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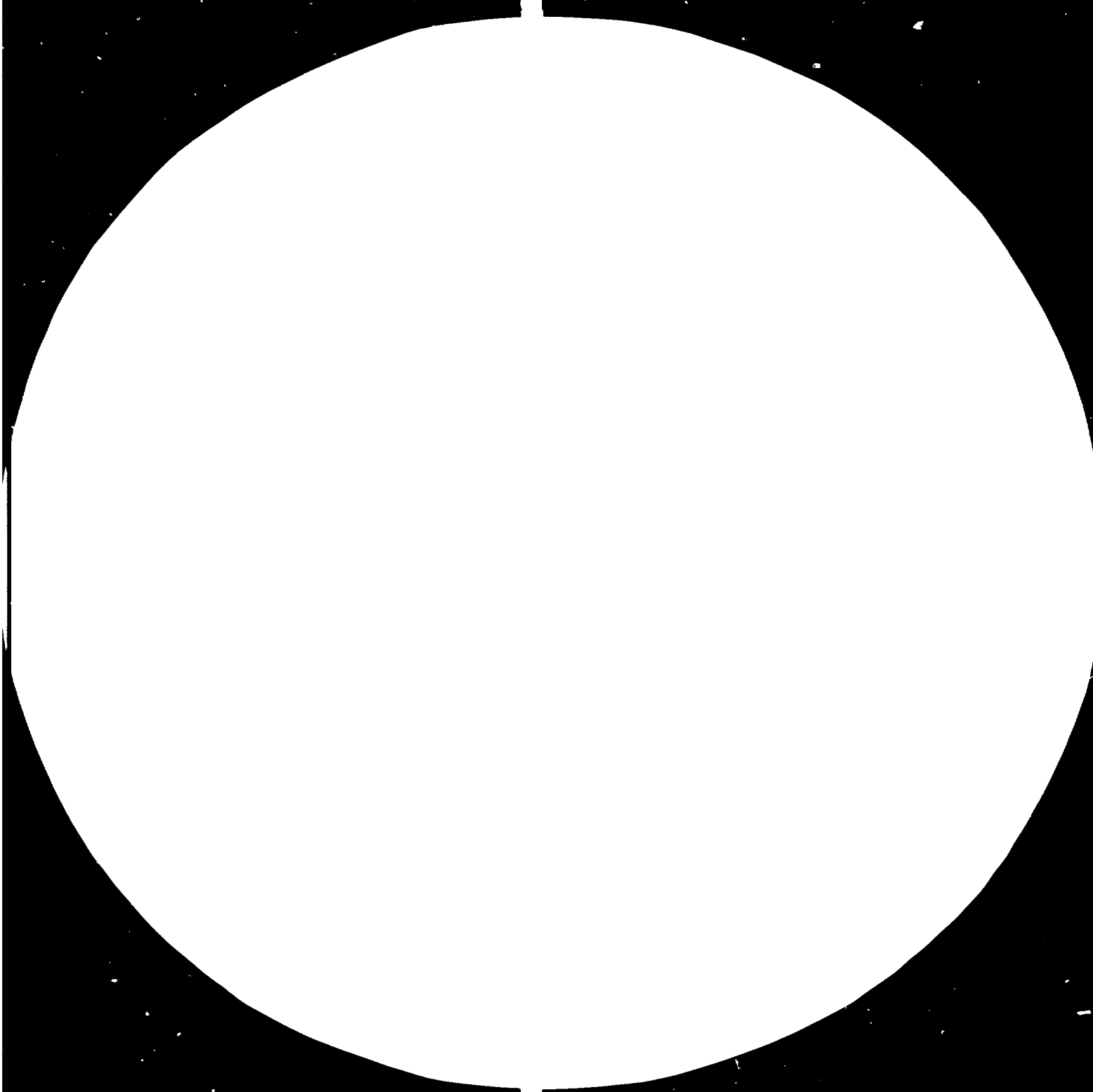

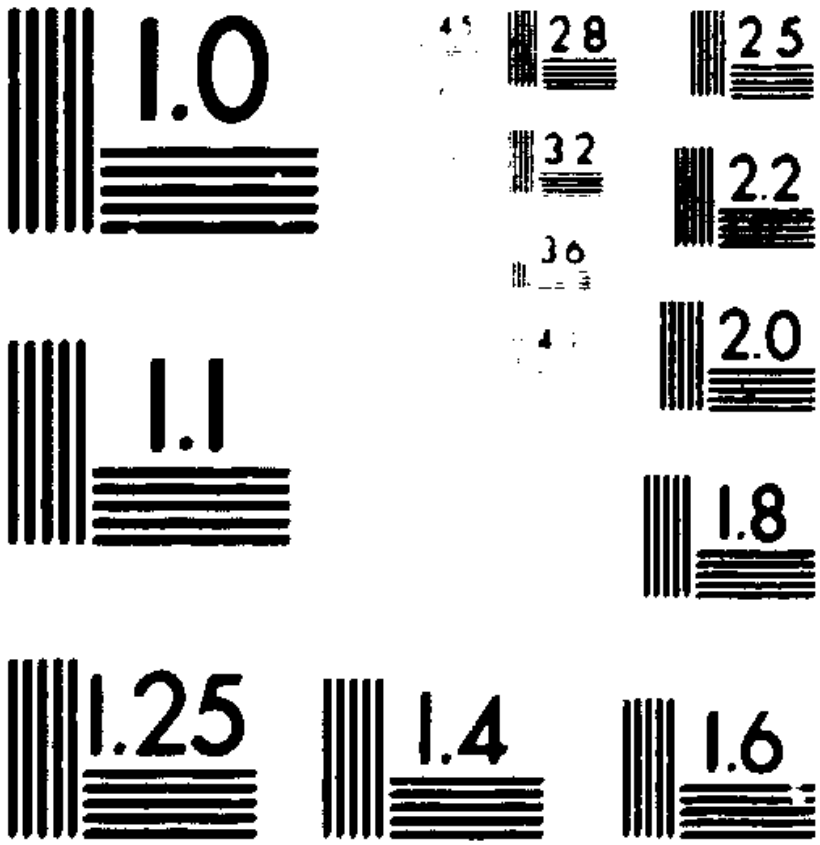

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PREPARATORY ASSISTANCE FOR THE ESTABLISHMENT OF
A NEW TEXTILE AND GARMENT TECHNOLOGY CENTRE

UC/BRA/92/009

BRAZIL

Technical report: Assistance to SENAI, Sao Paulo in formulating a project document for establishing a new textile and garment technological centre*

Prepared for the Government of Brazil
by the United Nations Industrial Development Organization

Based on the work of Peter W. Morgan, chief technical adviser, in collaboration with Helen M. Dunn, knitting specialist; Hansruedi Frey, weaving specialist; Werner Klein, spinning specialist and Arthur Scherler, dyeing and finishing specialist

Backstopping officer: J.P. Moll
Agro-based Industries Branch

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* Mention of company names and commercial products does not imply the endorsement of UNIDO. This document has not been edited.

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1. INTRODUCTION

With its clearly identified role as the national provider of industrial apprenticeship and training programmes for all aspects of Brazilian industry, SENAI has been and is in a unique position to be a very positive force for change at all levels of education and training. In the textile and garment industries, which are of major economic importance in the city and state of Sao Paulo, recent research projects undertaken by SENAI have clearly identified the need for a Textiles/Garment Centre in Sao Paulo which would more effectively service the requirements of the textile/garment industries than do the existing separate textile and garment schools which currently operate at different skill levels and on separate sites.

In an effort to encourage the modernisation of Brazilian industry the government has embarked on a new development and industrial strategy which would free enterprises from economic restrictions imposed by previous policies. With a much freer economy exposed to worldwide trading conditions the textile/garment industries will face rigorous competition from more efficient and market-orientated producers. To strengthen its position industry will need to benefit from extensive education and training programmes which will need to be provided by the proposed integrated Textile/Garment Centre.

To enable the visiting specialists to obtain as broad a view as possible in the time allowed extensive visits were made to the textile and garment industries in Sao Paulo city and state.

Details of these visits are in the annexes 3 and 4.

Visits were also made to the existing SENAI schools "Francisco Matarazzo" for textiles and "Engº Adriano José Marchini" for garments.

