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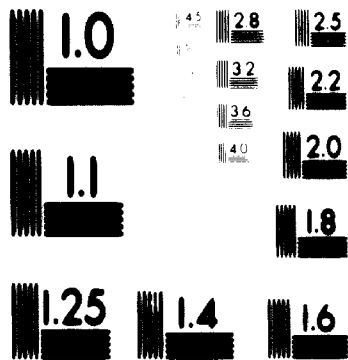
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Mexico.

GRAPHIC ARTS CONSULTING PROJECT.

PIRA/CONACYT

MEXICO SEPTEMBER 1976

BRIAN BLUNDEN

DIRECTOR, INFORMATION AND TRAINING DIVISION

PIRA, THE RESEARCH ASSOCIATION FOR THE PAPER

AND BOARD, PRINTING AND PACKAGING INDUSTRIES

LEATHERHEAD, ENGLAND

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FOREWORD

This report is the result of a two-week consultant visit to Mexico with time spent in Mexico City and Monterrey. During the visit, over twenty organisations were contacted including large and small printing companies, as well as CONACYT the National Council of Science and Technology; SIT the Technical Information Service of Mexico; the National Chamber for the Graphic Arts Industry; the Ministry of Industry and Commerce; the College of Managers for the Graphic Arts Industry; ARMO the National Service for Rapid Training of Manpower in Industry; CENETI the National Centre for Technical Industrial Instruction; the Centre for Improving Workers Skills; and LANFI the National Industrial Development Laboratories.

In preparation for the consultant project, the staff of SIT undertook a preliminary survey of the graphic arts industry in conjunction with the National Chamber for the Graphic Arts Industry; also, the author of this report prepared three illustrated lecture presentations and an interrogative interview, aimed at stimulating maximum response to the project from the Mexican printing industry and other organisations involved.

The author wishes to thank all those who cooperated so enthusiastically with the project. Particular thanks are due to the staff of SIT/CONACYT. The staff of SIT took the initiative through discussions with the National Chamber of the Graphic Arts Industry to mount the project and, in addition, undertook all the pre-planning and administrative arrangements. Their initiative and efforts are an outstanding example of effective information management at work in a practical situation aimed at improving the efficiency of a given industry sector.

INTRODUCTION - TERMS OF REFERENCE

The terms of reference and objectives set for Pira's consulting programme were defined as follows:

- a) to provide consulting services and establish permanent lines of communication through SIT/CONACYT to the graphic arts industry in Mexico**
- b) to identify the need for a national research and development institute for the printing industry and provide follow-up assistance for its development**
- c) to identify technological and marketing information requirements of the Mexican printing industry, and establish a means of keeping SIT informed on the state of the printing industry worldwide, and any consulting services available to it**
- d) to identify training requirements for production, quality control and management staff in the graphic arts industry**

The preliminary investigation undertaken by SIT and the subsequent consultancy provided by Pira, were both aimed at ascertaining the current state of the graphic arts industry in Mexico, and determining what further activities need be undertaken in order to ensure its successful future development.

Appendix I reproduces the survey of the graphic arts industry undertaken by SIT. This report identifies certain problem areas in the printing industry in Mexico and makes recommendations for improvement. The Pira consultancy's project aimed to verify the SIT findings and, where appropriate, to extend the recommendations made.

INTRODUCTION - MEXICO AND THE MEXICAN GRAPHIC ARTS INDUSTRY

Mexico, under the 1917 Constitution, is a Federal Republic consisting of 31 states, and the Federal District which contains the capital Mexico City. The country is south of Northern America and covers an area of about 760,000 square miles and lies immediately south of the United States of America. It has about 6,000 miles of coastline bordered to the west by the Pacific Ocean and to the east by the Gulf of Mexico. Its southern neighbours are Belize, formerly British Honduras, and Guatemala. The population is about 55 millions and increasing at the rate of 3-4% annually. Some 20% of the population lives in the main cultural and industrial regions in and around Mexico City. Guadalajara and Monterrey are the other two major cities, having an estimated population of 1.6 million and 1.2 million respectively.

The Mexican government pursues an active socio-economic programme, aimed at rapid industrialisation of the country. Encouragement is given to activities aimed at self-sufficiency and, understandably, emphasis is placed on the encouragement of small industries.

In common with many other countries, the Mexican printing industry is composed of a relatively large number of companies many of which are small in size. There are some 3,000 companies in membership of the employers' federation, the Camara Nacional de la Industria de Artes Graficas, yet only approximately 5% of these companies have a share capital in excess of US \$80,000. Of these 3,000 companies, more than 2,000 print by letterpress whereas less than 400 undertake production by offset litho, with something below 70 companies involved in gravure.

It seems likely that some 10% of the industry (by number of companies) account for as much as 70% of the total goods produced. As it is compulsory for printing companies to be in membership of the Camara Nacional de la Industria de Artes Graficas (CNIAG), a situation is produced where companies of a

relatively small size appear to have a disproportionate influence on industry-wide policy. This problem is complicated by the fact that small family-based companies often have an entirely different business objective and management philosophy to the larger organisations.

The small progressive company with competent management must be encouraged and helped to grow and contribute to the national economy. However, the majority of small printers do not have either the desire or the competence to grow and subsequently to make a major contribution to the economy.

Small companies provide a local service which they should be encouraged to continue and which the larger technology-based organisations would find it difficult, if not impossible, to provide. It is a characteristic of the graphic arts industry worldwide to be composed of a relatively large number of organisations, the majority of which will be small and employing less than 25 persons. These organisations offer primarily a local community service. In turn, most graphic arts industries have a relatively small number of large organisations which account for the bulk of production, and these companies are generally product-orientated in their management policy. It is this minority of larger companies which will impact most on the effectiveness of any graphic arts industry and, in particular, will influence the import-export position of printed products. Mexico is no exception to this general rule.

As printing technology develops in Mexico and craft-based techniques disappear, so that capital investment required for efficient printing will increase. This demands the development of larger printing organisations with properly qualified staff and technological competence. A classic example of such development is the Bank of Mexico printing works. This organisation provides technical and management competence, capable of making a significant contribution to the national economy.

It is desirable to have large and small printing companies to produce an efficient industry overall, but erroneous to believe that the requirements in terms of technology, marketing and training of these companies will be identical.

A printing company employing less than 50 persons rarely requires deep involvement in technology, nor can it use sophisticated marketing techniques. It may require craft training facilities and also benefit from management training, but even in these areas the small company's demand for such services will be spasmodic. This is in complete contrast to the printing company employing 150-2000 persons. These medium and large companies will require all the skills and competence of any large industrial organisation. In particular, such companies must ensure competence in:

- a) financial planning and cost control
- b) technology forecasting
- c) information management
- d) production control
- e) raw materials, specification, purchasing and stock control
- f) marketing
- g) personnel selection, training and management development

During the Pira consultancy, visits were made to a variety of printing organisations to determine the characteristics of the Mexican graphic arts industry. In addition, other educational, training, and research organisations were visited to ascertain to what extent specialist services can be provided to the graphic arts industry from within Mexico.

This report describes the various visits and draws conclusions from them; particular attention is drawn to the competitive position of the Mexican graphic arts industry; and finally projects are proposed to overcome the current problems. Additional information is presented in the appendices to support the recommendations and provide reference information.

CONCLUSIONS

The quality of printed matter produced in Mexico is good, and the standard of craft skill in the industry is high. However, the industry must increase its use of technology, improve its information and marketing skills and, in particular, ensure an adequate supply of technically trained manpower. If these problems are ignored, the industry will find itself in increasing difficulties in the future.

The graphic arts industry is important to the Mexican national economy. It ranks sixth in size of investment (more than 5,000 million pesos in 1974) and it is a significant source of employment (over 81,000 persons employed with a growth between 1965-70 of 47%). The industry has direct impact on:

- 1) literacy development and text book production
- 2) balance of payments arising from import/exports of printed matter
- 3) service costs of all industries, through its involvement in packaging and sales literature etc.

The problems facing the graphic arts industry may be identified as follows:

- 1) inability to obtain an adequate share of the market produced by a growth in demand for printed products in Mexico
- 2) inability to compete effectively in the export market for printed products
- 3) too much dependence on craft skills
- 4) lack of national training programmes to ensure an adequate supply of technician manpower
- 5) lack of a national centre to focus attention on the opportunities arising from new technology and its use in industry
- 6) lack of industry-wide infra-structure, capable of dealing with the problems of change at a strategic level
- 7) lack of awareness of the changing role of marketing in the graphic arts industry

The industry must cease complaining of its problems, and instead organise itself to overcome them. Competition from other media, high cost of raw materials, a deficit on the import/export of printed matter, and lack of technician manpower

are all problems which can be overcome. They require industry-wide solutions and this demands an industry infra-structure, composed of qualified and experienced people determined to achieve change. At present, this mission-orientated infra-structure is lacking. Consequently, national resources such as SIT, ARMO, CENETI, and LANFI are not utilised properly by the graphic arts industry. Nor are facilities from within the industry, such as the Lithographic Union training school, being used to the best advantage. The industry must face these problems realistically, or contract in the face of more efficient foreign competition.

CNIAG should be the centre for any industry infra-structure. But the staff of CNIAG cannot be expected to take the initiative, as their responsibility is to reflect the members' wishes. This results in a consensus view which is ineffectual towards problems that require a dynamic approach. SIT, as an independent body, can play a more aggressive role. SIT should take the initiative to establish the committee structure recommended in this report and, ultimately, this committee structure should change the character of CNIAG. When such change has been achieved, SIT should withdraw from its direct involvement and simply remain as a consultant to CNIAG.

The immediate need is to ensure that the Mexican printing industry can meet the demands from a growing market for printed products and minimise foreign entry to this market. Total exclusion of foreign involvement in the Mexican printing market is not possible, nor is it desirable. Therefore the Mexican printing industry must also ensure that it becomes competitive in the export field to ensure a net surplus on the import/export account of printed products. To achieve these objectives, the industry must develop in the spheres of technology, materials testing, information, marketing, education and training.

The recommendations of this report outline a plan for the creation of an industry infra-structure capable of solving these problems. It also provides guidelines for the initial work of the committees concerned. Precise details of project work are not given, as such detailed planning must be undertaken by senior executives within the graphic arts industry. Emphasis must be given to this participatory character of the Committees recommended in the report. The proposed Committees will not be satisfactory unless each member is prepared to devote time and energy, aimed at bringing about real change in the graphic arts industry. Individuals should not commit themselves to committee membership, unless they fully accept a deep involvement in the work programme required by the report's recommendations over the next 3-5 years.

