the "Kaizen" system(i.e.

proposing ideas for improvement) became a popular practice. Under these circumstances, Asociación Mexicana de Círculos Calidad, ITESM, CANACINTRA and some members of consultants reaffirmed that QC circle activities are effective in stimulating the manufacturing industry, and started to hold an annual QC circle congress (CNCCC: Concurso Nacional de Círculos de Control de Calidad) in 1990, inviting QC specialists from Japan with the assistance of the Japan External Trade Organization (JETRO).

As a commendation program for superior companies, the government founded the Premio Nacional de Caridad (PNC) in 1989, incorporating the object of the old PNN, in order to further promote TQC activities, which had been undergoing gradual expansion at that time. By collecting funds from over 20 large enterprises, SECOFI and NAFIN established the Fundación Mexicana por la Calidad Total (FUNDAMECA), a PNC Fund, under which superior companies are commended every year.

In addition, some states have started to establish their own quality awards independent of PNC, such as Nuevo León and Querétaro. For details of PNC and the quality award of Nuevo León, see 3.2.4.

(4) 1990s

In the 1990s, intensive TQC activities began to spread all over the country from Monterrey and other regions. ITESM, which has 26 campuses across Mexico, provides TQC education through satellite communication. In some cases, they include productivity up-grading not only to improve products' quality as an integral of business strategies. This activity is spreading across the nation while evolving into the so-called total quality management (TQM).

QC circles activities are gradually recovering, considering that the number of QC circles, which once had dropped to 1,000 in the late 1980s, has increased to roughly 8,000 in 1995.

PNC covers 7 categories, serving as an annual award not only to superior firms in the manufacturing sector but also to those in the field of commerce, services, government agencies, etc. To a certain extent, however, it has been reduced to a prize awarded in recognition of a firm's efforts to improve

business performance by reinforcing the management framework. QC activities are brisk in all states, and the State of Mexico is even considering to newly establish its own "product-quality award".

Meanwhile, ISO9000s, a standard for quality systems, was enforced under Europe's leadership. In Mexico, inspection and certification under ISO9000s began at IMNC in 1993. The demand for ISO9000s certification is skyrocketing as an increasing number of firms specify ISO9000s as a prerequisite for concluding an agreement, especially on exports to Europe. In the automotive industry, moreover, education and instruction on QS9000s, which was established by America's Big Three in consideration of ISO9000s, is also common today as much as ISO9000s. This is because the Big Three obliged suppliers to acquire QS9000s certification.

Refer to section 3.2.3 for the details of ISO9000s and QS9000s.

3.2.2 The Present State of QC Activities

(1) The present state of in-house QC activities

Among large enterprises, the majority of foreign-affiliated firms follow their parent company's policies to promote QC activities according to their corporate characteristics. In particular, Japanese-affiliated firms are eager to give instructions to subcontracting SMEs on how to make improvements, in order to ensure uniform product quality, although many other large enterprises tend to choose subcontractors who supply fine products instead of directly educating/instructing subcontracting SMEs. In other words, they are inclined to shift to imports or in-house production if there are no subcontractors that suit their purpose.

Many SMEs agree that QC activities serve to improve product quality in the long run, but the fact is that costly QC activities are burdensome. For the time being, at least, they seemed to be fully occupied with acquiring ISO9000s and QS9000s certificates, the key to requirements contracts.

(2) State-wise QC activities

On a nationwide scale, introducers of QC activities are enforcing education

programs and popularization schemes through various independent associations they have established (e.g. IMECCA, ANMECC, etc.). Their facilities and activities are nevertheless concentrated in Mexico City and surrounding areas due to the country's vast domain and the inferior information infrastructure. For worse, trade associations' activities are stagnant, as they merely support managerial education programs upon request from affiliated enterprises.

On the contrary, QC activities are dynamic on a state scale. For instance, the State of Nuevo León applies an education program for SMEs developed in liaison with ITESM. Some states are actively engaged in productivity education and overseas inspection missions through various groups and associations with local-government members (e.g. CEPROC in Toluca).

In Maquiladora, American-style TQC is practiced partly due to the American ASQC's influence. Also Japanese-affiliated firms employ Japanese-style TQC. In Ciudad Juárez, Chihuahua, for example, lectures for subcontractors are being held by Maquiladora firms in the electrical/electronic industry. Moreover, a project is under way to prepare a QC improvement program by 1997 under a contract with an American university, including quality awards by the state.

(3) QC circles and TQM

Mexican QC activities have developed while being substantially influenced by Japanese QC activities. Regarding QC circle activities, in particular, more than 20 Japanese specialists and practitioners have visited Mexico City and Monterrey once every two years since 1981, taking part in exchange and guidance activities for QC circles. Many firms, including Japanese-affiliated businesses, have started to hold in-house QC circle congresses and participate in CNQCC (under the joint auspices of JETRO, trade associations and consultants).

On the other hand, TQC, which has been promoted as one of the principal targets by ITESM, is becoming popular at a steady pace, although there are some regional disparities. Some firms are shifting their focal point to TQM, a version of TQC with greater emphasis on management, in addition to productivity and management including corporate strategies and marketing

under the influence of the Malcom Baldridge National Quality Award.

3.2.3 Certification of QC Activities

(1) ISO9000s and certification activities

1) ISO9000s

ISO9000-series standards are quality-control and quality-assurance standards enforced in 1987 by the International Organization for Standardization (ISO: established in 1947; 118 member states as of 1995; about 10,000 industrial standards). They consist of 5 standards, out of which ISO9001 - ISO9003 are subject to examination/registration, and stipulate the requirements for corporate quality-assurance systems, not for the product itself. In Mexico, three standards are registered as compatible standards, namely, NMX-CC-3, CC-4 and CC-5.

Table 3.2-1 shows the requirements and the check items under ISO9000s.