The first part of this report contains information on the educational visits followed by the recommendations for future training and education as proposed by the UNIDO team of advisors.

2. OBJECTIVES

The establishment of an Integrated Textile and Garment Schoool which will provide more extensive training and educational opportunities to service and support the wide-ranging activities of the textile and garment industries in the Sao Paulo region.

The emphasis of the school must be on the rigorous training of operatives, technicians and operational management staff (see Annex 2).

3. EDUCATION

Visits have been made to both the "Francisco Matarazzo" Textile School and the "Engº Adriano José Marchini" Garment School by the UNIDO specialists. This has enabled specialist areas to be seen as part of the wider textile/garment education provision and not just as a narrow specialist subject. The following sections reflect the individual specialist observations and cover accomodation, equipment, staffing, curriculum and industrial training and consultancy.

ACCOMODATION

The garment school has spacious uncrowded accomodation, is extremely well-maintained and set in pleasant grounds in a traditional garment/textile area of Sao Paulo.

Facilities for staff and students are good, with well-lit workshops and lecture rooms. A large hall provides excellent space for fachion shows and is well-used by industry for special presentations. In the general circulation areas around the entrance to the school there is ample space for exhibitions of work and information. The most serious and fundamental omission is the absence of a library and resource centre.

The textile school is well-looked after even though it exists within a very restrictive compound with no possibility of expansion. The laboratories and workshops are well-utilised and are very overcrowded. The accomodation for the teaching of academic subjects is satisfactory but teaching aids are minimal. The assembly hall is not large enough to accomodate the school for large events and is partly being used by the library for extra space as a reading room. The library itself is totally inadequate for academic and technical bibliography and there is minimal provision for international textile journals.

EQUIPMENT

Garment school sewing machinery covers all types of lockstitch, chainstitch, multithread chainstitch, overedge chainstitch, covering chainstitch, buttonhole and bar-tackers. The machinery was of a standard mechanised variety with very few having any electronic systems. This gives the sewing trainees little experience of this type of machine but more importantly leaves the mechanic trainees with no experience at all of electronic systems which are increasingly replacing standard equipment. There are no simple automatic garment handling or production systems.

Grading, lay-planning and marker-making use traditional methods but a Gerber CAD/CAM system is currently being installed in this area, it will not however have an automatic cutting-head unit. Lay-making is achieved with a simple spreading frame and all cutting uses traditional knives.

Pressing was done by hand-held steam irons and there were no steam presses. There were also no specialised fusing presses thereby limiting any teaching in fundamental fusing technology. Pattern-making and grading does not require specialised equipment for teaching practical skills but there were very few modern dress stands and none of a specialist nature as required for body-fitting garments.

The level of equipment across the school reflects the lower level of training courses offered. This itself mirrors a great deal of industry which also operates at a lower level and does not address the need of more productive and sophisticated methods.

Textile school - the vast majority of equipment in the school is out-dated and has been superceded by new technologies during the last 25 years. It is impossible to try to teach modern technology with such ancient equipment.

The following observations are from the individual UNIDO textile specialists.

Spinning - there are only 5 machines which are worth transferring to the proposed new school - all others should be replaced.

Weaving - the existing machines and models are too old and must be removed and modernised. It will be necessary for the school to decide which of the current machines will be used for elementary training and demonstration and can be integrated into the new school.

Knitting - there is no evidence of any electronic knitting machinery in any of the specialist areas of hosiery, warp, circular and V-bed flatknitting. Some of the machinery is of benefit for teaching basic techniques and should not be disposed of when replacements are considered, particulary the handflat knitting equipment. There is no knitwear garment making-up machinery whatsoever. All equipment is very well maintained.

Dyeing and Finishing - Contrary to spinning, weaving and knitting the equipment in the wet processing area is very functional. Besides perfectly maintained old equipment new machinery has been installed though most procedures can be reproduced in the laboratory.

For the future the following equipment should be installed.

An electronic colour matching system to enable practical instruction to be given in this field.

A magnetic screen printing machine to allow better reproduction of work.

An infra-red heated dyeing machine to enable even dyeing with good penetration of hard twisted cotton goods and thicker qualities of polyester.

For all the other processes which cannot yet be reproduced in the school, i. e. sanforizing and mercerizing, unfortunately no equipment is available on the market.

Laboratories - 50% of the equipment in the quality control and testing laboratory is insufficient for current testing standards and needs replacement and extended provision. Consultancy services for industry should be supported with a separate laboratory with its own equipment so as not to interfere with the teaching role and curriculum of the school.

STAFFING - The garment school is managed by a director, 3 co-ordinators for the regular courses and for training with industry and appoximately 30 other full-time staff most of whom are instructors rather than teachers - there are 3 or 4 part-time staff. SENAI requires that technical course staff instructing practical operative skills must have technical training and at least 5 years professional experience.

The textile school has three kinds of teachers. Academic teachers are responsible for the traditional academic curriculum and are normally university educated in their specialist area. Technical instructors teach the technical subjects of fibres, technical drawing, organisation and quality control, finishing, patterning, spinning, weaving, knitting, and computers - these teachers must have been textile technicians. Instructors train students to acquire practical skills in relevant practical subjects. The teaching staff are professional and very committed but are working within a rigid structure which allows inadequate opportunity for personal staff development. The heavy load of contact teaching, up to 36 hours out of 40, is totally unrealistic and can only allow teaching to take place at a very fundamental level. This is not a criticism of the staff but of the system under which they must operate.

CURRICULUM - Garment school courses are offered in four major areas - sewing, pattern-cutting, cutting and sewing machine mechanics. All courses are of 170 hours duration over five months and give students a basic level of training. The qualification is the lowest that SENAI offers and the school can give no higher qualification although it has the ambition to do so. The contents of each course are fundamental as might be expected within such a short training period but they appear to be carefully planned and taught. Areas such as CAD/CAM, pressing and fusing technology, electronic sewing systems are not addressed as there is little time and no equipment on which students could gain some

experience. The level of training excludes the need, at present, to consider training in quality control, production planning, supervisory, management and marketing skills except as special courses or as consultancy.

The textile school has 2 different courses. Textile technician (HP) course is a full-time course of 8 semesters. Students are 15 - 19 years old and they have satisfactorily completed the first 8-year cycle of elementary school. They take the academic course of the second cycle with professional textile studies.

Textile technician (COP) course is a 5-semester course taught in the evening. Students are 24 years old and have completed the first and second year of elementary school. They would normally be working in a textile plant and take only the professional textile studies.

During the 1st and 2nd semester course content on the HP course is nearly all academic. The 3rd, 4th, 5th and 6th semesters are divided into 55% textiles and 45% academic. Specialisation in one textile area takes place in the 7th semester while the 8th semester is appropriate industrial training. During the latter part of their course in the vacation period students will take additional industrial experience. Concern is expressed by the UNIDO specialists at the timing within the curriculum of the textile subjects.

The teaching content of the course, as evidenced by student handbooks which are given to them by teaching staff, indicates that a great deal of information is very basic and needs constant up-dating. The course content for knitting contains no information in knitwear garment assembly or of knitted trims production.

INDUSTRIAL TRAINING AND CONSULTANCY - The garment school has a co-ordinator for organising training courses for industry and he is supported by 2 permanent and 1 part-time member of staff. On average 12 visits are made to companies each month and 50 hours of time, given freely, are available to each enterprise. Most of the companies are small (1 - 99 employees) and training can be in-house or at the school depending on the specific requirements analysed by the staff. Training of operatives, organisation of production, financial costing and some management training is available. Additionally special short courses are regulary put on by the school depending on the demand. Courses vary in length from 24 to 100 hours and offer basic fashion design, silk-screen printing, quality control, quality inspection, time study and pattern-making for underwear and beachwear.

Industry is encouraged to use the facilities of the school to give fashion shows and presentations to the industry as well as providing extra-curricular information for the students.

The textile school offers a variety of short-term training courses of about 90 hours each course to the industry. Currently the demand for them is not high but for the future it will be a most essential need for the industry.

In-house training can be arranged to take place in the mills but this is usually at operative level.

There appears to be very little consultancy taking place in the school and the relationship between industry and the teaching staff appears minimal as staff have little time for developing this activity due to very high teaching commitments. This does need to be addressed.

4. RECOMMENDATIONS

ACCOMODATION

While fully supporting the concept of an Integrated Centre, the proposed site as well as existing and planned new buildings appear totally inadequate for the development needs of a comprehensive Integrated Centre.