PROGRAMME OF VISITS TO PRINTING ORGANISATIONS

Fifteen printing and bookbinding organisations were visited. The pattern of visits was to spend approximately 2-3 hours with each organisation. Each visit commenced with a discussion between the author and the management of the company concerned, the discussion being structured by means of an interrogative interview. The companies visited varied in size from one employing only 10 persons with a gross value of sales per annum estimated at US \$80,000, to an organisation employing 1,600 persons with an estimated gross value of sales of US \$10,400,000. The interrogative interview structure used to conduct each visit was based on the following questions:

- 1) what are the print end-products produced
- 2) how many persons are employed
- 3) what is the gross annual value of sales
- 4) what is the estimated net profit when expressed as a percentage of the gross value of sales per annum
- 5) does the organisation operate a corporate plan
- 6) does the organisation undertake any market research and marketing activities
- 7) how many qualified graduates are employed
- 8) does the organisation have any organised staff training programme
- 9) does the company have a systematic scheme to organise technical input of information
- 10) does the organisation belong to any external research or technical organisation
- 11) is any raw materials testing and control undertaken
- 12) is there any organised system of process and end-product quality control
- 13) what particular technical problems impede production
- 14) what are the major factors which will influence change in the company's operation over the next five years?

SUMMARY OF INFORMATION COLLECTED FROM PRINTING ORGANISATIONS VISITED

CONCLUSIONS

In general, the response from the fifteen visits gave support to the conclusions reached by the SIT survey. One point which cannot be over-emphasized is the lack in the Mexican graphic arts industry of industry-wide resource co-ordination and planning. This may be due to the influence of small companies in CNIAG; but the implication for the national economy of the present problems facing the graphic arts industry must be recognised and faced if the industry is to overcome such difficulties. Poor export performance, lack of national training facilities, high cost of raw materials, are all problems that require industry-wide discussion and industry-wide solutions. The recommendations of this report aim at presenting proposals which combine the findings of the Pira study with those of the SIT investigation into an overall plan likely to be acceptable to the graphic arts industry, and ensure its development to overcome the problems which have been identified and, subsequently, enable the industry to make a major contribution to the national economy and development.

- 1 The range of products produced by the organisations visited included packaging, business forms, labels, magazines, books, posters, catalogues, security products and credit cards, and general printed service goods. The approximate number of persons employed by the organisations visited was as follows:

10, 15, 30, 40, 40, 50, 60, 60, 60, 100, 250, 500, 700, 1600
- 2 The estimated gross value of sales per annum ranged from US \$80,000 to US \$ 10,400,000.
- 3 Each organisation was asked to indicate its current net profit expressed as a percentage of the gross value of annual sales. The figures quoted ranged from 8% to 25%. The larger organisations quoted figures between 8% and 12% and expressed doubts concerning their ability under present trading conditions to maintain this level of profitability. All the figures quoted above 12% were quoted by companies employing less than 60 persons.

- 4 Each organisation was asked to indicate how many graduates were employed. The total number was in the region of 40, but this included a substantial number of non-science/engineering graduates. It suggests that something in the region of 1% of the work-force is graduate personnel, but that no more than one-third of this figure are science or engineering graduates.
- 5 Only three organisations claimed to have an organised and documented five-year corporate plan. One of the organisations engaged in developing corporate planning activities also demonstrated a computer-based cost control and analysis technique, as well as the beginnings of a frequency analysis of job faults. This latter fault analysis system was based on computer manipulation of pre-determined fault descriptions.
- 6 Only one printing organisation claimed to undertake marketing and market research studies. In general, there was relatively little appreciation of the role of marketing in the printing situation and equally little evidence of serious studies related to export marketing opportunities. The smaller organisations did not feel themselves to be in a position to undertake export sales. The larger organisations were convinced that their competitive position would not enable export sales, due to the high cost of paper in Mexico. It was suggested that paper costs are in the region of 60% above the average international open market prices, and that this factor alone made it impossible to compete in the international sales market for printed products. Interest was expressed in export sales, but the assumption was invariably made that production costs would make it at present impossible to compete. Frequent complaints were made concerning the arrangement whereby foreign manufactured paper cannot normally be imported without special permits for use by the Mexican printing industry, whereas printed products, particularly books, may be imported without any special permits. This arrangement was felt to be strongly to the disadvantage of the Mexican printing industry.

7 Although there was evidence of a high level of craft competence in the companies visited, there was no evidence of organised training programmes. The training aspect of the personnel management function appeared to have received relatively little attention. All organisations expressed a desire for improved training facilities, both in the technical and administrative spheres. Attention was drawn to an attempt in Monterrey to develop training, based on a local secondary school, as well as the facilities provided by the lithographic school financed through the Lithographic Union. Hardly any of the organisations visited appeared to have any detailed knowledge concerning the work and purpose of ARMO and CENETI.

8 No company visited had an organised technical information system. The input and organisation of technical information appeared to be virtually random in each organisation. However, many of the companies pursued an active programme of visits, both within Mexico and overseas, to participate in graphic arts exhibitions as a means of remaining technically updated. There was agreement that the benefits from this approach are limited and, in general, there appeared to be sympathy for an organised technical information system which could be made available to individual companies.

9 Each organisation was asked to provide details of membership of any external technical body. Only two organisations claimed membership of external bodies. There was general sympathy for the idea to step up contact between the Mexican printing industry and external specialist bodies, but reservations were expressed concerning the cost of this activity, and it was felt desirable to make the arrangements on an industry-wide basis if possible, to minimise the cost.

10 Each company was asked to describe what raw materials testing it undertook as well as the techniques it employed for specification when purchasing raw materials. In addition, they were asked to provide details of any process control or end-product inspection system which was installed. Only one organisation had a comprehensive raw materials testing specification and end-product inspection system. In general, the awareness of raw materials testing techniques and specification procedures was low. Very few of the organisations visited were aware of the existence of LANFI and virtually none had any detailed knowledge of the facilities available at the LANFI laboratories.

11 Each organisation visited was asked to indicate particular problems which were giving rise to production impediments. The problems quoted may be ranked as follows:

- a) high price and poor quality of paper**
- b) lack of quality control facilities and specification techniques**
- c) lack of cost and estimating control procedures**
- d) lack of national training facilities both for technical and administrative personnel**
- e) lack of marketing expertise**

12 Each organisation was asked to indicate how it saw its own business operation changing over the next five years. Very few definite responses were provided to this question, although it was suggested by several organisations that they saw development in the spheres of web offset and gravure printing. Most organisations indicated that they could not see a significant change in their operations over the next five years, but all expressed great concern at the rapid increase in costs related to raw materials. This observation recurred during the interviews, as well as doubts concerning the level of profitability likely to be possible during the next five years, and the difficulties which this would present in providing sufficient finance for the investment necessary to keep pace with new equipment. It is not surprising that this question produced relatively little response when one notes the lack of forward corporate planning indicated by Item 5 above.

PROGRAMME OF VISITS TO SPECIALIST ORGANISATIONS

THE TECHNICAL INFORMATION SERVICE - SIT

The Pira consultancy to Mexico was initiated and organised by SIT. Therefore the first visit of the consultancy was to the SIT offices for discussions with Ing Jose Quevedo P, Director of the Department of Information Services, Ing Jose Pablo Fernandez Cueto, and Ing Nicholas Alvarado. During the meeting with SIT, its role and involvement in the graphic arts industry was discussed.

The Technical Information Service of Mexico, SIT, is a section of the National Council of Science and Technology (CONACYT). It has been created to foster the use of scientific and technical knowledge by the manufacturing industries, particularly the small and medium sized ones. One of the most important activities of SIT is to visit small enterprises to determine their information requirements; to create a favourable climate for innovation; to promote the systematic use of knowledge; and to help raise the quality and marketability of their products by providing technical and managerial knowledge.

SIT provides a liaison service whereby its engineers visit industrial enterprises to familiarise themselves both with the field of interest of the companies and with the capabilities and facilities of associated bodies such as research institutions. SIT also provides a direct technical enquiry service. In addition, there is a monthly information service called Technical News which keeps industries informed on the latest technological developments. Through the Technical News, SIT now serves close on 2,000 users from the metal, mechanical, chemical, food, glass and ceramics, pharmaceutical and electrical industries. The Technical News consists of nine different one-page bulletins: six cover the fields of interest of each one of the above-mentioned industries and three cover the horizontal fields of management, industrial engineering and pollution. All the information contained in these bulletins is fed into the

computer of INFONAVIT (The National Fund Institute for the Promotion of Labour Housing) and processed through the computer system SITEC. SITEC prepares a KWOC (keyword out of context) list, which serves as a continually up-dated information source for the technical enquiries.

SIT and the SITEC facility are the obvious starting point for the development of information services to the graphic arts industry in Mexico. It seems likely that the Pira computer-based information service would be compatible with the SITEC system, and thus it would be possible for SIT to obtain immediately a data base related to the graphic arts, packaging, and paper and board industries from which to provide both direct Technical News services and an information base for subsequent manipulation and use by a specialist organisation, specifically serving the graphic arts industry.

The role of SIT is as a marketing service for knowledge. Therefore, its role is primarily that of establishing a need for information and knowledge, and creating the means of enabling a service to be developed, but thereafter SIT normally aims to detach itself from the specific service operation. In this context, it would seem desirable that SIT should supply the initial impetus to establish information and marketing services for the graphic arts industry. Ultimately, it should aim to pass this service activity to LANFI, in a similar fashion to that which has been done for the chemical industry or, if more appropriate, to establish an information service for the graphic arts industry within CNIAG.

The initial action required is to establish a means of providing SIT with a graphic arts data base from which to initiate direct information services for the graphic arts industry. As previously mentioned, this could be done immediately through cooperation between SIT and Pira. This SIT/Pira cooperation should be one of the first proposals considered by the SIT/CNIAG National Committee for Information and Marketing, and is one of the recommendations emerging from the Pira consultancy.

**THE NATIONAL INDUSTRIAL DEVELOPMENT LABORATORIES
(Laboratorios Nacionales de Fomento Industrial - LANFI)**

A visit was made to LANFI with Ing Jose Quevedo P of SIT and a discussion took place with the Director-General of LANFI, Dr Rafael Rojas Gutierrez. LANFI was established by official decree of the Mexican government in 1948. It is a non-profit organisation providing national laboratory facilities for applied research and technical services. It is located on the west side of Mexico City and has a staff of approximately 50. In summary, the act which brought LANFI into being set forth the following objectives:

- 1) to study the characteristics and properties of raw materials and end-products of importance to Mexican industry
- 2) to study ways and means of using Mexico's national resources and for manufacturing derivatives
- 3) to give technical assistance to government, commercial or industrial groups by establishing testing methods for standardisation, undertaking pure science projects, or performing other laboratory work
- 4) to arbitrate technical controversies
- 5) to determine needs for basic, intermediate, tributary, or complementary industries which should be developed in Mexico
- 6) to carry out any complementary activity to aid in the accomplishment of the above.

In accordance with these original objectives, LANFI has been primarily concerned since 1950 with two types of activities. They are:

- a) applied research programmes initiated by LANFI which are related to subjects of national interest. This type of research is financed directly by the government through its annual budget to LANFI.
- b) technical services to private industry which are paid for by industry on a cost-recovery basis.

At present, LANFI has four main departments. They are pulp and paper; food and drugs; chemical engineering; and analytical chemistry.