Table 3.2-1 Scope of ISO9000s

Subject	ISO9001	ISO9002	ISO9003
1. Management responsibility	○	○	○
2. Quality system principles	○	○	○
3. Quality in marketing (Contract review)	○	○	○
4. Quality in specification and design (Design control)	○	×	×
5. Administration of document and data	○	○	○
6. Quality in procurement (Purchasing)	○	○	×
7. Management of products supplied to customers	○	○	○
8. Identification/traceability of products	○	○	○
9. Quality in production (Process control)	○	○	×
10. Product verification (Inspection and testing)	○	○	○
11. Control of measuring and test equipment (Inspection , measuring and test equipment)	○	○	○
12. Control of verification status (Inspection and test status)	○	○	○
13. Nonconformity (Control of nonconforming product)	○	○	○
14. Corrective action and preventive measures	○	○	○
15. Handling and post-production functions (Handling, storage, packaging and delivery)	○	○	○
16. Quality documentation and records (Document control)	○	○	○
17. Auditing the quality system (Internal)	○	○	○
18. Personal training	○	○	○
19. After-sales services	○	○	×
20. Use of statistical methods (Statistical techniques)	○	○	○
No. of check items	20	19	16

Upon the certification of a firm under ISO9000s, the ISO committee registers one private authorizing agency per country. The registered private authorizing agency is to authenticate an agency to certify firms for ISO9000s. The ISO9000s certificate given to firms is valid for 3 years, during which period the certifying agency checks, every 6 months, whether the firm's performance has been maintained acceptable for each check item. It should be noted that a certifying agency in country A may directly certify a firm in country B. A Mexican firm being certified by an American certifying agency applies to this case.

So called "Mutual Certification Scheme" which means, under an agreement between the authorizing agencies of two countries, to accept the certificate by a certifying agency of the other country in the same manner as that by a certifying agency of the own country is now being studied. There are already a few countries who have entered into this agreement with other countries.

2) ISO9000s certification activities in Mexico

The situation for the Mexican manufacturing industry is harsh considering the intense competition with imports, participation in NAFTA and the 1994 currency crisis. The tough economic climate, however, has served to boost activities to acquire ISO9000s certificates as a guarantee of product quality, partly to promote the export of products. There is an increasing number of cases in which the ISO9000s certificate is included in the terms and conditions of a sales contract. Even consultants and associations which have taken part in education/guidance to upgrade product quality are currently more interested in encouraging firms to acquire ISO9000s(especially ISO9002) certificates.

At present, the Mexican authorizing agency for ISO9000s is DGN. Firms are subject to certification by the Mexican certifying agencies authorized by DGN, as well as overseas certifying agencies. The fact is that a substantial portion of certificates are issued by overseas certifying agencies, as there are only two certifying agencies in Mexico, that is, Instituto Mexicano de Normalización y Certificación (IMNC, established in 1993) and Calidad Mexicana Certificada (CALMECAC, inaugurated in 1994).

Merely some 30 certificates have been issued under the two agencies by 1995.

(2) QS9000s and certification activities

1) QS9000s

QS9000s is a standard formulated about the same time as ISO9000s, under the leadership of the Big Three (i.e. the American automotive assemblers GM, Ford and Chrysler, which base their activities in ASQC in the U.S.). It came about by unifying different conditions of quality assurance given by the Big Three to autoparts suppliers, materials and related businesses, and by adding extra requirements unique to the automotive industry. It consists of three sections: 1) terms and conditions based on ISO9001; 2) additional terms and conditions common to the automotive industry; and 3) requirements set forth by the firms.

2) Certification and acquisition of QS9000s

The three automotive assemblers demand suppliers to acquire a QS9000s certificate in the following way.

GM: All suppliers across the world must acquire the QS9000s certificate by Dec., 1997.

Chrysler: All suppliers, excluding those in China and Latin America, must acquire the certificate by July, 1997

Ford: New suppliers must have QS9000s to conclude a contract with Ford. For existing suppliers, however, the deadline for acquisition remains unsettled.

Even in Mexico, suppliers to the Big Three assemblers GM, Chrysler and Ford have started to make preparations to acquire QS9000s certificates, providing education and training in conformity with ISO9000s. Nevertheless, there are still no special certifying agencies other than the Big Three, and the only thing happening is that organizations like IMNC are working to obtain approval as a QS9000s certifying agency.

Meanwhile, firms other than the Big Three such as Volkswagen and Nissan

are applying their own quality assurance criteria i.e. acceptance standards.

3.2.4 QC Commendation Activities

(1) Premio Nacional de Calidad (PNC)

PNC, which is awarded by the president, was founded in 1989 to commend, on an annual basis, firms and organizations which have not only planned to popularize QC activities but also endeavored to make quality improvements. The PNC program adopts a screening system which takes such factors as "social contribution" into account on the basis of the Malcom Baldridge National Quality Award (founded in 1987).