The buildings are not large enough, particularly in the textile areas, to contain the range of machinery and equipment which will be required to modernise the technology of these areas. Our experience strongly advises that both spinning and weaving need approximately 50% and 100% more space respectively allocated to both areas. Knitting needs additional space for computer workstations, however what has not even been addressed in knitwear garment assembly. This essential activity encompasses both textiles and garments and should not be separated either physically or educationally.

The proposed dyeing and finishing area is too small to contain a sensible provision for printing and a separate testing laboratory should be provided if the centre wishes to service industry without interfering with the curriculum. The space allocated for the garment area appears more satisfactory but needs to include separate fusing and pressing sections. The pressing area must be able to properly service both knitted textiles, woven and knitwear garment. With correct provision of ducted steam presses.

The new centre will require a large and comprehensively stocked library with adequate workplaces, excellent textile and garment bibliography and subscriptions of a wide variety of international trade journals.

The site precludes the future development of the centre which will restrict long-term planning and efficient operation with no possibility of future development. It cannot be stressed forcefully enough that unless an enlightened, forward-thinking view is taken, a situation will occur which already exists in the textile school - no room for future growth. With the proposed increase of student numbers in both the textile and garment areas the situation would soon become extremely serious.

We cannot recommend or support the proposal that the new Integrated Centre be built upon this site. Having reached this conclusion we believe that it is inappropriate for us to advise on the detailed planning of space until this vitally important issue has been satisfactorily resolved.

EQUIPMENT

Comments from the specialist advisors in the educational section clearly indicate that the new centre must be prepared to massively invest in new technology if it is to seriously meet the challenges of the 21st century and to properly provide suitable training and education which will enhance the industry's expectations and provide a centre of excellence.

It is vitally important that the centre equips itself for the future and not just for the immediate present. It is unlikely that the centre will be in any physical condition to accept new equipment for at least four or five years and during this intervening period there will be further advance in new technology in all areas. Decisions therefore cannot be taken now on specific models for new equipment but only on the broad basis for the equipment types, otherwise the centre will find itself with machinery that has been superseded by new developments.

A rolling programme of replacements and additions must be constantly considered and it would be wrong to believe that one large pump-priming investment, though necessary, would be adequate for the following twenty years. Ideally the centre must equip itself with the most appropriate modern and advanced technology which, at the least, is equal to that which the more advanced and forward-thinking companies in Brazil are investing in themselves. Although cost is important and cannot sensibly be ignored, quality of equipment is a greater long-term benefit than the short-term expedience of a cheaper product which may cause difficult future problems of service and maintenance.

Machines will be required for training which can be repeatedly dis-assembled and re-assembled as well as machinery which will allow individual trials and product work. In spinning, for instance, equipment from the last generation-but-one can be used for the first activity.

SENAI should now begin a thorough and on-going research, survey and evaluation programme to establish quite clearly what both the textile and garment industries currently use and are planning for the future. This will have an important bearing on the decisions which will need to be taken when re-equipping. We would not expect all existing machinery to be replaced as some of it is extremely useful fopr teaching and demonstration purposes.

Equipment is suggested in annex 5 but what must be re-emphasized is to consider the future and not just the present requirements.

CURRICULUM

In seeking to advise on curriculum development we are very much aware of the federally planned academic curriculum which is an integral part of the Brazilian model for apprenticeship training and of the schooling system which precedes it. Our aim, therefore, is to suggest improvement which will enable courses to be delivered more efficiently and effectively and with great relevance to the industry. We have concentrated primarily on the existing Textile Regular Technical Course (HP) as the garment technology courses is not yet in operation. Our observations reflect the multidisciplinary nature of the textile course but those considering the garment technology course may wish to take note of our deliberations.

With such a short time, in reality 2 years, devoted to textile subjects we are concerned that the course is of a very generalist nature producing students with a little knowledge of many specialist textile areas but no thorough specialisation in any. It is our belief that the industry would be better served by producing students of a more specialist nature. Currently the course inhibits such development in all of the textile areas and in knitting specifically there is even greater variety with the different basic knitting and knitwear technologies.

Students should select a specialism at a much earlier stage in the course so that they can begin to build-up the knowledge base of their chosen area and acquire more detailed and sophisticated technology. Industrial training should take place for 2 semesters not 1 and be introduced at an earlier stage. The timing of this would need to be evaluated.

Annex 6 provides 2 examples, one encompassing a slightly more generalist viewpoint the other more specialist. Both, however, strongly supporting 2 semesters of thoroughly staff-monitored industrial training.

The first example demonstrates a more radical change to the timing of the delivery of subject matter by blocking subjects together but does not enable students to specialise until after their first more general experience of industry in semester 4.

The second example is more reflective of the current delivery of subjects but would enable students to select an area of study and specialise from their first industrial placement in semester 3.

Evaluation of this is strongly recommended and while acknowledging the different approach, evolved from experience, by the Brazilian system we would advise that an evaluation study is made, sooner rather than later, of the best practice currently available in Europe. The major points of earlier specialisation, timing of subject delivery and increased industrial experience can then be evaluated afresh.

Although believing that a radical approach might be even better reality would suggest that it would probably be more effective more quickly to up-date and adjust the existing system than to try to completely change it.

STUDENT PROFILE

The input of students into the courses depends entirely on the profile of the Brazilian educational system. It is not our task to advise on this but we believe that if our recommendations are carried through higher standards can be demanded and achieved. The output of the students will be correspondingly
higher and they will be more acceptable to industry.

Student input

TOF courses or similar provide one-semester training and currently most of the provision of lower-level courses at the garment school. They give students over 14 years of age basic skills for a qualified occupation.

At HP courses in the textile school, the student intake is at 14 years old after 8 years of elementary education. The courses are of 4 years' full-time duration.

At CQP courses in the textile school, students have experienced elementary first-cycle and 3 years second-cycle education plus 3 to 5 years' industrial practice in specialist areas.

Student output

HP qualified students should be fully competent in their specialist areas having completed the course in order to become skilled technicians and supervisors in industry. A short period of adjustment within individual companies may be necessary. Should students wish to continue their studies the top graduates should be qualified to undertake further advanced technical education at appropriate universities or equivalent-level institutions, such as the faculty of textile engineering at FEI.

CQP course output should be the same as the HP output.

STAFFING PROFILE

The profile for textile and garment teachers should be varied so as to enable the staff body as a whole to bring to their teaching a number of collective experiences. For the higher level of courses an ideal profile would encompass a degree from a university textile department e.g. textile engineering at FEI and a minimum of 5 years in industry with middle-management experience. Where it is possible to select from other SENAI garment and textile schools an advantage in widening communications in education would be achieved.

The prime activity should always remain student contact but not so exclusively that there is no formal allocation of time for other relevant activity.

Academic duties should include student assessment, the regular renewal of relevant subject teaching material, student counselling and personal up-dating of appropriate subject literature. These duties should be able to be satisfactorily completed during the allocated teaching week within the school environment if necessary.

All staff that we have met have been dedicated and professional but unable to benefit from a wide-ranging system of staff development because it is almost non-existent. This must be addressed.

Personal staff development should seek to establish constant contact with industry. Attendance at symposia and trade fairs should be undertaken at an international as well as national level so that staff can remain informed of technical advancement in the textile and garment industries. Staff should also be encouraged to organise conferences and to contribute to these as well as others in Brazil and overseas. After a period of 7 to 8 years' teaching sabbaticals should be allowed to renew staff contact on an experiential basis with the industrial world for which they educate and train their students. This could be in the form of consultancy, working within industry, obtaining a higher qualification or research to extend their subject knowledge or, if relevant, re-direct their career pattern.

A planned programme of guest lecturers would enhance the total educational provision for all staff as well as the student body.

Before the completion of the proposed new centre a comprehensive staff development programme is urgently required. This should include fellowships and study tours at home and overseas (see Annex 7). Staff interchange with other Brazilian institutions should be undertaken as a method of encountering different teaching philosophies both for the centre in receiving staff and for individual staff in experiencing other educational patterns.

As much of the technical literature is available in specialist textile/garment trade journals in English it would be advantageous for all staff to learn English so that they are able to constantly up-date themselves as soon as information is published and available.