The pulp and paper department serves the pulp and paper industries in Mexico and carries out a research programme on raw material utilisation and process improvements. The laboratories use TAPPI standards for pulp

evaluation and have good facilities for physical testing. A major part of the research effort is devoted to studying non-wood raw materials which grow in the arid zone of Mexico as a possible source of pulp. In particular at this time studies are being undertaken on the use of wheat straw as an alternative source of pulp for papermaking. The analytical chemistry department is well equipped with modern instruments, for example, X-ray fluorescence and diffraction units, equipment for infra-red and ultra-violet and visible spectrometry, as well as facilities for the study and resolution of a variety of chemical analytical problems. Pilot equipment is also available for pulp evaluation and papermaking.

The visit to LANFI centred on discussing ways in which their activities might be extended to provide services to the graphic arts industry. The Director of LANFI is a paper technologist and very sympathetic to extending the work of the Institute to render service to the graphic arts. Because of LANFI's involvement in papermaking, much of the equipment required for paper testing projects is already available. Also, the analytical facilities already offer equipment suitable for application in printing and the packaging aspects of printing. Obviously, LANFI lacks the practical facilities for printing trials. However, the question of cooperation between LANFI and the lithographic school financed by the Lithographic Union was discussed, and it seems likely that a cooperative arrangement could be established between these two organisations to provide practical printing facilities, thus obviating the need for high capital investment at LANFI. LANFI is the logical place for the graphic arts industry to establish a technology and raw materials testing centre. However, the initial impetus must come from the graphic arts industry, as must the leadership both in terms of project definition and the organisation of finance.

Therefore, it is recommended in this report that the first task of the SIT/CNIAG National Committee on Technology and Raw Materials Testing should investigate ways and means of extending the work of LANFI to provide testing facilities aimed at improving paper performance in the lithographic industry.

**ARMO - EL SERVICIO NACIONAL DE ADIESTRAMIENTO RAPIDO
DE LA MANO DE OBRA EN LA INDUSTRIA**

A visit was made to ARMO - National Service for Rapid Training of Manpower in Industry, and discussions were held with senior members of the ARMO staff.

The Mexican government and the UN founded ARMO in 1965. It was established to improve the training of Mexican workers. The aim was to extend the capabilities of the Mexican labour force to meet the problems encountered in the technical changes brought about by the country's industrial development. The methods which ARMO uses to achieve its goal are modern methods of transmitting knowledge and the production of training materials, principally for in-plant teaching. The object of many of these materials is to supply training facilities for use in plant which can be used also to develop instructor skills within factories.

ARMO has also the following objectives:

- 1) training supervisors and instructors to carry out in-plant technical training programmes
- 2) increasing the theoretical knowledge and the practical skills of the work force in industry, in order to improve the quality of their work
- 3) preparing teaching materials for improving the worker's capability and capacity
- 4) researching, promoting, organising, and monitoring rapid manpower training programmes
- 5) providing consultancy services in the field of labour and manpower development

During the visit and in subsequent discussions, it was pointed out that ARMO is not an educational institution in the traditional sense of this term. It is instead a centre for research into design and development and testing of educational materials, and for the preparation and training of instructors.

The topic areas in which ARMO is at present involved are mechanics, maintenance mechanics, electrical installation and maintenance, electronics, and woodwork.

At present, ARMO is not involved in the graphic arts. However, the staff of the service expressed sympathy with the problem of the graphic arts industry, and agreed that they would be in a position to provide help and services leading to the development of training programmes.

Obviously, ARMO staff would need input and support so far as graphic arts technology is concerned. However, the service is well equipped to deal with the pedagogical aspects of developing suitable syllabuses for national training programmes, and also to take responsibility for the development of supporting training materials. If the skills of ARMO could be linked to the experience of CENETI, the practical experience of the Lithographic Union training school, and the centre to be developed at Queretaro with support from the Italian government, a powerful facility for the development of graphic arts training in Mexico could be established. If these facilities were further supplemented by training materials produced by other graphic arts research centres, it should be possible to develop a comprehensive in-plant training facility for the printing industry in Mexico.

Later in this report it is recommended that ARMO should be represented on the SIT/CNIAG National Committee for Education and Training and, by this means, the service can be encouraged to play its full role in the development of graphic arts training.

CENETI - CENTRO NACIONAL DE ENSEÑANZA TECNICA INDUSTRIAL

A visit was made to CENETI, the National Centre for Technical Industrial Training, and the Director General, Ing. Julio Cortes Hernandez, was available for discussion, together with some six graduates, who had just completed the first course in graphic arts engineering studies.

CENETI was established to provide professional training suitable for the needs of Mexican industry, and to create a communications network between industry and education. It was founded in 1970. The aim of the first plan instituted through CENETI was to develop a programme which would produce high-quality teaching staff with firsthand industrial knowledge to fill the gap between industry, technology and academic resources.

Since 1970, the so-called Industry and Education Plan has been developing. One of its purposes is to make a coordinated attack on the problem of industry's lack of technicians and technologists to fulfill middle and higher technical management roles. The industry and education project produced data from practical investigations in industry, which suggested that the graphic arts industry is one of those suffering most from a lack of training technicians. This fact was considered all the more important as the graphic arts industry is the sixth largest in Mexico, in terms of capital investment.

Obviously, the graphic arts industry presents a great variety of technical specialities, since it is involved on the one hand with industries producing basic raw materials and, on the other hand, extends to the sphere of publishing. As has already been mentioned in this report, the impact of the graphic arts industry spreads from the growth of literacy to the support or impediment which it can provide to the export of other goods through its service role.

The CENETI industrial study showed that, although the printing industry is one of the most important as regards the creation of new jobs, it is also one of the industries most in need of technical specialists. CENETI's study suggests that 3,000 technicians are required in the Mexican printing industry. The CENETI conclusion that 3,000 technicians are required sounds an unrealistically high

figure at this moment in time, and it may be based on taking overall industry statistics, instead of making a closer examination of those organisations within the graphic arts industry which can benefit from the introduction of technician manpower. However, it cannot be denied that technician manpower is required in the graphic arts industry of Mexico and, undoubtedly, CENETI is making a very valid contribution to this need through the development of graphic arts engineers.

The pilot scheme which has been developed by CENETI is an admirable start to the problem of developing formalised programmes for the education of graphic arts technicians. However, two things are now required: they are

- 1) a programme to broaden the experience of the newly-emerging graduates by involvement in overseas graphic arts research and industrial technology
- 2) a means of integrating rapidly the graduates emerging from CENETI into the technical and industrial management structure of the graphic arts industry.

Discussions took place with Ing. Cortes Hernandez on the possibility of establishing links with European countries for the graduates from CENETI to spend time undertaking research and other industrial project work, to develop and extend their skills and experience. This idea should be one of the first problems to be considered by the SIT/CNIAG National Education and Training Committee.

It will also be an advantage if CENETI could have made available to it the experience of overseas experts who have already spent years developing educational programmes related to the graphic arts. Such individuals would certainly be available from the United Kingdom and probably from other European countries, as well as possibly from the United States of America. It is suggested that the SIT/CNIAG National Committee for Education and Training investigate the means of providing such additional expert input to CENETI. Finally, the work of CENETI will not be successful unless the graphic arts industry takes the initiative in rapidly integrating young graduates from CENETI into the graphic arts industry. Consideration should be given to the means of doing this, and also the possibility of drawing on these individuals for the development of a graphic arts research centre associated with LANFI.

THE COMPETITIVE POSITION OF THE GRAPHIC ARTS INDUSTRY IN MEXICO

Throughout the Pira consultancy, repeated reference was made by representatives of the Mexican printing industry to the difficulty which the industry faces in remaining competitive, due to the problems of high paper costs and foreign competition. Reference to official documents and statistics suggest that there are problems in the area of book production which need careful attention.

According to UNESCO data for 1965, Mexico published 4,851 book titles, including school text books, with an average of 1,333 copies of each title. This made a total of 6.5 million copies. In the same year, Spain and Argentina stood out as the major book producers among the Spanish-speaking countries. Spain published 17,342 titles with an average run of 5,055 copies making a total of 87.7 million books. At the same time, Argentina produced 3,539 titles with an average of 5,071 copies giving a total of 19 million copies. Obviously, Mexico lacks the advantage of long production runs, which in turn will tend to be reflected in higher unit costs.

Book printers have suggested publicly that paper supplies obtained within Mexico are 30% above that of foreign paper prices, and some of the printing organisations visited during the Pira consultancy quoted figures as high as 60% above the foreign price. Despite the fact that the domestic pulp and paper industries have been working at maximum capacity, there are still delays and shortages in the supply of paper. This has been particularly aggravated recently, due to the general shortage of paper production capacity.

Although it was not possible during the Pira consultancy to verify the claims of publishers, they appear to hold the view that some of the materials and services available in Mexico are inferior to those available overseas, yet offered at a higher price. Specifically, they refer to paper, photocomposition and offset plates.

It is suggested that the publishing industry is further aggravated due to the nature of the business in which they operate, since the reimbursement for their investment

through sales comes in slowly due to the nature of publishing. Because of this situation, the Fund for the Encouragement of Exports of Manufactured Products (FOMEX) has been arranging larger and larger financial resources at preferential rates for the publishing industry, with the objective of stimulating its production for export.

In 1972 FOMEX granted credits of approximately US \$6.4 million to finance these exports. This figure amounted to 43.5% of the total of printed matter exported in the year quoted.

It would appear that Mexican imports of all classes of printed material has been increasing substantially in recent years. Between 1967 and 1972, imports increased from US \$58.9 million to US \$99.6 million. The publishing industries of other countries were able to make inroads into the growing Mexican market for books, pamphlets, journals etc. It is suggested that this situation was made relatively easy by the lack of discriminatory measures against imports. This relative ease of entry into the Mexican market was further stimulated by the considerable growth of demand for printed products in Mexico.

In contrast, the export sales of books increased between 1969 and 1970 but suffered reductions in 1971 and 1972, when they constituted totals of US \$11.4 million and US \$12 million respectively. If the increase in imports of printed material is added to the drop in exports, then the imbalance in these transactions obviously worsens. In 1967 the deficit for Mexico was US \$46.9 million and in 1972 it amounted to a total of US \$84.9 million.

Publishers suggest that there are both internal and external causes for the decrease in exports of Mexican books. They suggest that the increased price and scarcity of home-made paper, and necessity of acquiring it abroad, is a major factor. However, figures published by the department of economic studies show that exports of books earned US \$10 million for January-July 1973, a figure substantially greater than that of the same period of 1972, which was only US \$6.8 million. This increase is largely attributed to large-scale exports to Colombia, Venezuela and Peru.

Printed books are an important aspect of Mexican exports for the nations of the central American common market. In 1971 they were in third place after medicinal products. In 1972 they passed to fourth place. So far as the Spanish market is concerned, its book imports were valued at US \$27.1 million in 1972, the principal suppliers in order of importance being Italy, United Kingdom, France, United States, and the Federal Republic of Germany. Argentina only accounted for 3.2% and Mexico for only 2.8% of the total.

It can be seen from the above data and the appendices giving statistical information on import and export of books, that Mexico has the characteristic of a growing demand for printed books and magazines, which is being exploited by foreign suppliers, rather than through growth of the home industry. The three reasons for this situation are suggested as being:

- 1) the high cost of paper and production in Mexico
- 2) relatively poor profit margins from printing and publishing, thus impeding re-investment to exploit a growing market
- 3) lack of tariff protection from overseas producers of printed products.