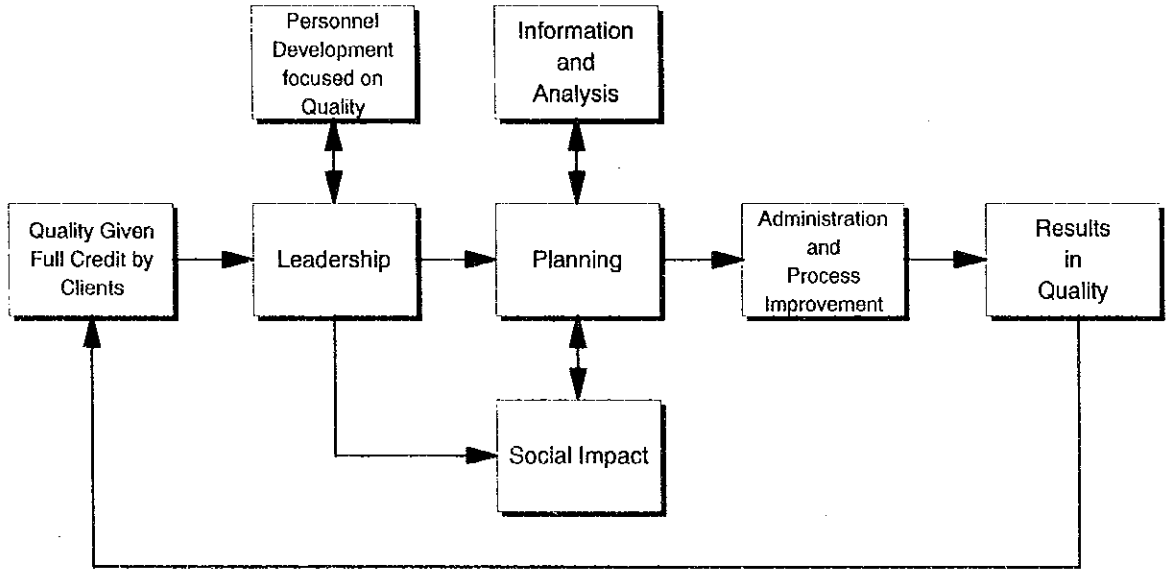
1) Administration of PNC

PNC is operated by a committee headed by SECOFI's vice minister. The committee is stationed in the secretariat of SECOFI, and is operated by volunteers from large enterprises.

2) Evaluation criteria and procedures

Evaluation tasks are performed by judges who have passed the technical test by the PNC committee. As illustrated in Figure 3.2-1, firms and organizations are rated by weighted points (8 categories; full mark = 1,000 points) for each category, as in the screening procedures of the Malcom Baldridge National Quality Award.

There are two stages in the evaluation procedures, that is, (1) document evaluation and (2) on-site study. To begin with, applicants fill in and submit a questionnaire covering 8 predetermined categories. Using this, 6 judges evaluate the candidates through panel discussion, after which the PNC committee decides whether to launch an on-site study. As part of the on-site study, applicants are required to fill in and return a report which consists of extra questions in the 8 categories. The report is required not to exceed 185 pages. Once this is completed, 4-5 judges visit, inspect and inquire the firm/organization, and submit a report on their rating to the PNC committee, which serves as the basis of judgment as to whether the firm/organization deserves the award.



Sequence of Evaluation Criteria

Categories and Specific Themes	Max. Points
1.0 Quality Given Full Credit by Clients	**200**
1.1 Thorough knowledge of clients	80
1.2 Improvement system of services for clients or users	60
1.3 Discernment system of future requirement of clients	60
2.0 Leadership	**150**
2.1 Leadership in casestudy and in practice	80
2.2 Quality values	70
3.0 Personnel Development focused on Quality	**150**
3.1 Informed participation and efficiency of personnel	50
3.2 Education and development	40
3.3 Execution and examination	30
3.4 Quality of life with work	30
4.0 Information and Analysis	**60**
4.1 Source and data	40
4.2 Analysis of information	20

Categories and Specific Themes	Max. Points
5.0 Planning	**70**
5.1 Strategy planning	30
5.2 Operation planning	40
6.0 Administration and Process Improvement	**120**
6.1 Product design and services	30
6.2 Key processes	30
6.3 Secondary supporting processes	20
6.4 Suppliers	20
6.5 Quality evaluation	20
7.0 Social Impact	
7.1 Ecomanagement	150
7.2 Diffusion and promotion of quality culture in community	50 20
8.0 Results in Quality	**200**
8.1 Improvement of products and services	50
8.2 Improvement of operation and productivity	30
8.3 Improvement of supporting areas and suppliers	30
8.4 Improvement of financial results by quality	40
8.5 Improvement of results to satisfaction of clients	50

Marking Criteria of Final Evaluation

Figure 3.2-1 Evaluation Criteria of "Premio Nacional de Calidad"

3) Candidates of commendation and the number of awarded companies

Candidates of commendation are divided into 7 categories. In a year, no more than 2 entities may be awarded under one category, nor 12 entities as a whole. Candidates may be organizations and public agencies, not only enterprises. Table 3.2-2 shows the number of awarded entities between 1990 and 1995.

Table 3.2-2 Record of "Premio Nacional de Calidad"

Category		Year																			Total		
		1990			1991			1992			1993			1994			1995			1996					
		L	M	S	L	M	S	L	M	S	L	M	S	L	M	S	L	M	S	L	M	S	L	M	S
Manufacturing industry	1. L	2			2			2			2			2			2			2			14		
	2. M,S			1								1						1						2	1
Commercial	3. L																								
	4. M,S																								
Services	5. L	1												1									2		
	6. M,S														1									1	0
Public organizations	7.																								
Total		3	0	1	2	0	0	2	0	0	2	1	0	3	1	0	2	1	0	2	0	0	16	3	1
		4			2			2			3			4			3			2			20		

Note : L = Large-scale enterprises, M = Medium-scale enterprises, S = Small-scale enterprises

(2) State quality awards

Some states have founded their own quality awards a long time ago, such as Nuevo León (1989), Querétaro, Tamaulipas and Hidalgo, followed by Chihuahua which also established its original award in 1994. Other states, including the State of Mexico, are also showing interests in establishing similar awards. As an example, a description of the Premio Nuevo León a la Calidad is given below.

Premio Nuevo León a la Calidad

- Establishment : November, 1989
- Subject:
  1) Manufacturing
     i) Large-scale enterprises
     ii) Medium-scale enterprises
     iii) Small-scale enterprises
     iv) Micro-enterprises
  2) Commercial
     i) Large-scale enterprises

ii) Medium-scale enterprises
iii) Small-scale enterprises
iv) Micro-enterprises

3) Services
i) Large-scale enterprises
ii) Medium-scale enterprises
iii) Small-scale enterprises
iv) Micro-enterprises

4) Education
i) Primary schools, middle schools
ii) High schools, colleges

Although the evaluation categories and screening procedures are more or less the identical to PNC's, this award is distinctive in that there is a separate category for micro-enterprises and that it covers educational institutions instead of public organizations other than enterprises.