Regardless of when the centre is built staff development should take place immediately.

INDUSTRIAL LIAISON

Students

It is imperative that students have industrial contact on their courses. This can be most effectively achieved by the introduction of 2 semesters of industrial experience as proposed previously. Additionally a comprehensive programme of industrial visits should be arranged throughout the different course structures.

Staff

As well as acompanying students on industrial visits and monitoring the supervision of students on industrial placements, individual staff visits should be planned particularly to enable them to build relationships with management at the highest possible level. Staff would also benefit from a staff programme of industrial placement within industry in a regular basis. Staff consultancy in industry can involve the centre in offering a range of services using its facilities in areas such as technical trials and prototype development.

What is of importance is a constant range of activity at all levels between educational and industrial personnel so that they may learn to understand and be supportive of each other's needs and requirements. Continuing dialogue could be formalised in the creation of active consultative committees which could support the centre as a whole or, if this appears to be too large and ineffective, as subject-group areas.

FUTURE DEVELOPMENTS

It was the future development of the proposed centre which caused us to debate and reach the conclusion that the physical limitations of the site and its buildings would, of necessity, limit future expansion and course provision which may not be apparent at present. One course provision which is not adequately available in Sao Paulo is a quality design course, there would not be space for this in the centre.

To be able to offer the industry a complete portfolio of courses we believe that design studies should be considered once the centre becomes established and has resolved any initial setting in problems. It is the logical conclusion of all the activity which will be encompassed in the centre and without design input there is no quality end-product. The areas which should be considered for future development are woven, printed and knitted textiles - woven and knitted garment design. It would be possible to provide design studies in both garment and home furnishings.

The centre should plan to offer in the future a permanent formal education programme for the up-dating of staff from industry. This should be targetted at lower to middle management and should seek to improve their knowledge and understanding of management, economics and technology in the textile/garment field thus giving them the opportunity to continue personal development.

The creation of excellent textile and garment technical services and consultancy will be a demanding task for the future centre. Apart from the inherent educational and industrial liaison between personnel previously mentioned it should generate income for the centre and be self-financing. Textile testing, lay-planning and marker-making, recipe making for dye-stuffs etc. are all areas which could be easily undertaken.

There are many productive and worthwhile opportunities if an imaginative and creative view is taken of the future development of the centre.

FURTHER ACTIVITIES REQUIRED

1. The most fundamental decision which must be made is the concept and magnitude of the project proposal.

2. Following this is the determination of the site, buildings, equipment and staffing levels.

3. Finally an evaluation of the investment and operational costs.

When these three have been decided a final decision can be made.

5. FINAL STATEMENT

We have welcomed the opportunity which has been given to us of being able to advise on the proposed Integrated Centre for Textile and Garment Education in Sao Paulo.

Worldwide competition is intense and the needs of industry and education can only be fully met when a broad and imaginative vision of the future is taken allowing growth which we believe is understood byt most of the people we have met.

We welcome the positive and far-sighted plans of SENAI and the industry in working together to provide a better and more secure future for the Brazilian textile and garment enterprises in the Sao Paulo region.

We have been most impressed by the pride and concern which SENAI school staff have for their respective institutions and by their enthusiasm and commitment for the concept of the new centre. They need and deserve the support of a first-class institution which can, in time, be one of the major centres for textile and garment education not only in Brazil but in South America.

It is possible to interpret some of the recommendations as being negative if the view is taken that the cost would be prohibitive. This would be a great mistake for without investment, particularly in education, there is no future. The future is about the will of the Brazilians in Sao Paulo to have vision and faith in their own energy to make it happen.

We would advise you to address very positively the major issue of space and accomodation from which all other decisions must flow. It is your concept, your country and your future - we believe in it, the question is - do you?

ANNEX 1

JOB DESCRIPTIONS - UNIDO

Purpose of the project

Preparatory assistance mission to assist SENAI-SP in formulating a project document for establishing a new Textile and Garment Technological Centre.

Duties

As Chief Technical Adviser the consultant will co-ordinate the work of an international team assigned to SENAI/Sao Paulo in a preparatory assistance mission. In close co-operation with his assigned counterparts the consultant will specifically be expected to:

co-ordinate the work of the international personnel assigned to the project, giving them all necessary support, assistance and advice throughout the duration of the project;

ensure effective co-operation between international and national project staff;

ensure co-ordination of project activities with related activities undertaken in Brazil by UNIDO or other agencies;

ensure the compliance with instructions concerning the timely preparation of the required reports;

participate, as required, in the review and evaluation of the project.

The following job description applied equally to all specialist consultants.

Consultants in the Spinning, Weaving, Knitting, Dyeing and Finishing, Garment Manufacturing Industries

- appraise the general level of the Brazilian spinning, weaving, knitting, dyeing and finishing, garment manufacturing industries and its institutional infrastructure for industrial training;

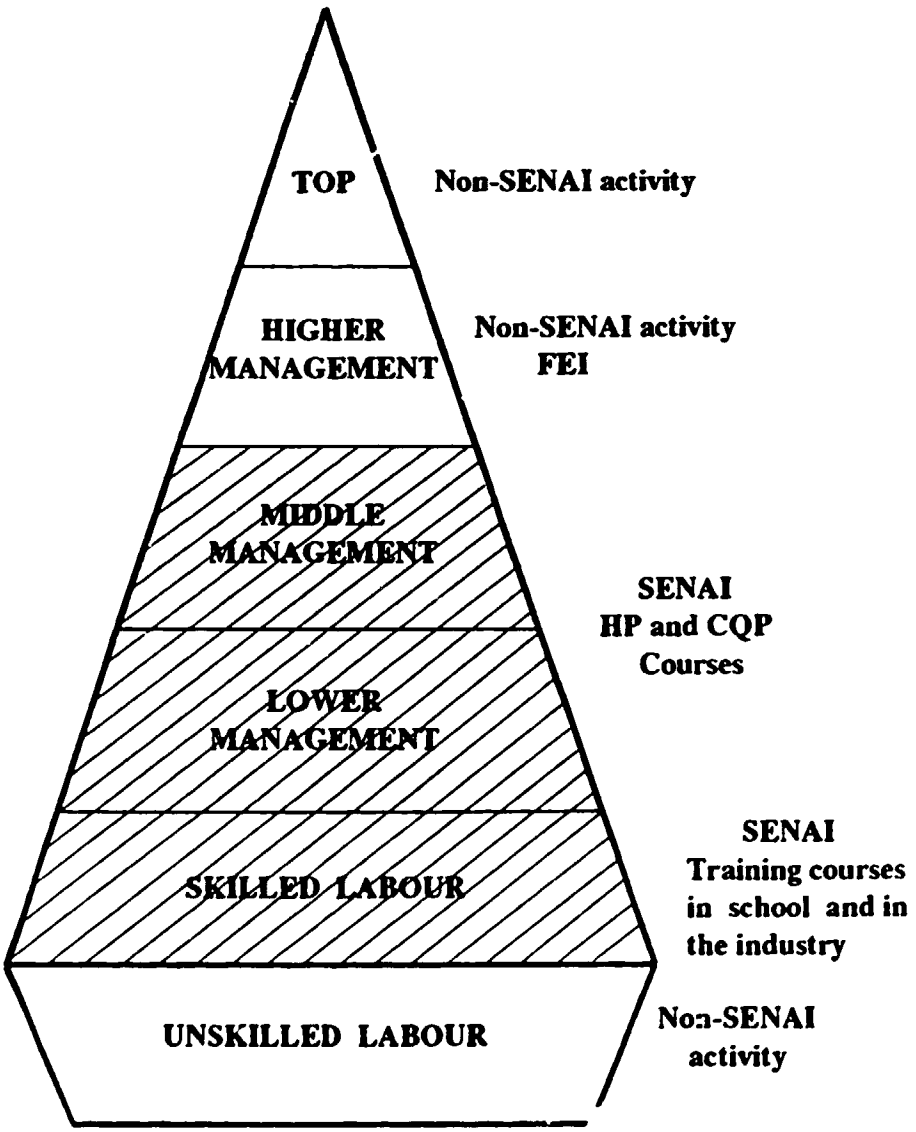
- appraise the general level of industrial practices (production, machinery and equipment, human resources) and the present level and future needs for industrial training in the textile manufacturing industries in the São Paulo region;

- analyse the development concept of SENAI-SP for establishing a new textile and garment technological centre;

- participate in the preparation of a draft project document, setting out the details and justification of the contemplated project objectives, outputs, activities and inputs, including the layout of the centre, preliminary equipment specification, study tours and training programmes for the counterparts.