Because of the influence of paper supply and cost on the printing industry, it might be useful to consider some information related to the paper industry and its growth characteristics in Mexico.

The Mexican paper industry

Mexico's paper producers in 1973 enjoyed substantial growth but this was complicated by operating problems, such as the scarcity of pulp. A direct outcome of the shortages of pulp was an increase in the price of all paper products, with some companies increasing prices up to three times during the year (on average wholesale prices for paper products were 8.2% higher in 1973 than in the previous year). Demand throughout the year was very strong for paper, and this was particularly so in the area of packaging, paper board for boxes and folding cartons, as well as specialised paper products used in the construction industry. Most paper manufacturers during 1973 found it difficult to keep up with demand, due to the limitation on production capacity and the shortage of pulp. During

this period, virtually no additional capacity was added to the industry, though at the end of the year various expansion programmes were announced which should improve capacity during the next two to three years, but even these expansion plans may encounter difficulties so far as adequate financing and supply of paper machinery is concerned.

In 1973 national paper production totalled 1.09 million metric tonnes which was an increase of 10.4% over the previous year's output. In 1973 the industry operated at an estimated 85.6% of the theoretical capacity, as compared with an approximate 82% for 1972. Tonnage sales of paper by the major producers rose by 12.1% in 1973. Apparent domestic consumption of paper in 1973 was 1.29 million metric tonnes, and at present the national paper industry of Mexico accounts for some 98% of domestic consumption of paper products, with the exception of newsprint.

During the year the employers' federation forecast that by 1980 domestic demand for paper would be around 2.2 million metric tonnes a year. This suggests that during the period 1973-1985 Mexico will need at least 18 new paper plants with an average daily production capacity of 300 metric tonnes. It was further noted that this expansion of plants will require an investment of something in the region of US \$1,420 million. Mexico at present accounts for approximately 25% of paper industry production and consumption in Latin America, and this share of the market is expected to be maintained.

During 1973, various plans were announced for the expansion of the paper industry, and this was particularly so, so far as newsprint is concerned. Another project unveiled was paper production from sugar cane bagasse by Promotora del Noroeste SA, a joint venture of Cia Industrial de San Cristobal, Nacional Financiera, Cia Azucarera de Los Mochis SA, and the Sinaloa state government. That plant is estimated to cost US \$36 million and will produce cellulose, white paper, and corrugated paper boxes. Annual capacity for paper production will be 60,000 metric tonnes. In north western Mexico plans were announced for establishment at Magdalena de Kino Senora of a US \$6.4 million plant for producing corrugated paper boxes from wheat straw

cellulose. Production for that plant projected at 90 metric tonnes a day would, however, be almost exclusively for export to the United States.

The largest complex of new expansion programmes under way in 1973 were those of San Rafael Papel, the country's largest paper producer. San Rafael plans over the next three to five years to spend around US \$108 million in various programmes, under which it expects to increase annual paper production in its own producing units, or those of affiliated companies, from 110,000 metric tonnes to 320,000 metric tonnes, with increasing emphasis being placed on a kraft, writing and printing, coated and speciality papers.

The nation's largest producer of kraft papers reported plans to increase output by 50% with an expansion programme to commence in 1974 through new investment of almost US \$16 million. Meanwhile, Sonoco de Mexico SA continued as Mexico's only paper company active in the export business. This specialised paper producer during 1973 exported approximately 20% of its total output, the material going primarily to South America.

A major development in the industry was the decision by Kimberley Clark de Mexico SA, one of the country's most important producers, to increase its percentage of "Mexicanised" shares from 40% to 56% via a secondary offering of shares. Kimberley Clark of the US continues to hold 44% of the equity in the local company. Later last year the firm announced approval of a US \$20 million expansion programme for its cellulose and paper-producing facilities, and indicated plans for additional capital expenditure of US \$30 million over a three to five year period.

The paper industry at the end of 1973 was comprised of 62 companies, 37 of which manufacture basic paper products, and 11 of which produce same types of pulp. There are 14 which produce both paper and pulp. At the end of the year, total investment in the paper and pulp industry was estimated at US \$540 million. In 1973 the industry employed about 20,000 persons and produced some 425 different types of paper. Total paper industry sales for the year were estimated at US \$406 million, as compared with US \$344 million in 1972.

This material, taken from data published in Mexico, indicates that the paper industry is operating at high capacity and substantial plans are in hand for its expansion. It would seem, in the light of the difficulties which the printing industry experiences relative to the supply and quality of paper, that more coordination should take place between the two industries to seek to establish joint programmes, both for development and discussions with government, aimed at optimizing the growth of both industries. At the same time, these discussions should seek to obviate unnecessary imbalance between supply and demand which, in turn, can only aggravate the stability of the two industries concerned.

Recommendations are made in this report that the SIT/CNIAG National Committee on Information and Marketing should consider the development of forecasting information related to the printing industry's demand for paper, as well as the likely growth in home demand for printed products and the export opportunities potentially available to the graphic arts industry. If projects of this sort were established, and data produced, it could be used in constructive discussion between the graphic arts industry, the paper industry, and government.

RECOMMENDATIONS FOR A PROGRAMME OF DEVELOPMENT PROJECTS TO MEET THE PRESENT AND FUTURE NEEDS OF THE MEXICAN GRAPHIC ARTS INDUSTRY

One may conclude from the Pira consultancy and SIT investigation, that the Mexican graphic arts industry should pursue a development programme. Every effort should be made to redress the balance between imports and exports of printed products, so that Mexico can become a net exporter of printed goods. Also, literacy development in Mexico can be either aided or impeded, depending on the efficiency of the graphic arts industry. It is obviously desirable in the national interest to have an efficient graphic arts industry, producing educational materials used in the development of national literacy at the lowest possible cost.

Export industries also require the support of an effective graphic arts industry, both for the production of sales literature and packaging materials. An inefficient graphic arts industry adds substantially to the overhead costs of these other export activities and is contrary to the national interest.

To develop the graphic arts industry under the present difficult trade conditions, an aggressive approach is required from a small, effective, and senior group of persons from within the industry, drawing on the expert services and support of outside agencies such as SIT, LANFI, ARMO, CENETI and Government Departments.

It is recommended that a programme of development projects be established related to:

- a) technology and materials testing
- b) information and marketing
- c) education and training

SIT and CNIAG should form three National Committees, each responsible for the investigation, establishment and implementation of a project programme related to the above topics (a), (b) and (c). It is suggested that initially the three SIT/CNIAG Committees be based on the lithographic section of CNIAG.

The reason for selecting the lithographic section of the industry is

- a) the lithographic process is the one most likely to expand during the next five years**
- b) the lithographic section of the Mexican graphic arts industry has already shown considerable initiative through the development of such activities as industry-wide paper purchasing schemes and training facilities.**

The lithographic section of the graphic arts industry should be used as a prototype, aimed at establishing a pattern of project development which would be followed quickly by other sectors. In particular, national committees should be established as soon as possible for the development of the bookbinding and serigraphic sectors.

SIT/CNIAG NATIONAL PROJECT DEVELOPMENT COMMITTEES

Each SIT/CNIAG Committee should have a leading industrialist from the lithographic industry as its chairman. It should also have a co-chairman from the staff of SIT and a technical representative from CONACYT. The President of CNIAG should be an ex-officio member of each of the proposed three Committees. The secretariat should be provided initially by SIT, but it is hoped that it would be possible ultimately to pass this responsibility to CNIAG.

The chairman of each Committee should be appointed by SIT, because SIT is an independent body and best able to make an independent judgment on the most suitable individuals to act as chairmen of the respective Committees. It is recommended that SIT should make the appointments in consultation with the CNIAG council representative for the lithographic sector. The members of the Committees should be appointed by SIT in consultation with the chairmen and should be appointed for a five-year period, with a review three years after the creation of the Committees. This period of appointment is an essential feature of the committee structure, if serious project work is to be developed and undertaken.

It is suggested that Pira, the research association for the paper and board, printing and packaging industries in the UK, be retained as consultant to the three Committees, to ensure adequate external back-up in the fields of technology, materials testing, education and training, and information and marketing. This consultant support will enable the Committees to make rapid initial progress with their work. The consultancy support from Pira would take the form of:

- a) consultant support to the three National Committees and
- b) specific expert consultancy related to any subsequent projects established by the three National Committees

The consultant role to the three National Committees mentioned in (a) above would make available sufficient staff time at Pira to enable the Committees to have verification of the project plans and assistance with project development. In addition, it would provide one visit per year to Mexico by a senior member of Pira staff for consultation with all three National Committees. Pira would

require an annual consultancy fee of US \$4,600 to provide this consultancy and make a senior member of staff available for a visit to Mexico every year for a three-year period.

All three Committees should be established by 1st January 1975. This early establishment is essential, as it is recommended that the chairman and co-chairman of each of the Committees, together with the President of CNIAG, should immediately undertake an external mission to the United Kingdom, in order to obtain background information related to technology, materials testing, information, marketing, education and training in the graphic arts industry. Such a joint mission which included all the Committee chairmen, as well as representatives of SIT and the President of CNIAG, will help to establish an identity of purpose between the three Committees, and provide initial stimulation and impetus to their work.

SIT/CNIAG NATIONAL COMMITTEE FOR LITHOGRAPHIC TECHNOLOGY AND MATERIALS TESTING - STRUCTURE, TERMS OF REFERENCE AND INITIAL PROJECT

COMMITTEE STRUCTURE

The Committee should have a chairman from the lithographic industry and co-chairman from the staff of SIT. There should be three representatives from senior management in the lithographic industry, one of whom should be from the Bank of Mexico printing works. Also on the Committee should be

- 1) a technical representative from the paper-making industry
- 2) a technical representative from the printing ink manufacturing industry
- 3) the Director-General of LANFI

The chairman and co-chairman should be encouraged to co-opt other specialists on to the Committee, capable of contributing to its work.