The number of awarded candidates (32 in total) between 1990 and 1995 is shown in Table 3.2-3.

Table 3.2-3 Record of "Premio Nuevo León a la Calidad"

Category	Year																											
	1990					1991					1992					1993					1994					1995				
	L	M	S	Mi	E	L	M	S	Mi	E	L	M	S	Mi	E	L	M	S	Mi	E	L	M	S	Mi	E	L	M	S	Mi	E
Manufacturing industry	2	1	1	1		1	1	2			1	1	1	1		2	1				1					2				
Commercial	1	1											1																	
Services						1	1	1			1	1				1		1	1		1									
Education																									1					
Total	3	2	1	1	0	2	2	3	0	0	2	2	2	1	0	3	1	1	1	0	0	0	0	0	1	2	0	0	0	0
	7					7					7					6					3					2				

Note : L = Large-scale enterprises, M = Medium-scale enterprises, S = Small-scale enterprises, Mi = Micro-scale enterprises, E = Education

(3) QC-Circle commendation

QC circles are being commended in various ways, considering in-house commendation (or business-group commendation in some cases), and awards by the Mexican and international congresses. Here the focus is set on the Concurso Nacional de Círculos de Control de Calidad (CNCCC), which is directly awarded by the president of Mexico.

As mentioned in section 3.2.1 which dealt with the historical backgrounds, the first congress was held at CANACINTRA in Mexico City under the joint auspices of CANACINTRA, ITESM and JETRO-Mexico in 1990, where approximately 200 people amassed. A statement was given out by 10 circles, and SMEs received 3 awards out of 6. In 1995, when the sixth congress was held, the venue shifted from Mexico City to the provinces, to Mérida in Yucatán. This congress is marked for the participation of the service sector, announcements by the project team in addition to QC circles, the participation of approximately 500 people from 22 states, 36 cities, and the cooperation of CONCANACO and Centro de Mejora Continua as sponsors.

Table 3.2-4 depicts the activities by CNCCC since 1990.

Table 3.2-4 Record of "Concurso Nacional de Círculos de Control de Calidad"

Serial No.	Year	Place	No. of Applicants	No. of Presentation	No. of Awards	
					Manufacturing industry	Services
1st	1990	D.F.	15	10	6	
2nd	1991	D.F.	17	11	3	
3rd	1992	D.F.	18	10	3	
4th	1993	D.F.	60	10	3	
5th	1994	D.F.	65	12	5	1
6th	1995	Mérida	60 +(10)	15 + (6)	7 + (1)	1 + (1)
7th	1996	Chihuahua	88 +(6)	15 + (6)	1 + (2)	1 + (0)

Note : ( ) No. of Forum for project team

3.2.5 Problems faced by QC Activities and Future Challenges

(1) The need to acquire ISO9000s, the "quality-system certificate", is likely to grow even further, as a means to supply parts to assemblers and primary suppliers and to promote exports.

In Mexico, there are only two ISO9000s certifying agencies i.e. IMNC and CALMECAC, with the authorization of DGN. As stated in section 3.2.3 (1), certificates may be acquired from overseas agencies, and some actually do so in Mexico. But the problem is that this process is rather time-consuming and the costs and procedures involved are burdensome especially to SMEs. By contrast, there are 16 certifying agencies in Japan as of 1996.

Having said that, it should be noted that Mexican firms apply for certificates to overseas agencies not only because there are few certifying agencies in Mexico; as a matter of fact, some assemblers and primary suppliers (the customer) order firms to acquire them from overseas agencies. This issue is concerned with the status and credibility of the Mexican manufacturing industry in the international market, meaning that there are no immediate solutions. Nonetheless, DGN and overseas authorizing agencies are bound to be pressed by the industry to make arrangements for "mutual certification" sooner or later. If so, DGN might end up as an "obstacle" considering that it is part of the government structure, unlike authorizing agencies abroad which are private agencies.

(2) Despite TQC's long history in Mexico, with specialists, consultants, association and colleges being in charge of TQC-oriented education and training, no consensus has been reached on the basic curriculum. Even ASQC's activities differ among branches in different states.

(3) In spite of the principles set forth by PNC, quality awards by the state and the CNCCC prize, the fact is that award-winners tend to be dominated by large enterprises until now. In Europe, for example, the criteria and costs of screening have been reviewed to encourage more SMEs to participate. There is a strong movement on food in Mexico, too, to encourage SMEs to participate in PNC, which is expected to help stimulate the interest of SMEs in quality control.

It should be remembered that PNC, whereas Deming and MB prizes are subject to constitutional reform and improvement of business performance, now merely functions as a prize awarded in recognition of a company's efforts in quality management.

(4) The standard of consultants is a matter of concern, considering that proper instructions have not been given to QC activities. Activities by study groups and the publication of research work by specialists and bulletins by special agencies seem to have stagnated.

(5) Some people still confuse ISO9000s with industrial standardization, believing that ISO9000s certification is equivalent to industrial standardization. It should be recognized that the former is a standard for quality systems, whereas the latter is mainly concerned with the characteristics of products which should be secured.

3.3 Technical Support Organizations

3.3.1 Overview of Technical Support Organizations in Mexico

The following are the main functions of external technical support organizations required by automotive and electrical/electronic parts suppliers (SIs), the target of the project.

a) Assistance to R&D of production technology
b) Support to human-resource development schemes
c) Consulting services on technical and managerial issues
d) Assistance to entrepreneurs
e) Information services

Obviously, most organizations are engaged in activities which combine several of the above. This section deals with technical support organizations that are normally available to private enterprises, especially SMEs. Refer to section 3.1 "Industrial Standardization" in this report for the details of organizations which certify products, system and those which calibrate measuring instruments under NOM and NMX.