ANNEX 2

FIELDS OF SENAI ACTIVITY



ANNEX 3

INDUSTRIAL VISITS - COMPANIES VISITED

A list of the companies visited by the consultants in their different specialist areas is detailed below with the major contact person. The size of the companies as classified by DPEA - Labour Market Studies, Research and Evaluation Directory is

(S) small (5 - 99 employees), (M) medium (100 - 499), (L) large (500+)

Spinning

(M) Fiação Vila Prudente - Sao Paulo
Sr. G. Chamma

(M) Corduroy - Sao Paulo
Sr. J. C. Capitani

(M) Gasparian - Sao Paulo
Sr. J. Bosco

(L) Cotonifício São Bernardo - Sao Paulo
Sr. Y. T. Okubo

(L) Cotonifício Guilherme Giorgi - Sao Paulo
Sr. J. E. Portilho

(L) Campo Belo S.A. - Indústria Têxtil - Santa Bárbara D'Oeste
Sr. A. Zulian

(M) Têxtil Nova Odessa - Nova Odessa
Sr. J. S. Souza

(L) Cia. Nitro Química Brasileira - Sao Paulo
Sr. M. L. P. Machado

Other visits

CETIQT - Rio de Janeiro
Dr. Arp - Dr. Hirschler

FEI - Faculdade de Engenharia Industrial - Sao Paulo
Sr. P. Apieri

Weaving

(L) São Paulo Alpargatas S.A. - Tatuí
Sr. A. Fortuna
(L) Lanifício Amparo S.A. - Amparo
Sr. A. C. Balaguer
(M) Carambella - Sao Roque
Sr. V. C. Pensa
(L) Indústria Têxtil Tsuzuki Ltda. - Suzano
Sr. A. Nakaya
(M) Fábrica de Etiquetas Helvetia Ltda. - Sao Paulo
Sr. E. B. Costa
(M) Fábrica de Tecidos Nella Ltda. - Americana
Sr. C. A. Guarda
(L) Cotonifício Beltrano S.A. - Santa Bárbara D'Oeste
Sr. H. E. Doring

Knitting

(M) Italina S.A. - Sao Paulo
Sr. Henrique
(S) Hobbyn - Sao Paulo
Sr. Nayda
(L) Rosset - Sao Paulo
Sr. F. Juchler
(L) Waiswol E Waiswol Ltda. - Sao Paulo
Sr. S. Waiswol
(M) Esge S.A. - Sao Paulo
Sr. F. Sauer
(S) P. Sayeg - Itaquaquecetuba
Sr. L.A. Rezende
(L) Rhodia S. A. - Sao Paulo
Sr. G. Campanatti
(L) Malharia Nossa Senhora da Conceição S.A. - Sao Paulo
Sr. E. M. Haddad

Dyeing and Finishing

(M) Tinturaria Pari Ltda. - Sao Paulo
Sr. R. M. Gornatti
(M) Têxtil Mouradas S.A. - Sao Paulo
Sr. E. Mouradas

Garments

(L) Levi Strauss do Brasil - Jardim da Glória
Sr. N. B. de Moraes
(L) Valerin - Itaquaquecetuba
Sr. E. Hara
(M) Affini-Aoka - Tietê
Sr. B. Paladini
(M) General Modas - Sao Paulo
Sr. S. Trezmielina
(M) Nutrisport - Sao Paulo
Sr. A. Isidoro
(M) Confecções Holanis Ltda. - Sao Paulo
Sr. J. R. Gandra
(S) Geneve - Campos do Jordão
(S) Dolena Confecções Ltda. - Mairiporã
Sr. E. Kaneco
(S) Louve - Santos

4 very small companies, each with less than 20 employees, were visited in Taubate.

Additionally visits were made to the SENAI "Mário Amato" School, which has combined three separate schools, to the Sao Paulo Mart Center - a large wholesale garment centre and to a private fashion college in Sao Paulo - Santa Marcelina.

ANNEX 4

INDUSTRIAL VISITS

Extensive visits have been made by the UNIDO specialists to all the main fields of the textile/garment industries. Small, medium and large enterprises have been visited and personnnel at all levels of responsibility have been encouraged to openly discuss areas of concern which affect their specific fields of operation. The findings which follow are those of the individual UNIDO specialists and they do of necessity reflect the specific and sometimes very different conditions of the specialist areas.

SPINNING

Introduction

Visits were made to 7 spinning mills and a viscose producer in the Sao Paulo and Americana region and were supposed to represent an average standard. Only one mill contained the newest development in machinery.

The aim of the industry is to reach good world standards in quality and economy very soon but the economic situation at present is in general unsatisfactory. Production time in some cases has decreased from 3 to 2 shifts. Also in some cases there has been a forced increase in export ratio from 20% to 80% even to 90%.

The yarns spun are in the range of Ne 4 - 18 (O.E.) and Ne 12 - 40 (ring) with one mill up to Ne 80 in Co, PES/Co or viscose. Quality parameters like CV, IPI-values and strength are mainly to be found between 25% and 50% of Uster statistics.

Buidings varied from old to modern, mostly air-conditioned or with humidification. Except for the old buildings there should not be any difficulty in installing new machines. In some cases air conditioning will need to be installed. The layout of machines in general varies from serviceable to good.

Machinery and equipment were, in most cases, a mixture of old and new though rarely very new except for some O.E. machines. The newer machines are mainly Trutzchler, Marzoli and Crosrol in blowroom and cards, Rieter in combing, Howa and Vouk in the preparatory section, Howa, San Giorgio in ring spinning, Autocoro in O.E. and Murata in winding. Except for O.E. and Murata automation is completely missing even for dotting at the ring frames. Some spinning mills contain spinning sections with mostly very old machines. The whole situation is typical of a closed machinery market with domestic machinery of foreign manufacturers. Only machines from the last-but-one generation are available. Connections to the latest development get lost e.g high-performance ring spinning and material cleaning. This always goes together with a fall-back in technology and to reach good world standards high investment must be made in improved machinery and technology. Quality control laboratories are fairly well equipped. Material handling is done to old not always satisfying methods.

Suggestions for improvement would be a shut-down of all old and unprofitable mills and to buy in future machinery according to its high potential profitability not to the lowest price. Investment must be part of a thorough evaluation programme undertaken by teams of responsible and knowledgeable staff.

Management staff is good, they carry out their responsibilities according to the situation in a capable way. For the future, however, the demands will be considerably higher; therefore, more will need to be done to improve professional qualifications (HP, CQP, FEI) as well as training & education for staff at all levels in permanent employment. Apart from this it is remarkable that most staff had been trained at SENAI.

Training facilities are available in most mills as they have equipment, staff and programmes, some mills also have additional pilot plants for training purposes Future needs however will demand higher efficiency, improved and uniform programmes and central control of the training process. The training needs of personnel who take over responsibilities at a higher level must also be positively addressed.

It is important to remember that these observations are the result of visiting only a very small proportion of the spinning mills even though they are said to represent a significant picture of the whole.

WEAVING

Buildings and Weaving Sheds

The buildings are partially in good condition, they are generously concepted and, in most cases, expansion is technically possible. Normal maintenance services are carried out. The factories were built in regions where workers can be recruited. The workrooms are friendly, well illuminated and have all the necessary social installations The buildings as well as the workrooms are secure with fire equipment.

Infrastructure

In every building provision of power, water, compressed air, as well as drainage, is good. During visits to factories there were no stoppages due to powerfaults In most weaving sheds air conditioning is installed but the capacity of some is too little to ensure good climatic conditions during the hot season. For cotton weaving values of about 24 - 26^{0} Celsius and 75 - 85% relative humidity in the production rooms should be guaranteed. Equally one must remember that efficient and future production machinery will require more power and therefore will also yield more heat. For correct calculation of air conditioning this must be taken into consideration, in future.

In future more room will be needed for transport-corridors in the production rooms as wide transport-gear for warp beams will be necessary. Consultation concerning layout and material flow must be obtained from the machinery manufacturer

In modern factories overhead cleaners will be installed and consideration must be taken regarding column distance and turning radius of the equipment.