TERMS OF REFERENCE

The Committee shall, with the support of the lithographic sector of the graphic arts industry, seek to:

- 1) establish research and development projects to meet the needs of its industry sector
- 2) establish projects aimed at developing testing procedures and services related to raw materials
- 3) establish projects aimed at establishing national standards and test procedures
- 4) recommend to the appropriate official body the adoption of national standards
- 5) establish projects aimed at developing improved purchasing specification procedures
- 6) encourage the development of joint projects with supplier industries, aimed at reducing materials and equipment costs and improved materials performance
- 7) establish study projects, aimed at evaluating new materials, equipment techniques and processes
- 8) establish projects, aimed at the development of quality control devices, techniques and systems
- 9) establish projects aimed at improved production control and plant utilisation

- 10) establish the means of financing the above projects from:
 - a) industry contributions
 - b) supplier industry contributions
 - c) government grants
 - d) international organisation funds
- 11) ensure that the results of any project work undertaken are implemented in industry to improve its efficiency and profitability

INITIAL PROJECT - THE IMPROVEMENT OF PAPER PERFORMANCE

As paper can represent in the region of 50% of the cost of a printed job, it is essential that the performance of paper be optimized. To optimize paper performance, two things are required:

- a) a definition of the performance requirements demanded by the subsequent processes to which the paper is to be subjected
- b) recognition of the constraints of the paper-making process

Paper testing facilities should be established at LANFI so that these could be used to determine the performance characteristics of paper required by the lithographic sector. This information should then be related to the constraints of papermaking, so that the performance characteristics of paper may be optimized and related to production costs. Facilities for measuring the following paper properties would be required:

- 1) fluffing tendency
- 2) surface strength
- 3) pH and chemical content
- 4) moisture content and hygro stability
- 5) smoothness
- 6) opacity and whiteness
- 7) absorbency

The organisation of the project should be based on obtaining the cooperation of a number of papermakers and printers in selected end-product groups. Samples from various makings of paper could be submitted to LANFI for testing, and subsequently the same batches of paper when used in the associated lithographic companies should be observed and reported on, as a means of obtaining feedback, relative to the test results and performance characteristics of the paper. The project

would form the basis for the establishment of improved paper performance and, at the same time, would help to bring together the paper and lithographic industries to consider ways of reducing paper costs through a closer relationship between paper characteristics and the demands placed on the material by lithographic printers. It might lead also to the rationalisation of different types of paper, thus reducing costs through larger scale production.

SIT/CNIAG NATIONAL COMMITTEE FOR INFORMATION AND MARKETING - STRUCTURE, TERMS OF REFERENCE AND INITIAL PROJECT

COMMITTEE STRUCTURE

The Committee should have a chairman from the lithographic industry and co-chairman from the staff of SIT. There should be three representatives from senior management in the lithographic industry, and it would be desirable that these representatives should have a sales or marketing background. Also on the Committee should be

- 1) a representative from CONACYT, specifically concerned with printing information services to the graphic arts industry
- 2) a representative from the Mexican Institute of Packaging concerned with information
- 3) a representative from the Mexican Centre of Chemical Information
- 4) a representative from the Ministry of Industry and Commerce
- 5) a representative from IMCE (Mexican Institute for Foreign Trade)

The chairman and co-chairman should be encouraged to co-opt other specialists on to the Committee, capable of contributing to its work.

TERMS OF REFERENCE

The Committee shall, with the support of the lithographic sector of the graphic arts industry, seek to:

- 1) establish contact with sources of information relevant to the graphic arts industry
- 2) establish information services for the graphic arts industry
- 3) establish forecasting projects related to technology changes
- 4) establish joint projects with supplier industries to forecast materials demands
- 5) establish market research projects to identify areas of home market erosion from imported printed products, and recommend the national strategies to overcome this problem
- 6) establish market research studies, aimed at identifying export markets for printed products produced in Mexico

- 7) study the feasibility of establishing a graphic arts national export centre
- 8) establish the means of financing the above projects from:
 - a) industry contributions
 - b) supplier industry contributions
 - c) government grants
 - d) international organisation funds

INITIAL PROJECT - INFORMATION CENTRE FOR THE GRAPHIC ARTS INDUSTRY

In future, the graphic arts industry will increasingly require information services and facilities to gather and treat information and data, in order to determine its own future policies. The purpose of SIT is not to provide specific industry services, but to act as a national service to establish the need for information facilities and to play the role of an information marketing organisation. A typical example of this is the role of SIT in bringing about the creation of the Mexican Centre for Chemical Information, acting as a specialised information centre within the national industrial laboratories (LANFI).

A similar initiative should be taken relative to the graphic arts industry. It is suggested that the SIT/CNIAG National Committee for Information and Marketing should make its first project the study of the need in the lithographic sector for information and marketing services, with a view to establishing information services initially based on SIT staff but with the possibility of the transference of this activity to LANFI.

It is proposed that the Committee consider using the Pira computer-based information material as the basis for an initial service, which could be integrated with existing SIT Technical News services. It is also desirable that there should be coordination between this activity and the Mexican Institute of Packaging.

Once an initial information service has been established for the lithographic industry, the Committee is urged to move on rapidly to studies related to export/import relationships of printed goods in Mexico, with a view to making recommendations to CNIAG and Government, aimed at changing the present deficit on the import/export account.

SIT/CNIAG NATIONAL COMMITTEE FOR LITHOGRAPHIC EDUCATION AND TRAINING - STRUCTURE, TERMS OF REFERENCE AND INITIAL PROJECT

COMMITTEE STRUCTURE

The Committee should have a chairman from the lithographic industry and co-chairman from the staff of SIT. There should be three representatives from senior management in the lithographic industry, all of whom should have some involvement in matters related to education and training in the industry.

Also on the Committee should be

- 1) a representative from ARMO
- 2) a representative from CENETI
- 3) a representative from the Ministry of Education (familiar with the plans for a graphic arts technology education centre at Queretaro)
- 4) the President of the College of Managers for the Graphic Arts Industry
- 5) a representative from the Lithographic Union technical school

The chairman and co-chairman should be encouraged to co-opt other specialists on to the Committee, capable of contributing to its work.

TERMS OF REFERENCE

The Committee shall, with the support of the lithographic sector of the graphic arts industry, seek to:

- 1) recommend a national structure for training in the lithographic sector
- 2) establish the need for training by occupation and indicate the practical facilities required
- 3) recommend a national programme for the development of training materials and text book production
- 4) develop and recommend national training programmes for administrative and management personnel
- 5) develop a manpower requirement plan for the next five years
- 6) guide the introduction of the graphic arts engineering graduates now becoming available into the lithographic industry
- 7) In cooperation with the College of Managers for the Graphic Arts Industry and the Ministry of Education, establish recognised national standards for education and training in the lithographic industry

- 8) establish the means of financing the above projects from:
- a) industry contributions
 - b) supplier industry contributions
 - c) government grants
 - d) international organisation funds

INITIAL PROJECT - THE DEVELOPMENT OF A NATIONAL PROGRAMME FOR TRAINING PERSONNEL IN THE LITHOGRAPHIC SECTOR

There are a number of activities already taking place related to education and training in the lithographic sector. For example, there is the work being undertaken by the lithographic school provided through the finance of the Lithographic Union. Also, there is the small pilot study in Monterrey brought about through the initiative and generosity of the graphic arts industry in that district, the Italian project at Queretaro, as well as the facilities of ARMO and CENETI.

It is suggested that the SIT/CNIAG National Committee on Education and Training should, for its first project, seek to establish a national plan for training in the lithographic sector. To do this, it will need to undertake the following programme:

- 1) define the target populations and manpower requirements
- 2) define behavioural characteristics required and educational objectives
- 3) examine the subject matter required by (1) and (2) above
- 4) identify the levels of learning
- 5) define detailed level behavioural objectives
- 6) identify structure of programme
- 7) analyse types of learning
- 8) identify the learning conditions
- 9) draw up work and resource schedules
- 10) select the appropriate methods of instruction
- 11) select appropriate media and hardware
- 12) prepare learning material
- 13) develop case studies, project work, simulators etc
- 14) devise evaluation tests and test procedures
- 15) select validation groups
- 16) implement training for validation groups

- 17) apply tests and obtain objective assessments
- 18) evaluate results
- 19) revise material and programmes as necessary

The objective of this study should be to develop a comprehensive plan for technical education in the lithographic sector of the printing industry, drawing on the resources of ARMO, CENETI and the Lithographic Union school. Also, consideration should be given to ensure that the training facilities recommended can be made available nationwide. This will require thought to be given to problems of providing training courses outside Mexico City or, alternatively, developing schemes for block release of students to be brought to Mexico City.

SPECIAL PROJECT - OVERSEAS MISSION BY THE SIT/CNIAG NATIONAL COMMITTEE CHAIRMEN, CO-CHAIRMEN AND PRESIDENT OF CNIAG TO STUDY UK FACILITIES IN THE SPHERES OF TECHNOLOGY, MARKETING, EDUCATION AND TRAINING RELATED TO THE GRAPHIC ARTS INDUSTRY

The work of the three SIT/CNIAG National Committees needs to be developed rapidly. The Chairmen and Co-Chairmen of these Committees must take an active and leading role in formulating project work, and ensuring that the Committees are effective in initiating and progressing such activities. To provide impetus to this work, it would be desirable for the Chairmen and Co-Chairmen of the Committees to have the opportunity of examining technology, materials testing, information, marketing, education and training facilities in a country such as the United Kingdom. In addition to visiting the UK, it would also be useful to arrange for the mission to make selected visits in countries such as Italy and Germany.

Therefore, it is suggested that means of financing such a mission be explored to enable this group to undertake an external mission. It is recommended that the mission should spend a minimum of three weeks overseas, and that the following establishments should be visited:

- 1) The British Printing Industries Federation - this Federation should be visited to discuss overall industry organisation and, in particular, the provision of management services such as standard costing and estimating systems and inter-firm comparison schemes
- 2) The Printing and Publishing Industry Training Board - this organisation should be visited to study national training plans for the graphic arts. The PPITB has been responsible for the development of industry-wide training programmes related to management, administrative and technical needs. Their experience could provide very valuable background to the development work in Mexico.
- 3) The London College of Printing - this is one of the largest schools of printing in the world, providing courses for several thousand students. It offers the opportunity for representatives from the graphic arts industry in Mexico to view at firsthand the operation of a large educational establishment devoted to the graphic arts.

- 4) The Watford College of Technology, Printing Department - this college of technology has developed a specialist school in printing and was the first centre to offer bachelor courses in graphic arts. It also offers the possibility of master degrees. It is suggested that it should be visited to discuss the development of higher level studies and the likely demand for manpower in this sphere in the graphic arts industry.
- 5) Garnett Teacher Training College - this establishment is concerned with the training of teachers. It is one of two colleges in the United Kingdom concerned with the training of teachers in the graphic arts industry.
- 6) Pira, the research association for the paper and board, printing, and packaging industries - Pira is one of the largest graphic arts research institutes in the world and is concerned with research, information, marketing, and training materials development. It is suggested that a visit be made to the laboratories of Pira to view the facilities and work programme, as well as to hold discussions related to the consultant role which Pira might play relative to the graphic arts industry in Mexico.
- 7) It is suggested that a programme of visits also be arranged to large printing organisations, such as the International Publishing Corporation, the British Printing Corporation, and the University Presses of Oxford and Cambridge. These establishments would be asked to discuss with the representatives from Mexico their activities in the field of technology, materials testing, management control procedures, information, marketing, and training.
- 8) Visits to papermakers. It is suggested that a programme of visits be established to papermakers, such as Reed International, the Inveresk Paper Group, Tullis Russell etc, to discuss techniques of papermaking quality standards in papermaking, and materials testing procedures.
- 9) Visits to other manufacturers. It is suggested that a programme of visits be arranged to manufacturers, such as Crosfield Electronics, Kodak, Crabtree-Vickers etc, to discuss developments in technology and explore possibilities of graduate personnel from Mexico spending time in these organisations, in order to have the opportunity to develop post-graduate experience.

- 10) **Discussion Forum.** It is suggested that, following an intensive programme of visits and discussion around the United Kingdom, a one-day forum be organised either at Pira's laboratories or, alternatively at a management centre such as the Ashridge Management College (one of Europe's largest management training centres) in order to evaluate the mission, and relate its work to the work of the SIT/CNIAG National Committees.