As a list of Mexican organizations engaged in technical R&D and education, the directory produced by the "Consejo Nacional de la Micro, Pequeña y Mediana Empresa" is worth looking at, since it covers 91 technical research institutes and 213 educational institutions. The following are organizations other than financial institutions and organizations whose name and object clearly indicate that they have nothing to do with the manufacturing sector.

Technical research institutes:	Public	36
	Private	15
Educational institutions:		168

Among these, the distribution of technical research institutes (51 institutes) is quite uneven throughout the country, as shown in Table 3.3-1. More than 50% of Mexican states have no technical research institutes at all, according to the directory.

Table 3.3-1 Technical Supporting Institutions for Manufacturing Industry by Location

State	Public	Private
Baja California	0	0
Baja California Sur	0	0
Sonora	0	0
Chihuahua	0	0
Coahuila	2	0
Nuevo León	0	1
Tamaulipas	0	0
Sinaloa	0	0
Durango	0	0
Zacatecas	0	0
Nayarit	0	0
Aguascalientes	0	0
San Luis Potosí	0	1
Jalisco	1	0
Guanajuato	2	1
Querétaro	5	0
Hidalgo	0	0
Colima	0	0
Michoacán	0	0
México	2	2
D.F.	20	6
Morelos	1	0
Tlaxcala	0	0
Puebla	0	0
Veracruz	0	1
Guerrero	0	0
Oaxaca	0	0
Tabasco	0	1
Chiapas	0	0
Campeche	0	0
Yucatán	1	1
Quintana Roo	1	0
-	1	1
Total	36	15

Source : Consejo Nacional de la Micro, Pequeña y Mediana Empresa

Among the technical support organizations in Mexico, those which serve to support automotive and electrical/electronic parts suppliers in various ways

may be broadly divided into three groups.

a) Technical support organizations under SEP
b) Technical support organizations led by private enterprises and industrial associations
c) Public and private colleges

a) Technical Support Organizations under SEP

a)-1 SEP-CONACYT (Consejo Nacional de Ciencia y Tecnología)

CONACYT, which is regarded as the principal promoter of technology in Mexico, aims to contribute to social development through the promotion of technology by working in close cooperation with industrial circles. It consists of 27 institutes covering all the key fields of technology, which are divided into 4 groups according to their purpose and field of work.

Basic science and technology	9 institutes
Social development	9
Technological development	7
Information services	2

Among the 27 institutes listed above, the following are defined as technical support organizations targeting automotive and electrical/electronic parts suppliers considering their purpose and field of work.

CIMAV *(Centro de Investigación en Materiales Avanzados, S.C., Chihuahua)*

This is a materials engineering research institute established in 1996, dealing with metals, polymers, ceramics, semiconductors, etc. While concentrating on the research of metal materials, their research is mostly academic, geared to postgraduate schools.

CIATEQ *(Centro de Investigación y Asistencia Técnica del Estado de Querétaro A.C., Querétaro)*

Based in Querétaro, the initial focal point of this research institute was the sugar industry. Their scope has expanded in recent years, to the extent of conducting R&D for automotive and electrical/electronic industries,

especially design/production of measuring instruments.

CIDESI *(Centro de Ingeniería y Desarrollo Industrial, Querétaro)*

This institute is involved in technological promotion and modernization, especially for SMEs and micro-enterprises. Specifically, it designs and manufactures production machinery, particularly for metals and machinery, holds training seminars for companies, and runs consulting services.

CIDETEQ*(Centro de Investigación y Desarrollo Tecnológico en Electroquímica, S.C., Querétaro)*

This is a R&D and training institute specializing in electrochemistry and surface treatment.

CIQA *(Centro de Investigación en Química Aplicada, Coahuila)*

This institute, which was established as a research center for chemicals, now concentrates on polymer study. It also offers various services to plastic firms.

COMIMSA *(Corporación Mexicana de Investigación en Materiales, S.A. de C.V., Coahuila)*

This institute undertakes R&D and offers consulting services in the field of energy and metals/machinery.

INFOTEC *(Servicios de Información, Consultoría y Capacitación, D.F.)*

This is a public foundation established in 1974, with the purpose of offering technical information services to domestic manufacturers. Other than business information services, their activities include consulting and training.

a)-2 SEP-CONALEP

(Consejo Nacional de Educación Profesional Técnica)

In CONALEP, which is under SEP like CONACYT, there is an organization called CAST (Centro de Asistencia y Servicios Tecnológicos), which aims to provide technical support to private enterprises, other than vocational training schools mentioned in section 2.7 (Human Resource Development) of this report. The inauguration of CAST took place in 1993 mainly in regions near the national border where Maquiladora firms concentrate. As stated below, there are 9 CASTs throughout the country, each of them having close ties with the local industry. As their object is to contribute especially to the local industry, services vary among different CASTs. Note that the target industry of each CAST is given in

parentheses.

D.F.
Izcalli, State of México
Guadalajara, State of Jalisco .....(plastics)
Veracruz, State of Veracruz
León, State of Guanajuato .....(shoes)
Matamoros, State of Tamaulipas
Tijuana, State of Baja California
Guadalupe, State of Nuevo León
Cd. Juárez, State of Chihuahua ..... (automation)

Their activities are mainly concerned with the development of SMEs through (1) staff training, (2) consulting services, and (3) technical development. They were aided by the World Bank upon purchasing equipment at the time of establishment. Government subsidies account for roughly 25% of operating funds, the rest being covered by income earned from various services to companies.

Although CASTs are mainly working on education/training programs enforced upon companies' requests, in practice, they also conduct commission-based research studies, lease education-oriented equipment to SMEs, and directly lease production machinery over a certain period. Most training programs go on for 3-6 months, headed by lecturers from private companies. In border-regions, 90% of the companies utilizing CAST are Maquiladora firms, while others enterprises, such as SMEs, are smaller in numbers as they have little time and money to spare.