Illumination must be generously calculated and should not lie below the standard of the textile industry. In the future one should think about noise protection on walls and ceilings The industry has developed specific noise-protection plates which can reduce high emissions of noise by several decibels.

Weaving Preparation Machines

Preparation machines are very old in all the establishments and not adequate for raising production in the future It seems that no investment has been made in this equipment. Sometimes it is difficult to obtain spare parts for these old machines. Should new, high-speed weaving looms be installed it would be necessary to substitute the preparation machines for new modern equipment. For efficient, high-speed weaving looms it is essential to provide correct warp beams.

Warping Machines

Modern warping machines satisfy all needs relative to warp quality, warp length and high production It is possible to work with various yarn counts on the machines without great alterations Warp beams were seen from sectional warping machines that were of very bad quality. With modern sectional warping machines the put-on of the band and the shifting are regulated automatically Many very bad warp beams were seen which, in the sizing department, caused major problems because of running out ends

Sizing Machines

Sizing machines are a very important factor in weaving preparation Mostly these machines are "bottle-neck machines" and therefore they must work correctly and be very productive Many bad-sized beams were seen in the weavings; these warp beams would give very bad efficiency with modern weaving machines It is necessary in many establishments to modernize the old sizing machines or to acquire the new technology.

Drawing-in Section

In the drawing-in section it is very important that the ends are not drawn-in crossed, many crossed threads were ooserved. The manner in which drawing-in is done in many establishments should be avoided. In none of the establishments was much attention being paid to drawing-in, it seemed as if it was an unnecessary factor. However, drawing-in should be considered very seriously, as the running of the warp beams on the weaving machines can be very strongly influenced. It would be advisable to acquire semiautomatic drawing-in machines. With these machines it is essential to prepare the warp beams correctly for drawing-in

Healds, Dropwire, Reed Cleaning

In not one establishment were cleaning machines seen for these very important attachments. However, it is necessary that the healds, dropwires and reeds are well cleaned and properly handled Cleaning correctly has great influence on the quality of the cloth and efficiency.

Weaving Preparation General

Only the most important points which need to be improved have been highlighted. In future more attention will have to be paid to weaving preparation. It must be possible for the textile industry to arrange for optimal weaving preparation in order to satisfy new and high demand. Top quality and efficiency in future can be reached only with optimal and newest technology-provided weaving preparation machines. In the near future productivity and quality will determine the market, therefore, the textile industry must take account of new technology as soon as possible. Many third-world countries have taken action in these last few years and today export their goods worldwide.

Weaving Machines

In many establishments very old machines of the shuttle loom type are still running and there are big problems with spare parts. In comparison with the production of these machines the spare parts are very expensive. Many parts were welded, sometimes more than once, and therefore the function of the machine is no longer guaranteed There were many weaving faults with these old machines and with such machines the quality of fabrics cannot be guaranteed

Production is very small as the weaving is done with very low revolutions or very deep weft insertion rates per minute With these old weaving machines it is not possible to weave 2, 3 or more cloth widths side by side In many cases machines are set for 4-colour weaving, but generally only 1 or 2 colours can be woven, as the machines no longer have full production capacity. Equally Dobby machines are in very bad shape. A very big disadvantage for the shuttle looms is that in every case pirn winding machines have to be present These machines are also in very bad shape. In no establishment were the winding heads in order, many were out of use or in repair. For good cloth quality it is essential to produce good weft pirns.

Some establishments have old and newer weaving machines running sometimes even air-jet machines In most cases however only newer weaving machines were acquired and no investment made in the weaving preparation, therefore there are many more problems with the newer machines as the warp yarn and the warp beam quality cannot be optimal

Many weaving companies acquire the warp beams from abroad and therefore have no influence on the sizing and warp beams quality Transport can damage the warp beams, long transport ways are very bad for their moisture content, many warp beams have too little humidity in the thread Handling, storage and transport equipment is relatively complicated and causes great expense.

Many establishments showed relatively very good efficiency but when one looks at the running weaving machines many are stopped. It seems as if one calculates with false numbers, i.e., revolution numbers or time units. This is very bad for each establishment as in the end only profit is conclusive. A relatively big part of these profits should be reinvested in new machines and equipment, as only in such a manner can the establishments continue.

The condition of the weaving machines is only partially satisfactory and in most cases the machines must be better cared for. Establishments must give better maintenance and train the right people to take care of this

If one observes the cloth quality on the machines and in the quality control one is partially surprised by the bad quality. Many faults are caused by the bad maintenance of the machines as well as by the weaving operatives.

The technical stand of the weaving machines is very old and bad, with few execptions Companies must try harder to reach the standards that are demanded today

Industrial Training

In all the establishments personnel are trained at the machines and without any theoretical preparation These machines are very old and it is impossible for the apprentice to learn new technologies because he will never be confronted with up to-date machines This kind of training is good only for the respective establishment and used only to train personnel in that establishment It is not an adequate instruction but only narrow teaching on how to operate the installed machines This is very dangerous because no new image or new knowledge can flow into the establishment. The learning time is very distinct, depending on the apprentice and there is no proper program.

With this kind of instruction young people are taught old technology which can be very bad for the development of the textile industry in future.

There is no kind of master in any of the establishments who could train young apprentices individually and who would also be responsible for their future career. No establishment sustains an apprentice workshop though in many, because of the size, this would be possible. It looks as if each establishment cares only for itself, the idea for the whole textile industry does not exist. The textile industry is not inclined - with all the disadvantages and ocurring costs - to facilitate knowledge to the younger generation The philosophy to supply the whole textile industry with a strong knowledgeable new generation does not exist. To instruct the new generation effectively needs training as soon as possible at installed machines so as to integrate people quickly into production. It would be of great advantage to the whole textile industry, to regard the problem of new generation with a positive outlook and to find new ways which would produce only benefits for the whole industry. It has been demonstrated, in bad times, that an exchange of know-how between establishments can bring only advantages for the whole industry and therefore make them more able to compete.

The idea of a big family in the textile industry and of training newcomers must be intensely studied. The family can only be successful and endure if in future each new generation is able to understand and solve the problems Crises can be resolved if each new generation has good ideas and is knowledgeable.

Industrial training must be improved, the textile industry is self-responsible for its own regeneration, cooperation with experienced educational centers must be encouraged and undertaken

KNITTING

Knitting is a term which covers many aspects of knitwear and knitting technology Visits were made to 8 companies covering a wide cross section of the industry It is necessary to define the textile knitting industry as seen in the Sao Paulo area, this is, Cut and Sewn Knitwear, Hosiery, Double and Single Jersey Circular production and Warp Knitting No evidence was found of fully fashioned or hand knitting.

Within these areas many manufacturers had vertically integrated production incorporating texturisation, coning and splitting, printing, dyeing and finishing as well as the knitting process and garment assembly. The appraisal visits consisted mainly of fabric production when produced on warp and circular machines, the total production in the cut and sewn sector and in all cases examination of the final product.

Cut and Sewn Knitwear

The decision of yarn purchase is always controlled by the type and gauge of machinery and the target market sector. Easy-wash acrylic yarns are most commonly used. This is demanded in the home and South American export market. Very little natural fibre was seen other than some cotton. Fancy yarns consisted of chenille. Most yarns were produced in Brazil although some yarns were imported from Egypt and France. Equipment used in the knitting sector was relatively old with computerised circular machinery, some computerised V-bed flat machinery, mechanical machines and handflat machines. Machine types were Jumberco, Universal and Dubied.

Handflat knitting was evident although currently being reduced. This was also used by knitting out workers. The knitting plant followed the usual format of mixed gauges ranging between 5, 7, 8 and 10 gauge. Handflat knitting machines were used for prototype development with experienced technicians producing structures suitable for power knitting. Electronic training was provided by the machinebuilders with senior technicians spending approximately six months in Europe to gain full experience.

The normal pattern of production was observed with control and technical understanding on existing making up machines. All standard processes were being used - Drawthreading, First Press, Cutting (handshears and handknife), Overlocking, Strapping, Buttonholing, Necklinking, Pockets, Handfinishing, Final Press, Packaging and Despatch.

Operative training for knitting, pattern cutting and operative skills was from SENAI Schools or own training. Specialist electronic skills were provided by machine builders in Europe.