Pira would be willing to undertake the organisation of such a mission, although financing would have to be provided either by the graphic arts industry in Mexico or CONACYT, or through the resources of an appropriate international agency. In addition to making all the necessary arrangements, Pira would also be prepared to undertake and lead the final seminar forum.

SUMMARY OF RECOMMENDATIONS

- 1 It is recommended that the work of LANFI be extended to include a materials testing centre for the graphic arts industry. Ultimately this materials testing centre should be enlarged to form a technology research and development centre, undertaking any projects necessary for the development of the graphic arts industry.
- 2 It is recommended that SIT establish immediately an information service for the graphic arts industry. Initially this should be based on an extension of the SIT Technical News, and then be developed into a comprehensive service, similar to that offered to the chemical industry. Ultimately, SIT should transfer this service, either to a separate organisation - possibly based on LANFI - or to a section of CNIAG. Finally, the organisation should provide marketing information, market research and forecasting services, with particular reference to raw materials requirements and export opportunities.
- 3 It is recommended that the work and activity of the Lithographic Union training school be extended to provide national training facilities for the lithographic sector of the graphic arts industry. Also, this school should extend its activities to provide all the training required by the lithographic sector, in addition to the purely technical training of craftsmen. To achieve this extension of activity, it is proposed that a national plan for graphic arts education and training be developed.
- 4 It is recommended that the three projects suggested above be implemented through the formation of three SIT/CNIAG National Committees: one responsible for technology and materials testing, another for information and marketing, and a third responsible for education and training. SIT should take the initiative in forming these committees as a means of implementing the complete project programme recommended in this report.
- 5 It is recommended that the terms of reference in this report related to the proposed National Committees be used as the basis of a project programme. It is suggested that the three National Committees be formed by the 1st January 1975. Thereafter their objective should be to ensure that the activities contained in the committee terms of reference should all be under way not later than three years after the formation of the committees.

- 6 It is recommended that the Chairmen and Co-Chairmen of the National Committees, as well as the President of CNIAG undertake immediately an external mission to the United Kingdom to study the graphic arts industry in that country as a preliminary to implementing the work of the three National Committees. Also, it is recommended that Pira be retained as a consultant to the three National Committees, to ensure that expert resources are available to implement the programme of work rapidly. To ensure that this consultancy is possible, it is proposed that CONACYT/SIT investigate immediately the allocation of UNIDO funds sufficient to cover the Pira consultancy for the next three years. A minimum sum of US \$13,800 will be required for Pira's consultancy to the three National Committees.

APPENDIX I

SIT REPORT ON THE GRAPHIC ARTS INDUSTRY

INTRODUCTION

The National Chamber of the Graphic Arts Industry requested the assistance of the Technical Information Service (SIT) of the National Council of Science and Technology in order to determine the technological and managerial information requirements of this industry.

Forty companies were chosen to represent all branches of industry and a program of visits was carried out to determine their information requirements in a preliminary way. All these companies are located in the metropolitan area of Mexico City.

STATE OF THE INDUSTRY

The graphic arts industry holds an important place within the national picture. It consists of more than 4,000 enterprises, of which about 3,000 are affiliated with the Chamber. Its capital investment is more than 5,000 million pesos, and it employs 81,500 persons (data furnished by the Chamber).

The industry is in a decisive expansion period, which calls for a better utilization of human, material and financial resources. Limitation on imports of books, pamphlets, etc. is being considered. This would open opportunities to efficiently attend actual demand. The decision will affect the supply of good quality paper and will demand the use of modern techniques in production, plant distribution and personnel training.

The graphic arts industry is placing emphasis on export activities; this means that special attention should be given to production systems in order to improve quality, price and delivery time.

REAL PROBLEMS

In the visits undertaken by the SIT to the 40 companies, manufacturing processes were observed in detail in order to determine the most important problems afflicting this industry. A tour through each plant was made and conversations were held with management and production personnel, including workers.

The results of the survey are presented below and are the bases to adequately satisfy the technical and managerial information requirements of this industry.

The fundamental problem of the graphic arts industry rests on the entrepreneur. It was observed that in the majority of the cases the most important problems are caused by the lack of managerial preparation of the entrepreneur. Decision-making is excessively centralized; delegation of authority within the individual enterprise is uncommon, therefore the entrepreneur must devote his energies to solve sometimes trivial problems. Even though the majority of the enterprises are small, they cannot effectively respond to market changes and to changes in manufacturing processes and methods. This problem affects deeply the future of this industry since a more mature management is required to respond to the limitation of imports and to export programs.

Entrepreneur and personnel working in the enterprises visited, possess a notable creativity and inventiveness, which is used to develop, modify and adapt manufacturing methods and processes, machinery and equipment. Some companies have developed their own technology which can be transferred to other enterprises and to other countries, representing additional sources of income.

Personnel Problems

- 1 Lack of technically trained personnel.
- 2 Lack of plans or programs to train and prepare personnel.
- 3 Lack of a feeling of responsibility of the personnel or the individual worker towards his work.
- 4 Ignorance of plans and policies for personnel management.

Raw Material Problems

- 1 Lack of and high prices of raw materials.
- 2 Inadequate utilization of and ignorance of other raw materials as substitutes.
- 3 Lack of planning in raw material buying.
- 4 Late delivery of raw materials.
- 5 Complete lack of quality control laboratories.

Manufacturing Problems

- 1 Lack of reference specifications and standards for raw materials, processes, products, etc.
- 2 Utilization of out-of-date machinery and equipment.
- 3 Ignorance of appropriate techniques on quality control.
- 4 Inadequate utilization of installed capacity.

Industrial Engineering Problems

- 1 Bad location of plants.
- 2 Inadequate distribution of the plant.
- 3 Inadequate production and inventory control.
- 4 Lack of cost control.
- 5 Lack of preventive maintenance programs.

RECOMMENDATIONS

- 1 The main recommendation is the managerial development of the entrepreneur. The decision recently taken by the Chamber to establish the "Colegio de Superacion del Empresario de las Artes Graficas" (College for the Development of the Graphic Arts Entrepreneur) is, undoubtedly, an excellent one since it centres on the main problem facing this industry. It would be very convenient to start the activities of the College with a cycle of conferences given mainly by Mexican industrialists renowned for their ability to manage their enterprises and who come from different branches of industry. It is also recommended the participation of those entrepreneurs of the graphic arts industry whose business firms are considered the most advanced both in their organization and in their planning and use of resources.

- 2 The plan for the expansion of this industry should be based on the development of the entrepreneur. Therefore, one has to stress that the greater number of problems faced by the industry can be solved if the quality of its entrepreneurs is improved.
- 3 There is also a very generalized problem which is the inadequate training of supervisors and workers. Regarding the training of supervisors we suggest that the Chamber requires the advice of ARMO (Adies tramiento Rapido de la Mano de Obra, ie, Fast Training of Labour) so that together they work out a training programme. The training of workers can take place in the same organization.

We believe that it is not advisable that the Chamber establishes a school for the training of workers, but that it uses the experience and facilities of ARMO.
- 4 The Chamber must take a more aggressive stand in the international level regarding the development of managers, supervisors and workers, using the scholarships and programmes that are offered by the governments of industrialized countries.
- 5 The Chamber should prepare a study on the development and implementation of norms and specifications. The National Council of Science and Technology could assist in these matters.
- 6 The Chamber should establish and maintain a close contact with associations and technical institutes in the international scene in the field of graphic arts, with the purpose of being up to date in the development of technological changes.
- 7 It should be studied the possibility of creating an applied research centre for this industry that should initially cover the main areas: lithography, linotype and binding.
- 8 A close study and promotion of national and international marketing should be made, the promotion with the collaboration of the Instituto Mexicano de Comercio Exterior. (Mexican Institute of Foreign Trade). It is of utmost importance to direct the efforts of this industry towards exportation.
- 9 With the cooperation of Nacional Financiera, the possibility of creating industrial parks should be studied, so that a number of plants can simultaneously share a common supply of raw materials, maintenance service and product distribution.
- 10 As for collaboration of the Chamber with the Technical Information Service of CONACYT, we suggest that:
 - a) Enterprises of the graphic arts industry be provided with information to promote administrative and technical improvement. Information provided by the SIT in its Technical News service could be published in a detachable sheet of titles of common interest, which would be included in the magazine which is published every two months by the Chamber. Copies of the articles in the list could be requested directly from the Chamber.

- b) Attention to the requirements of the industry regarding technical information be made more efficient by hiring an engineer, paid by the Chamber, who would join the SIT staff and would work out of its offices, thus profiting from the total of experience available through this organization.**
- c) An expert be requested through ONUDI, to obtain a more thorough study of the graphic arts industry in Mexico. Contact has been made with PIRA in England, which is favourably disposed to establish a consulting program to determine the technical information requirements of this industry.
PIRA has world-wide prestige in this field, has one of the largest R & D organizations and the best information center for graphic arts in the world.**
- d) Advantage be taken of contacts already established by the Chamber and the SIT in Latin America to promote Mexican technology already developed in this industry. Initial contacts with national entrepreneurs have been made through the Chamber's magazine. Nevertheless, in order to develop these, personal contacts should be established.**

APPENDIX II

DISTRIBUTION OF CNIAG MEMBERSHIP BY ACTIVITY

1	LETTERPRESS	2,096
2	LITHOGRAPHY	390
3	BOOKBINDING	137
4	PHOTOENGRAVING AND GRAVURE	76
5	STEEL ENGRAVING AND SOCIAL STATIONERY	54
6	VARIOUS:	
	Stereo	1
	Label printing	12
	Ink making	3
	Small offset and photocopying	53
	Trade typesetting	25
	Flexography	9
	Silkscreen printing	41
	Die cutting	21
	Various	34
	ASSOCIATE MEMBERS	33
	TOTAL	<u>2,990</u>

APPENDIX III

CNIAG MEMBERS DISTRIBUTION BY STATE

State	Number of companies
Aguascalientes	19
Baja California	33
Campeche	4
Coahuila	37
Colima	2
Chiapas	15
Chihuahua	44
Durango	13
State of Mexico	81
Guanajuato	65
Guerrero	32
Hidalgo	30
Jalisco	227
Michoacan	31
Morelos	28
Nuevo Leon	271
Oaxaca	19
Puebla	87
Queretaro	17
San Luis Potosi	36
Sinaloa	25
Sonora	19
Tabasco	4
Tlaxcala	11
Tamaulipas	74
Veracruz	67
Yucatan	32
Zacatecas	10

APPENDIX IV

CNIAG MEMBERS DISTRIBUTION BY CAPITAL VALUE

Number of companies	Value of capital US \$
225	under 200
538	200 to 400
418	400 to 800
336	800 to 2,000
387	2,000 to 4,000
289	4,000 to 8,000
254	8,000 to 20,000
288	20,000 to 40,000
66	40,000 to 60,000
73	60,000 to 80,000
78	80,000 to 240,000
13	240,000 to 400,000
27	400,000 and above

APPENDIX V

PRINCIPAL CHARACTERISTICS OF THE GRAPHIC ARTS INDUSTRY
 Census data - from 1965 to 1970