It should be noted that CAST is not included in the directory of Consejo Nacional de la Micro, Pequeña y Mediana Empresa.

b) Technical Support Organizations led by Private Enterprises and Industrial Associations

In some cases, private companies open part of their laboratories and factories to the local community, a company in the same business, or a subcontractor, to help their technical progress. There are also some cases in which private

firms have established new support organizations in cooperation with industrial associations. A number of technical support organizations led by private enterprises and trade associations are listed below.

CEMYT *(Centro de Moldes y Troqueles, State of Chihuahua)*

This is a metal-mold center jointly established by a stamping company and a plastic molding firm, to develop a metal-mold industry that is capable of meeting local demand.

FIDEIM *(Fideicomiso para el Desarrollo de la Industria Mexicana, D.F.)*

This is a foundation established by two automotive assemblers to assist the technical development and modernization of firms. FIDEIM is operated by ITAM (Instituto Tecnológico Autónomo de México) and COLMEX (El Colegio de México).

UTT *(Unidad de Transferencia de Tecnología, D.F.)*

This support organization was jointly established by a private company, CANACINTRA and SECOFI, and puts a great deal of effort in trade information services, other than environment-oriented technical services and QC-system introduction services.

Cámara such as CANACINTRA, a private trade association, take part in the operation of some of the technical support organizations categorized as "public" in the aforementioned directory.

c) Public and Private Colleges

In the questionnaire survey on companies conducted by the study team, there were 4 colleges among 10 organizations which provided technical support to the highest degree. Indeed, many colleges offer admission, training and technical service programs to go on to postgraduate courses which aim to educate entrepreneurs, independently of ordinary curriculums. In practice, however, they primarily consist of joint research courses with large companies (including foreign-affiliated firms), such that services and technical guidance to small/medium-sized parts suppliers merely play a secondary role.

On the other hand, Instituto Tecnológico y de Estudios Superiores de Monterrey (ITESM), which has 26 campuses all over the country, station an international competition center (Centro de Competitividad Internacional) on

most of the campuses. Specifically, their activities include the education of business managers, seminars and management consultation.

d) Centro Regional para la Competitividad Empresarial (CRECE)

The construction of CRECE, which was mentioned in APRE announced in October 1995, is currently under progress. CETRO (Centro para el Desarrollo de la Competitividad Empresarial), which is to coordinate CRECEs in different states, has already been established in SECOFI with the cooperation of the government, NAFIN and private associations. Efforts are being made to install CRECE in 10 states by the end of 1996, and in all states by the end of 1997. CRECE will be a non-profitable private organization, financed by the government and contributions from the private sector.

The object of CRECE is to "assist the development of micro-enterprises and SMEs in all industries, including the service sector, by grasping the managerial/technical problems they have and by taking necessary measures to boost their competitiveness."

CRECE concentrates on the evaluation of SME management and consulting services, and consists of 8 staff members out of which 5 are consultants. In addition, there are plans to built a network of external consultants. They not only offer evaluation/consulting services, but also act as an intermediary for private/public financial institutions and companies. In Mexico City, CRECE is based in CANACINTRA.

3.3.2 Visitation Survey on Technical Support Organizations

A visitation survey was conducted to find out the existing state and the activities of technical support organizations which assist automotive and electric/electronic parts suppliers and small/medium-sized manufacturers in Mexico.

(1) Site selection

The directory prepared by the Consejo Nacional de la Micro, Pequeña y Mediana Empresa (mentioned in section 3.3.1) and the organization list by SEP-CONACYT were used upon the selection to places to visit under the

survey, taking the following matters into account.

1) There is a high probability that technical support industries offer technical services to supporting industries (SIs) of automotive and electric/electronic industries. With regard to R&D, this particularly applies to machinery/metals, plastic materials, electric/electronics, industrial standardization, instrumentation/calibration, quality control, quality assurance, etc.
2) Support organizations were visited regardless of their status, whether they were SEP-CONACYT, SEP-CONALEP, research centers of private companies, public or private colleges.
3) Regions with a high concentration of SIs were visited as much as possible without being regional biased.

Organizations under the SEP-CONACYT System

CIMAV	(Chihuahua)
CIATEQ	(Querétaro)
CIDESI	(Querétaro)
CIQA	(Saltillo)
COMIMSA	(Saltillo)
INFOTEC	(D.F.)
INAOE	(Puebla)

Organizations under SEP-CONALEP

CAST	(Ciudad Juárez)
CAST	(Guadalupe, N.L.)
CAST	(D.F.)
CRODE	(Chihuahua)

Private Organizations

Condumex	Central research institute	(Querétaro)
TREMEC	R&D institute	(Querétaro)
CEMYT	Metal-mold center	(Chihuahua)
CIDCE		(Saltillo)
UTT		(D.F.)

Colleges

UNAM	Laboratory of mechanical engineering faculty	(D.F.)
UNAM	Laboratory of geotechnology faculty	(D.F.)
UNAM	Materials research institute	(D.F.)
ITESM	Spearhead production-technology center	(Monterrey)
ITESM	Laboratory on Saltillo Campus	(Saltillo)
ITESM	Laboratory on Chihuahua Campus	(Chihuahua)
ITESM	Laboratory on Ciudad Juaréz Campus	(Chihuahua)
IPN	Laboratory of mechanical/electrical engineering senior school	(D.F.)
IPN	Laboratory of chemical/resource engineering senior scho ol	(D.F.)
ITCH	Exclusive laboratory	(Chihuahua)

(2) Survey method

The head and the section chief of the selected research institute were interviewed and questioned regarding preselected issues. The team went round facilities and studied equipment, facilities, and research activities.

(3) Survey findings

Table 3.3-2 shows the results of the survey on organizations about their services for SIs excluding colleges. Details on facilities and equipment are listed in Annex 3-1.