The product was of an exceptionally high standard of quality in both fabric and makeup. A conventional approach to selling the product was observed with two ranges per year being sold through showrooms and agents. Own label use alongside licensed designer labels Daniel Hechter and Liz Claibourne. Production was for both the home market and export to North and South America and Europe.

Warp Knitting

Recession in both the World and Brazilian market was evident within these companies with many machines not in use. Companies were trying to address this issue in a positive manner. Larger companies had provided massive investment into million-dollar computerised warp-knitting machines. Karl Mayer machinery was in use. This type of machinery demands sophisticated, well trained and flexible technicians who are willing to develop new concepts. The brightest technicians were sent to the machine builders in Europe to study electronic equipment. Managers also attended ITMA.

The Product. In the larger companies fabric end-use was for swimwear and underwear. The way forward for companies is to have strength in design and trend appreciation in order to remain amongst the world textile leaders. Examination of the end product reveals a competitive edge in colour, style and print. In these vertically operated companies print techniques were exploited in metallised effects, devore and three-dimensional rubberised prints. The production in swimwear (over 60%) was for the Brazilian and South American market. Products were sold through agents and by showing at International European tradefairs, e.g. IGEDO.

Jersey Fabrics

Circular jersey fabrics were generally combined with warp knitting producing fabric by the length. These fabrics were produced for the sportswear & casual wear market. Fine ribs and lycra fabrics were produced on Terrot and Bentley machines. Where there was more concentration in the jersey areas, dyeing, finishing and printing were also incorporated but in some cases the final garment was produced in a different company that specialised in garment manufacturing.

The product, if produced as fabric, was sold through wholesale fabric warehouses. There was an emphasis on quality of fabric with a low percentage of faults. A "quality chain" was formed through good quality fabrics into good quality garments. Lycra fabrics, which respond to world fashion demand of body fit, presented technical problems in both the knitting and finishing. Yarns were purchased from Korea.

Hosiery

The hosiery manufacturer visited was efficient and forward thinking. Large investment had been made. The company employed 900 people with purpose-built factory premises. The industry operated with modern production methods and planning. Microcomputerised stock control and top quality products were evident.

A vertical plant covering raw fibre texturisation, winding, lycra covering and dyeing cottons. Ranges of yarns were purchased from Brazil, Switzerland and USA. Production was on a three shift system which signalled a reasonably buoyant market. A variety of knitting machinery was employed with Lonati electronic machines alongside less sophisticated equipment. A female labour force of knitters and making-up operatives had specialist technicians and maintenance staff for support. A standard of quality was imposed throughout production although this was not an essential consumer demand. The concept of quality was vitally important with Japanese philosophy of worker participation and daily evaluation of quality. A positive attitude, with a five-year plan for company development, was under consideration. The recession has hit the industry with markets not so buoyant. Quick response and positive understanding of the South American market continues to satisfy production.

General Conclusion

The industry in general, throughout the specialist areas of knitting, was certainly being hit by the world recession. There was a general feeling of concern about this situation but the more positive companies do recognise that investment, although difficult, is necessary, along with positive thinking in training and upgrading of technicians for a more sophisticated approach towards electronic machinery. It was also recognised that communications at all levels of the industry and education is necessary in order to overcome the difficulties that may be facing them in the future.

DYEING, PRINTING AND FINISHING

In the Sao Paulo region there are 570 wet processing factories, 10% large, 25% medium-sized and 65% small and micro companies. Whereas the small/micro companies, in most cases, produce very low quality for the local market, the large factories often meet European standards and are therefore able to export. About 50% of the medium companies manufacture good quality products for the home market, some to an excellent standard.

70% of the total Brazilian textile production is cotton, 15% polyester mostly blended with cotton and the remaining other fibres and blends.

Buildings vary from old, sometimes even open-air, to modern. Machinery and equipment are, in most cases old, but still of good productiveness. Very old machines have usually been replaced by domestically manufactured machinery of foreign manufacturers - mostly Italian. Laboratories are generally insufficient for the correct preparation of work for the factory. Only 9 companies have modern electronic colour matching units. Many companies therefore need the constant assistance of the local organisations of the major dye-stuff manufacturers. This help at the moment is still easily obtainable but due to the economic situation of the dye-stuff manufacturers this could become more problematic.

The technical staff appear to be competent for everyday work but needs to be trained in order to meet the problems of the future. Most of the staff have been trained at SENAI. In the future training and education at all levels of staff must be intensified both on-the-job and outside the workplace - SENAI, congresses, expositions, visits to machine manufacturers and to dye-stuff suppliers.

The economic situation of many companies, particularly the small and micro ones, is rather critical. It would therefore not be surprising if more and more inefficient factories closed down, a situation which, in Europe and the United States, started 20 years ago.

GARMENTS

The garment industry differs fundamentally from the textile industry in one great respect as it has more than four times as many small and micro companies and half the number of large companies than the textile industry. The medium-sized companies in both areas are comparable. In total there are seven times as many garment companies than textiles but they only have 7/8% more employees. Visits were made to two large companies (over 500 employees), four medium-sized companies (100 - 499 employees) and seven small/micro companies (0 - 99 employees). Products ranged from individual made-to-measure garments to a well-known international jeanswear label.

With the dominance of smaller companies it was not surprising that there had not been much investment in modern specialised manufacturing machinery as their low production levels and flexible products would not have benefitted too much. What was unexpected was the lack of investment by the medium and larger-sized companies as they could have benefitted very quickly from increased production and quality standards.

In the pattern-making, lay-planning e marker-making areas there would have been an immediate saving in efficiency of labour, fabric utilisation and time with the introduction of CAD/CAM equipment. The cost of this could have been offset by offering services to companies without such equipment but there was little enthusiasm for this concept. There was an opportunity for computer-aided cutting in the larger companies but they did not seem prepared to take a long-term view in the current economic conditions. Some companies had made investment and although not reaping the maximum advantage at the moment should so in the future when trading conditions improve.

A common complaint was the lack of suitably trained operatives, supervisory and production staff. Larger companies had run in-house operative training but this had ceased during the last two years. Any training taking place now would be "on-the-job" variety learning as quickly as possible from an experienced operative who had probably had a similar experience herself.

All companies were aware of SENAI and many had ex-SENAI students at various levels in their organisation, the majority at operative or slightly higher positions. There was general support for training although some reluctance was expressed that staff sent for training at a higher level would demand more money, leave the company, or be poached by rival enterprises - this view was not uncommon! Without exception all companies had drastically reduced their labour force in many cases to less than half of what it was two years ago. Few companies appeared to have any policies to create a highly motivated and committed labour force.

The organisation of space and equipment to improve production and general efficiency was poor in the smaller and sometimes the medium-sized factories. There were obviously systems which worked but they appeared to have evolved over a period of time and no-one appeared to have taken a fresh look to see how efficiency might be improved just with existing space and equipment or even with one or two more productive key machines. As small companies account for 2/3rds of all garment companies their needs must not be overlooked.

All companies sold from ranges, except the large multinational jeanswear manufacturer, and few companies appeared to be making positive efforts to build up mutually beneficial relationships with the larger retail organisations as is usual in Europe and America with their powerful and influential retail groups. The buying power and influence of such groups appears less developed in Brazil but the manufacturers feared that their margins would be so low as to not to be worthwhile. Much of their production went into stock to be ordered from ranges on offer as the wholesalers and smaller shops required. More market research and a willingness to work with the larger retail companies could be of long-term benefit particularly if it can raise quality standards, this could provide a stronger base for export potential.

The product base was wide - mens' and womens' underwear, nightwear, swimwear, knitwear, corporate identity clothing, jeanswear, childrenswear, women's "classics", silk-screened leisurewear and bed-linen. Inevitably with such a wide range it is impossible to compare similar products, however, the manufacturing quality of most products was good, in some cases excellent. They seemed to represent the middle price range of the Brazilian market. The basic quality of the fabrics, most of which were Brazilian, was acceptable for the domestic market but lacked colour and textural interest for the more sophisticated international market. Styling ideas, except in one or two companies, were not strong and the trimmings available to manufacturers from domestic suppliers are of poor design and quality. Many of the designer/owners had the opportunity to travel abroad and be exposed to current information but the infrastructure of the domestic fabric, yarn and trimming suppliers is unable to support a more sophisticated market. Although visits were only made to thirteen different companies, a very large wholesale ready-to-wear centre with five hundred exhibitors catering for the middle/lower market was visited and a much smaller centre which was dearly down-market in both the styling and quality of merchandise. While companies concentrate on the domestic or South American markets they are unlikely to improve their styling input. Exposure and activity in the international arena will be a way to respond to new design development and innovation wherever it occurs.