	Year of Census		Change	
	1965	1970	Absolute	Rela-
No. of establishments	3,848	4,628	780	20.3
Capital invested US \$	206,310,800.00	340,769,680.00 +	134,458,880.00 +	65.2
No. of persons employed	49,463	73,082 +	23,619 +	47.8
Wages and salaries US \$	61,691,920.00	100,213,920.00 +	38,522,000.00 +	62.4
Raw materials consumed	1,155,439,000	1,675,043,000 +	519,604,000 +	45.0
Other materials consumed	704,834,000	1,037,969,000 +	333,135,000 +	47.3
Aggregate value US \$	122,717,840.00	213,581,000.00 +	90,855,760.00 +	74.0
Production value US \$	271,539,680.00	430,622,560.00 +	159,082,880.00 +	58.6

APPENDIX VI

GRAPHIC ARTS INDUSTRY STATISTICS
(Based on census data for 1971 and 1972)

	1971	1972
Number of establishments	5,100	5,610
Capital invested US \$	391,885,120.00	450,667,920.00
No. of persons employed	77,736	81,572
Wages and salaries US \$	107,840,880.00	115,561,280.00
Raw materials consumed	1,842,564,000	2,026,192,000
Other materials consumed	1,103,953,000	1,206,429,000
Aggregate value US \$	224,260,640.00	240,390,960.00
Production value US \$	301,172,160.00	522,266,720.00

APPENDIX VII

MEXICO: CHARACTERISTICS OF THE BOOK AND PERIODICAL SECTION
OF THE PRINTING INDUSTRY

Categories	1965 ^a	1970 ^b	1971 ^b	1972 ^b
Number of establishments	636	786	821	895
Books and similar products	192	250	267	295
Periodicals and reviews	444	536	554	600
Capital invested (millions of pesos)	1339.2	1735.0	1867.5	2050.5
Books and similar products	692.5	999.3	1060.6	1165.0
Periodicals and reviews	646.7	735.7	806.9	885.5
Value of production (millions of pesos)	1583.5	2006.4	2264.1	2485.5
Books and similar products	504.2	709.1	914.0	1005.5
Periodicals and reviews	1079.3	1297.3	1350.1	1480.0
Personnel employed	16986	19350	21653	23815
Books and similar products	4500	5966	6141	6815
Periodicals and reviews	12486	13384	15512	17000
Wages, salaries, social security payments (millions of pesos)	308.9	372.4	477.7	525.0
Books and similar products	87.2	121.2	145.0	160.0
Periodicals and reviews	221.7	251.2	332.7	365.0
Raw materials consumed (millions of pesos)	464.4	556.4	596.0	655.0
Books and similar products	86.4	116.4	124.3	140.0
Periodicals and reviews	378.0	440.0	471.7	515.0

Sources: ^a 8th Industrial census 1965 General Statistical Bureau SIC
^b National Chamber of the Publishing Industry estimates

APPENDIX VIII

APPARENT CONSUMPTION OF BOOKS AND PAMPHLETS (Thousands of pesos)

Categories	1965	1970	1971	1972
Production	504,228	709,118*	914,008*	1,005,500*
+ Imports	74,450	177,060	297,150	526,838
- Exports	67,137	210,460	142,375	156,450
= Apparent consumption	511,541	675,718	1,068,783	1,375,888

* Estimates of the National Chamber of the Publishing Industry
Sources: Industrial Census 1965; National Chamber of the Publishing Industry
and General Statistical Bureau, SIC

APPENDIX IX

MEXICO: IMPORTATION OF BOOKS

Country of origin	1967		1970		1971		1972	
	tons	thousands of dollars	tons	thousands of dollars	tons	thousands of dollars	tons	thousands of dollars
Total	4,666	9,099	7,580	14,165	9,562	23,772	18,083	42,147
Spain	1,652	3,728	4,054	6,659	5,714	14,555	11,997	27,317
United States	1,861	3,444	1,815	3,794	1,753	4,462	2,231	6,060
Latin American Free Trade Association	448	719	798	1,390	882	2,016	2,673	5,788
Argentina	381	630	396	1,002	446	1,173	1,288	2,783
Brazil	1	2	7	6	51	129	764	1,921
Colombia	12	24	340	316	228	393	401	728
Venezuela	13	21	7	14	111	233	185	306
Uruguay	4	3	25	22	3	2	21	26
Peru	17	26	12	14	17	35	9	20
Chile	18	11	11	16	21	48	2	2
Ecuador	2	2	(106)	(75)	1	1	1	1
Bolivia	-	-	(157)	(104)	1	(480)	1	1
Paraguay	(89)	(52)	(230)	(160)	3	2	1	(480)
Central America	81	180	146	488	244	1,018	318	1,264
Guatemala	9	11	6	11	18	79	11	19
Costa Rica	4	7	1	4	2	2	6	19
El Salvador	1	1	4	5	4	5	2	9
Nicaragua	1	(240)	1	1	2	3	3	5
Honduras	1	1	1	(400)	(357)	(480)	1	1
Panama*	65	160	133	467	218	929	295	1,211
Other	624	1,028	67	1,834	969	1,721	864	1,718
United Kingdom	84	140	166	682	217	464	263	667
France	145	244	176	305	158	301	172	351
Holland	49	99	158	313	134	205	84	157
Japan	62	112	39	73	55	80	41	121
Italy	54	100	72	141	180	271	93	114
Federal Republic of Germany	50	88	67	157	52	95	38	97
Russia	37	39	25	26	37	30	64	49
Belgium	7	11	1	1	4	25	7	6
Others	136	195	63	136	132	250	102	156

* Includes Canal Zone

() Kilograms or dollars

Source: General Statistical Bureau, SIC

APPENDIX X

MEXICO: EXPORTATION OF BOOKS

Country of destination	1967		1970		1971		1972	
	tons	thousands of dollars	tons	thousands of dollars	tons	thousands of dollars	tons	thousands of dollars
Total	4,961	11,288	5,458	16,837	4,041	11,390	3,498	12,516
Latin American Free Trade Association	3,446	7,177	3,363	11,341	2,355	6,131	1,691	6,215
Venezuela	515	1,735	574	2,012	378	1,200	553	2,404
Colombia	851	488	824	3,471	204	1,071	443	1,950
Peru	612	2,226	459	1,608	620	1,484	254	1,011
Argentina	852	1,170	619	1,989	741	1,090	222	346
Ecuador	62	162	78	163	65	159	56	156
Paraguay	19	32	28	48	11	78	19	121
Chile	322	848	381	1,125	168	546	67	116
Brazil	76	232	123	226	46	141	38	58
Uruguay	92	192	224	597	72	244	27	42
Bolivia	45	92	53	102	50	118	12	11
Central America	431	1,374	470	1,228	371	1,241	504	1,951
El Salvador	70	229	89	184	97	422	147	574
Costa Rica	129	430	125	287	65	241	113	512
Guatemala	88	273	125	409	107	369	119	416
Nicaragua	97	317	74	209	80	116	72	290
Honduras	47	125	57	139	22	93	53	159
Panama*	163	621	300	632	265	744	340	826
Other American countries	328	642	508	1,476	302	977	482	1,804
Puerto Rico	279	532	437	1,324	284	923	467	1,763
Dominican Republic	49	110	71	152	18	53	11	22
Haiti	(7)	(4)	-	-	(313)	1	4	19
Others	593	1,474	817	2,160	748	2,297	481	1,720
Spain	329	894	406	1,290	370	1,020	275	814
United States	225	476	372	772	277	730	167	613
Federal Republic of Germany	1	5	11	24	6	30	9	200
Japan	1	2	1	1	1	1	4	30
Portugal	4	27	6	25	3	20	5	25
France	5	19	8	25	19	36	3	12
United Kingdom	14	21	3	6	44	312	10	7
Nigeria	-	-	-	-	15	111	-	-
Others	14	30	10	17	13	37	8	19

* Includes Canal Zone

() Kilograms or dollars

Source: General Statistical Bureau, SIC

APPENDIX XI

MEXICO: IMPORTATION OF BOOKS
(January-April)

Country	1972		1973	
	tons	thousands of dollars	tons	thousands of dollars
Total	4,783	11,586	7,091	16,672
Spain	3,169	7,595	4,987	11,723
United States	658	1,650	906	2,347
Argentina	282	569	475	1,095
United Kingdom	64	157	159	392
Colombia	188	305	184	383
Brazil	3	15	55	170
Japan	2	25	77	138
Venezuela	78	119	64	103
France	76	155	35	66
Holland	29	57	24	43
Panama*	179	833	21	31
Federal Republic of Germany	11	31	13	28
Russia	3	2	24	20
Italy	3	8	9	15
Others	38	65	58	118

* Includes Canal Zone

Source: General Statistical Bureau, SIC

APPENDIX XII

MEXICO: EXPORTATION OF BOOKS
(January-July)

Country	1972		1973	
	tons	thousands of dollars	tons	thousands of dollars
Total	1,731	6,806	2,748	9,989
Colombia	112	458	552	2,340
Venezuela	287	1,248	404	1,910
Peru	186	801	297	1,397
Peurto Rico	259	1,211	201	870
United States	91	351	221	596
Spain	147	371	170	510
Panama*	192	539	222	514
Guatemala	70	228	84	313
Argentina	46	84	126	260
El Salvador	84	322	65	237
Honduras	26	117	120	211
Ecuador	27	98	71	205
Brazil	9	15	55	135
Federal Republic of Germany	(18)	(16)	12	121
Costa Rica	76	360	32	119
Nicaragua	55	238	18	60
Others	64	365	98	191

* Includes Canal Zone
() Kilograms or dollars
Source: General Statistical Bureau, SIC

APPENDIX XIII

PRINCIPAL BOOK-PRODUCING COUNTRIES
Numbers of titles (first edition)

Countries	1967	1970	1971
Total	407,793	488,621	417,641
Russia	74,081	78,899	85,487
United States	58,877 ^a	79,530	80,569 ^b
Federal Republic of Germany ^c	29,524	45,369	40,354
United Kingdom	29,564	33,441	n.o
Japan	30,027	31,249	31,040
France ^c	19,021	22,935 ^e	22,372
Spain	19,380	19,717	19,762
India	10,617	14,145	13,614
Holland	11,262	11,159	10,827
Poland	9,694	10,038	10,443
Czechoslovakia	8,079	9,041	n.o
Italy	8,215	8,615	8,283
Switzerland ^f	6,041	8,321 ^e	7,205 ^e
Yugoslavia	9,226	8,119	9,815
Sweden	7,218	7,709	7,558
Rumania	6,085	7,681	8,224
Turkey	5,688	5,854	6,540
Finland	5,485	5,595	6,018
Hungary	5,301	5,238	6,468
East Germany	5,312	5,234 ^e	5,068 ^e
Portugal	5,522	5,219	n.o
Denmark	4,895	5,052	5,339
Australia	3,412	4,935	n.o
Mexico	n.o	4,812 ^e	4,432
Austria	4,987	4,781	4,861
Argentina ^c	3,645	4,627	n.o
Belgium	3,888	4,414	4,191
Norway	3,276	4,295	n.o
Korea	n.o	4,207	n.o
Bulgaria	3,754	3,799	4,188
Canada	3,782	3,457	4,205
South Africa	2,641	2,649	n.o
Egypt	n.o	2,142	n.o
Burma	n.o	2,127 ^e	n.o
Thailand	n.o	2,085	2,174
Israel	1,471	2,072 ^e	1,889 ^e
Greece	1,241	2,027	2,212
New Zealand	850	1,580	1,238
Iran ^c	1,231	1,381	n.o
Chile	1,556	1,370	1,090
Nigeria ^c	778	1,219	n.o
Peru	681	885	973
Malaysia	483	874	1,202
Hong Kong	1,003	723	n.o

a Only production of commercial books, omitting a large part of the total production

b Includes 13,182 publications of the federal government, & in 1970, 30,933 university text

c Includes other editions d Includes books published in Ireland

e Includes books for children and schoolchildren

f Includes books published outside the country n.o not obtainable

Source: UNESCO, Statistical Yearbook 1972, New York

APPENDIX XIV

TRENDS IN THE GRAPHIC ARTS INDUSTRY
(Census data 1945-1970)