3.3.3 Overview of Principal Organizations

Among the organizations which were interviewed, those having relatively strong links with SMEs were: CIDESI, CIATEQ and COMIMSA (which belong to the SEP-CONACYT System); CAST (under SEP-CONALEP); CEMYT and CIDCE (private sectors); and spearhead production-technology centers (under ITESM).

Table 3.3-2 Technical Assistance for Supporting Industries Provided by Major Technical Organizations Visited

Ser. No.	Name of Organization	Authorities Concerned or Status of Organization	Location	Sub-sectors Served or Major Functions	Education/ Training		Technical Assistance						Others		
					1	2	3	4	5	6	7	8	9	10	11
					(Technology, QC, Seminar/Workshop	Vocational Training	Extension Services	Technical Consultation	Research & Development	Inspection, Testing	Calibration	Industrial Standardization	Consultation for Invest/Management	Technical Information	Credit
Public Institutions															
1	CIMAV	SEP-CONACYT	Chihuahua, Chih.	Research and Development of materials	○			○	○	○					
2	CIATEQ	SEP-CONACYT	Querétaro,Qro.	R & D for metallurgical industry	○			○	○	○	○			○	
3	CIDESI	SEP-CONACYT	Querétaro,Qro.	Technical assistance to SMEs	○			○	○	○	○		○	○	
4	CIQA	SEP-CONACYT	Saltillo, Coah.	Support and promote plastic industries	○			○	○	○		○		○	
5	COMIMSA	SEP-CONACYT	Saltillo, Coah.	R & D and consulting services for energy, metallurgy and mechanical industry			○	○	○	○		○		○	
6	INFOTEC	SEP-CONACYT	D.F.	Technical information services	○			○					○	○	
7	INAOE	SEP-CONACYT	Puebla, Puebla	Astrophysics, optics and electronics											
8	CAST-CHI	SEP-CONALEP	Cd. Juárez, Chih.	Assist manufacturing industry	○	○		○		○					
9	CAST-NL	SEP-CONALEP	Guadalupe, NL.	Assist manufacturing industry	○	○		○		○					
10	CAST-MEX	SEP-CONALEP	Izcalli, México	Assist manufacturing industry	○	○		○		○					
11	CRODE	SEP	Chihuahua, Chih.	Maintenance and fabrication of laboratory equipment of "Instituto Technologico"	○	○									
Private organizations															
12	Condumex	Private	Querétaro,Qro.	(Private laboratory)											
13	TREMEC	Private	Querétaro,Qro.	(Private laboratory)											
14	CEMYT	Private	Chihuahua, Chih.	Mold and dies for stamping and plastic injection	○										
15	CIDCE	Private	Saltillo, Coah	Consulting services on management	○			○					○	○	
16	UTT	Private	D.F.	Provide technical tools to SMEs	○			○					○	○	

(Note) ○: Services available for SIs. (Source) JICA team's interview survey

This section will overview: CIDESI, which sets its target especially on technical services to SMEs; CIATEQ, a technical organization geared to machinery/metals industries; CAST in Nuevo León, which is one of the three CASTs visited by the team; CEMYT, a new type of private metal-mold center which is yet to fully operate; and CIQA, the one and only chemical research institute under CONACYT.

(1) CIDESI (Centro de Ingeniería y Desarrollo Industrial)

- Location : Querétaro City
- Status : Technical research institute under SEP-CONACYT
- Staff : 205 persons
  consisting of 135 persons in technical development department
  45 in technical support department
  21 in administration department
- Establishment : In 1994, Mexico City
  In 1987, shifted to Querétaro City and came under SEP-CONACYT
- Organization : Design Section
  Design of products, equipment, automation/control system
  Manufacturing Section
  Production technology, machine work, special maintenance
  Material Technology Section
  Development of new materials, instrumentation, research on materials' properties
  Technical Management Section
  Information services, up-grading of technicians, technical management, sales activities
- Major Role
  CIDESI's role is to give technical support to SMEs and micro-enterprises. They provide services to approximately 400 clients per year, out of which 70% are SMEs and micro-enterprises.
- Principal Activities
  1) Metrology and Calibration
     CIDESI is a secondary metrology and calibration laboratory accredited by DGN. There are roughly 130 clients subject to the calibration of dimension-measuring instruments. In 1995, there were 1,340

calibration cases; the figure is expected to double in 1996.

2) Design and Production of Mold & Die
   The section chief mastered mold & die technology in Germany, then returned to Mexico. The section carries out the development of stamping die and plastic molds for small parts.
3) Development of various processing machines with automatic controllers
4) Provision of material-test services including: the analysis of chemical composition, studies on metal structure, examination of machine strength, and non-destructive tests.
5) Product Design
   Product design by CAE and CAD
6) Education and Training
   Lectures with practical exercises on instrumentation techniques

- Facilities and Equipment
  - A lot of the machine tools installed in the machine shop are outdated, general-purpose units.
  - Although they are equipped with a wide range of equipment for materials test/inspection, most of them are obsolete.
  - The range of metrology equipment is narrow considering that it is a DGN-accredited laboratory.
  - Refer to Annex 3-1 for the details.

(2) CIATEQ

(Centro de Investigación y Asistencia Técnica del Estado de Querétaro)

- Location : Querétaro City
- Status : A non-profitable organization, which is also one of the 27 research institutes part of the SEP-CONACYT System.
- Staff : 130 persons
- Establishment : November 9, 1978
- Organization : Agricultural Machinery Div.
  Mainly involved in the modernization of the sugar cane industry
  Machinery and Automation Div.
  Technical support on automation design (to target SMEs)

Mechanical Transmission Div.
Design & development of power transmission element such as gear, coupling (Sugar mill industry is the main client).

Machine Manufacturing Div.
Retrofit of sugar mills, development of various machine prototypes, development of jig and fixture

Material Technology Div.
Undertakes the following tasks in Quintana Branch;
1) Research on melting, casting and surface treatment of metals
2) Metallurgical laboratory service (construction project under way)

Systems and Electronics Div.
In charge of instrumentation and control, telecommunication software development

Process Equipment Div.
Development of chemical-engineering devices

Energy Process Div.
Measurement and calculation of heat-exchange efficiency

Aguascalientes Unit
Machining service, calibration service (temperature, mass, volume, dimension), metallurgical laboratory service

- Major Role

  CIATEQ's primary role is to contribute to the modernization of machinery/metal industries. There are 350 clients on the list.

- Principal Activities

  The aforementioned activities are performed under 9 Divisions.

  Work Composition 30% = Research
  50% = Development
  20% = Consultancy

  Other than the above, the organization is also engaged in the development of human resources.

- Facilities and Equipment

  A lot of the machine tools installed in the machine shop are outdated, general-purpose units. Refer to Annex 3-1 for the details.

(3) CAST (Centro de Asistencia y Servicios Tecnológicos)

- Location : Guadalupe, Nuevo León
- Status : A technical support center under CONALEP
  One of the 9 CASTs in the whole country
- Staff : 13 members

consisting of 8 engineers

- Establishment : 1993
- Major Role
  1) Special technical education/training of operators working in companies.
  2) Provision of machine work, instrumentation and other services mainly to SMEs and micro-enterprises, with the use of equipment installed in the center.
  3) Technical evaluation of operators
  4) Technical support
- Principal Activities

  CAST is not fully operating yet as it has only been established a short time ago; quite a few facilities and devices are still in the process of installation. The majority of machine tools and measuring instruments are the latest models, including those which are in the process of installation, and are frequently used. Most of the users are SMEs and micro-enterprises lacking the funds to purchase expensive, newly-produced machines. CAST not only provides training but also holds seminars.
- Facilities and Equipment

  They have a wide range of modern equipment; refer to Annex 3-1 for the details.

(4) CEMYT (Centro de Moldes y Troqueles)

- Location : Chihuahua
- Status : This is a private mold & die center established in 1994 by a private stamping firm and a Maquiladora plastic-injection company. Part of its operating expenditure is financed by the local government, and 50% of machine-purchasing costs by CONACYT. The organization belongs to FORCCYTEC-CONACYT.
- Object

  1) CEMYT aims to promote mold & die techniques which are currently dominated by imports, considering that (1) Maquiladora firms, especially those in the automotive and electrical/electronic industries, are eager to attract suppliers to somewhere near, and (2) there is a high demand for stamping die and plastic molds in both industries.

Its present target is to satisfy the demand of molds in the local automotive and electronic industries.

- Principal Activities

  CEMYT's activities are basically concerned with the education and training of mold & die technicians, while planning to start design/production of molds and dies upon order.

  For training courses for technicians, manuals have already been prepared following Germany's case, and there are 20 technicians including 3 engineers at present. CEMYT is currently recruiting lecturers and accelerating the construction of the building. The plan is to open 3-year courses which are divided into three classes, each consisting of 10 persons, to train a total of 30 persons with the combined use of CAD and CAM, covering both theory and practice.

(5) CIQA (Centro de Investigación en Química Aplicada)

- Location : Saltillo
- Status : Technical research institute under SEP-CONACYT
- Staff : 146 persons
  consisting of 100 technical staff (16 doctors)
- Establishment: 1976 (Started as WAX's research institute)
- Principal Activities

  CIQA, which is the only chemical research institute under CONACYT, was launched as an academic research center. At present, however, it concentrates on polymer research, including polymerization, analysis, mixture, and molding technology, and uses various types of resin, ranging from PE, PP, PVC, PS, PET to PC and POM. Regarding molding technology, it also undertakes research on injection, extrusion, and blow molding. As no plastic die are handled, all of them are imports.

  Research commissioned by companies are common (250 cases as of August, 1996), and most of the clients happen to be one of the leading Mexican companies.

  Furthermore, CIQA holds seminars, undertakes technical consultation, and offers information services.
- Facilities and Equipment

  Refer to Annex 3-1 for the details. It should be noted that their facilities and equipment are the latest models, comparing favorably with those in

developed countries.

3.3.4 Problems in Technical Support Organizations

In general, the following three requirements have to be satisfied for an entity to function as a sound, comprehensive technical support organization for SMEs.

a) The theme of R&D must not be over-academic. The entity must be fully equipped with the facilities and staff required to aid processing technology.
b) The entity must be a non-profitable organization.
c) The entity must be located in a region with a high concentration of SMEs.

Taking these into account, there are many problems that need to be solved, as suggested in the following, in order to enable technical support organizations in Mexico to facilitate the growth of hopeful supporting industries.

1) There are virtually no organizations which specialize in services for small/medium-sized manufacturers. State-run technical support organizations and private, non-profitable organizations tend to overspecialize in large and medium enterprises, as even private, non-profitable organizations cover part of their operating costs and capital investment loans by the income they earn from services to private companies. Services often fail to reach SMEs and micro-enterprises, even though they often require various technical services to the greatest extent.
2) As shown in Table 3.3-1, technical support organizations, excluding educational institutions such as colleges, are overconcentrated in Mexico City and its suburbs. Thus, CIDESI in Querétaro, which has the strongest ties with SMEs, needs to cover a vast area including Mexico City, State of Mexico, Guanajuato, San Luis Potosí, Jalisco, Tabasco, Veracruz, Michoacán, and Aguascalientes.
3) Principal R&D themes tend to cover computer application such as CAD, CAE and CAM, the development of prototypes of production machinery, and other flashy subjects, such that insufficient effort is made in the field of basic processing technology, such as stamping, machine work and plastic molding.

4) Many organizations were established in the 1990s, and some are still having management problems (e.g. CAST). In some cases, they are failing to fulfill their purpose and function due to the obsolete facilities in use (e.g. CIDESI).