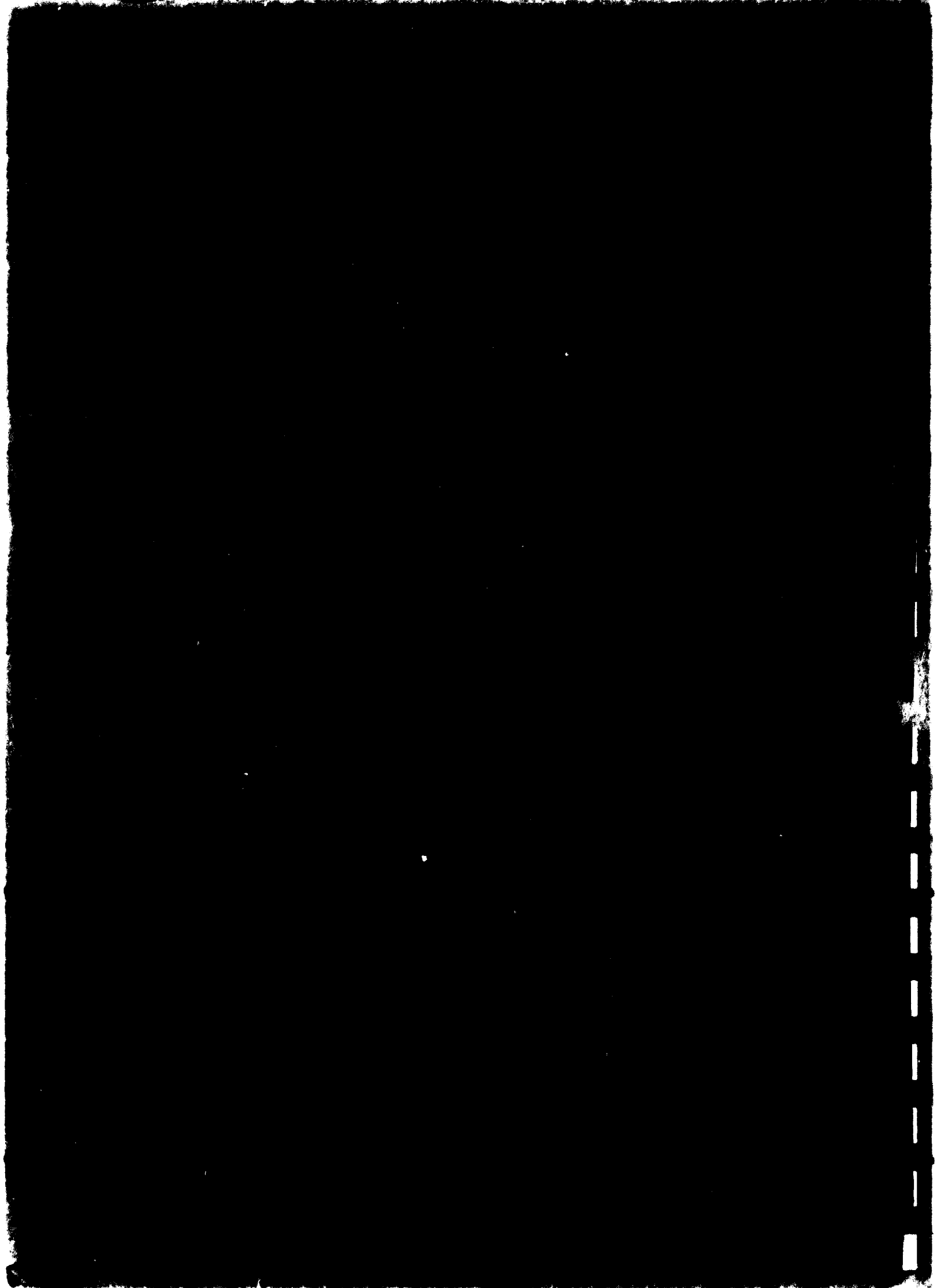
	1945	1950	1955	1960	1965	1970
Number of establishments	989	1,434	2,175	2,681	3,043	4,628
Capital invested US \$	8,341,120.00	21,460,080.00	51,501,600.00	95,237,200.00	206,310,800.00	34,876,968.00
Number of persons employed	37,811	17,606	44,971	30,630	49,453	73,082
Wages and salaries US \$	3,370,560.00	10,420,240.00	20,351,680.00	27,561,760.00	61,691,920.00	100,213,920.00
Raw materials consumed	40,801,000	158,934,000	446,502,000	610,488,000	155,439,000	1,675,043,000
Other materials consumed					704,834,000	1,037,969,000
Aggregate value US \$					122,717,840.00	213,581,600.00
Production value US \$	9,225,920.00	32,392,880.00	7,830,800.00	113,374,000.00	271,539,200.00	430,522,560.00

APPENDIX XV

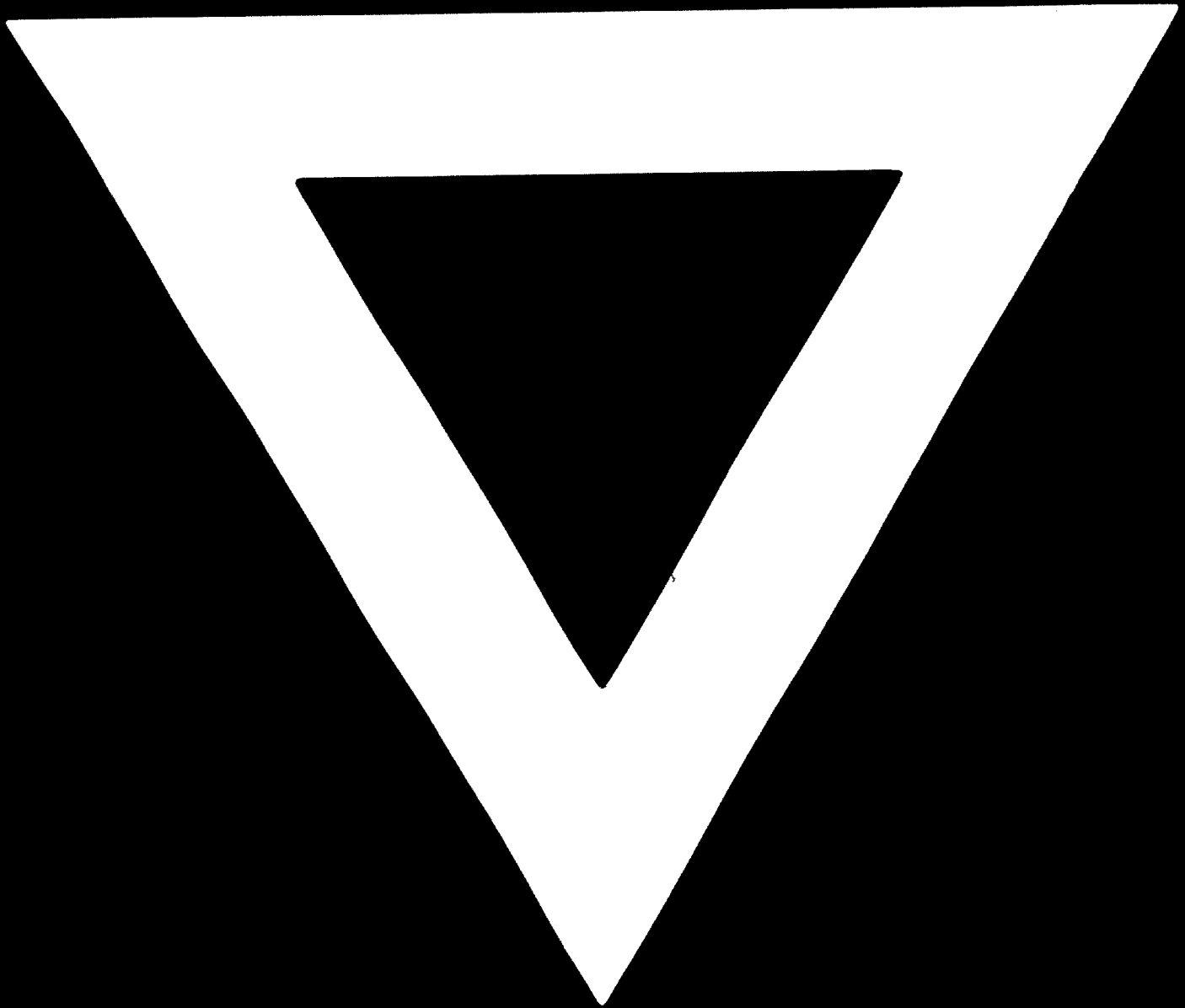
STATISTICS OF THE MEXICAN PAPER INDUSTRY
(Figures are expressed in thousands of tons)

	1960	1970	1971	1972	1973
A. CELLULOSE & PULP					
Total production	245.7	472.8	474.7	483.2	479.4
Wood cellulose	115.5	252.9	227.7	265.6	171.0
Bagasse	33.0	115.4	117.2	119.6	139.6
Wheat straw	26.0	22.2	18.9	9.8	6.9
Pulp	59.0	66.0	62.0	62.3	135.0
Others	12.1	16.3	14.6	25.9	25.9
Imports	67.8	170.1	115.9	125.2	228.9
Apparent demand	313.5	642.9	590.6	608.4	708.4
B. PAPER					
Total production	413.4	896.7	907.8	981.1	1,090.4
Kraft	55.9	120.2	121.1	122.2	141.4
Semi-kraft	124.8	344.8	355.0	301.3	287.7
Newsprint	13.7	40.0	37.9	39.7	42.0
Tissues	8.6	56.3	58.4	71.0	81.2
Cardboard papers	72.9	162.9	164.2	182.9	215.9
Printing & writing papers	61.7	145.7	125.2	144.5	173.1
Total imports	126.9	262.1	193.3	221.3	204.7
Apparent demand	540.3	1,158.8	1,101.1	1,202.4	1,295.1

Source: National Paper Industries Chamber, General Statistics Bureau, own research



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