ANNEX 5

EQUIPMENT

In many cases the equipment list contains recommendations for specific machinery and equipment where it is possible to do so. Sometimes only the type of machinery and equipment is given. Much standard equipment can be obtained from a variety of manufacturers as indicated. A bracketed figure shows the number of machines needed of that particular type. It will not be necessary to replace all existing equipment.

SPINNING

Short staple spinning

The following machines can be transferred from the present School

(1) Drawframe, Fasa-Zinser	1981
(1) Roving frame, Howa	1988
(1) Ring frame, Howa	1988
(1) Winder, Murata	1982
(1) Winder, Murata (with reservation)	1981

New Machines	Suppliers
(2) Automatic cone winder	Murata, Savio, Schlaffhorst
(1) Blowroom line	Rieter, Trutzschler
(2) Cards with chute feed	Crosrol, Marzoli, Rieter, Trutzschler
(2) Combers	Rieter
(1) Drawframe - normal	Rieter, Vouk, Trutzschler, Zinser
(1) Evener drawframe	Rieter
(1) Pre-combing lap winder	Rieter
(2) Roving frames	Howa, Marzoli
(2) Ring frames - one with auto-doffer	Howa, Rieter, Toyoda
(2) Rotor spinners	Rieter, Schlaffhorst
(1) Two-for-one twister	Saurer - Volknung
(1) Two-step twister	Saurer - Hamel

Space must be made for a new spinning system machine. Same degree of automation will be required in future and nearly every new machine needs more space than the replaced one.

Worsted and semi-worsted spinning

(1) Opener	Thibeau
(1) Card	Thibeau
(1) Fill	Schlumberger, St Andrea
(1) Comber	Schlumberger, St Andrea
(1) Reducer fill	Schlumberger, St Andrea
(1) Roving frame	Schlumberger, St Andrea
(1) Worsted ring frame	Schlumberger, St Andrea
(1) Semi-worsted ring frame	Schlumberger, St Andrea
(1) Finisseur	Schlumberger, St Andrea
(1) Cone winder	Murata, Savio, Schlaffhorst
(1) Fancy twister	Saurer-Alma

Others

(1) Texturing machine

WEAVING

Weaving Preparation	Suppliers
(1) Direct warping machine, incl. parallel or V-creel	Benniger
(1) Sectional warping machine, incl. parallel creel	Benniger
(1) Sizing machine, incl. warp beam creel, 1 sizing box, minimum 4 drying cylinders, beaming machine ande size cooking equipment. Also necessary would be a steam escape bonnet and 1 special delivery unit for the sectional beams	Benniger, Sucker
(1) Semi-automatic drawing-in machine, incl. the preparation creel.	
(1) Hand drawing-in frame	

(1) Uster knotting machine, incl. knotting frame	Zellweger
(1) Healds drop-wire cleaning equipment	Vollenweider
(1) Reed cleaning machine	Vollenweider
- Several frames for the shafts and healds	
- Several special chests for the reeds	
- Several special frames (racks) for the unsized and sized beams	
(1) Cone winding machine with splicer minimum 4 winding units	Schlaffhorst, S. S. M.
(1) Cone winding machine with knotter minimum 4 winding units	Schlaffhorst, S. S. M
(1) Pirn winding machine, minimum 4 winding units	S. S. M
- Several special creels for the warp cones	
- Several special boxes for the weft pirns	
(2) Special warp beam lifting and transport trucks	
- Eventually one model of the drop wire sticking machine	

Weaving

(1) Projectile weaving machine type P 7100 B 280 N4 EP D1, incl. all necessary accessories
(1) Rapier weaving machine type G 6100 B 150 N6 SP G1, incl. all necessary accessories
(1) Air-jet weaving machine type L 5100 B 170 N 1-1 EN TE, incl. all necessary accessories
(1) Rapier Jacquard weaving machine with Stäubli Verdol or Grosse Jacquard machine type G 6100 S 180 J G 2, incl. all necessary accessories
(1) Locally made rapier weaving machine, last development incl. necessary accessories
(1) Pattern card punching machine for the plain weave weaving and 1 pattern card punching machine for the Jacquard weave weaving.

All the above machinery is manufactured by Sulzer-Ruti. It could be advantageous to get these types of machines from one supplier for follow-up service and advice. Dornier, Somet, Toyoda and Nissan also manufacture such equipment.

DYEING, PRINTING E FINISHING

Equipment was generally good in this area but the following should be added

	Suppliers
(1) Electronic colour matching system.	Datacolor, Texicon Optronik (Mathis)
(1) Magnetic screen printing machine	Zimmer
(1) Infra-red dyeing machine	
(1) Laboratory jet-dyeing machine	Benz, Brazzoli, Henriksen, Mathis.

KNITTING

Knitting equipment should be divided into specialist activities of knitted fabrics and garment assembly machinery. Simple mechanical machinery, including all handflat knitting machines, should be retained.

Warp knitting-machines

Computerisation of warp machines is almost complete with control or guide bar, let-off and fabric take-up

Jacquard Raschel machine with split jacquard bar

Tricor machine with electronic guide bars - for patterned lingerie

Equipment for pile fabrics and jacquard guide bars

Patterning computer

The above machinery is available from Karl Mayer and care should be taken that it maximises teaching opportunities and relates to the future planning of the industry.

Circular Knitting machinery

Consideration should be taken into the knitting of elastomeric fabrics for underwear and outerwear, plush, jacquard, fleece, single and double jersey fabrics Gauge, computerised workstations and user-friendly software are important for maximum student input.

a) Garment length electronic circulars for improved programming and pattern preparation

Bentley RTCE, Bentley SPJE, Jumberca TLJ-5E, Jumberca DWN-3E, Mecmor-Variatex TEJ 2500, Okuma DS-18, Orizio LBE

These machines are suggestions and 6 - 14 gauge should be considered as well as a selection of fabric types Links, links jacquard, knit, tuck-and-miss selection Circular machines of this type are considered less versatile but more productive than handflat machinery Workstations and software should be compatible with other equipment, e g , Jumberca

b) Multi feed circular jersey fabric machines

Camber-Menor Bromley types Quattro II, 14RJ/72

Ferrut Sulzer Morat, types SCC4K, 196CN, MKP3

Similar equipment is available from Jumberca, Mayer & Cie, and Albi

Hosiery

Introduction of electronic hosiery equipment is vital as hosiery manufacturers worldwide are now using "quick-response" techniques for selling their products Equipment should cover a panty-hose, single and double cylinder sock machines.

Machine builders are Lonati, Giobil, Nagata, Santoni, Bentley and Sangiacoma.

Flat-bed knitting machinery

Machine builders are Abril, Diamant, Dubied, Emm, Mitsukoshi, Protti, Shima Seiki, Stoll, Universal, Steiger and Zamark.

Gauge, electronics and machine types should be carefully considered before purchasing any equipment as it is impossible to recommend any one particular type of machine to fit into all of the above categories.

Crochet machinery

Electronic equipment for quick pattern changing and raised productivity is available in a wide range of models from the following machine builders - Boegli, Comez, Colli, Rius and Jacob Muller

Garment assembly machinery for knitwear

Lockstitch zig-zag, lockstitch, twin-needle overlocking, buttonhole, flatlock, seam covering, button attachment, strapping attachment, mock linking equipment, linking equipment to suit different gauges

GARMENT EQUIPMENT

Sewing machinery

A specialist garment technologist is required to evaluate the existing sewing equipment as it is apparent that much of the exiting machinery is of value and should be retained for the lower-skill level courses that will still be offered.

Purchase of new sewing equipment should seek to cover the standard reference BS3870 Classification and Terminology of Stitch Types, bearing in mind that only high-volume manufacturers are likely to use all six classes Most machine builders below offer a comprehensive range of types and models including semi and automatic workstations - Brother Industries, Singer, Durkopp-Adler, Rimoldi, Pfaff and Yuki.

Consideration should also be given to a pilot-unit production system with flexiole chain and electronic addressing, e g. Eton Systems.

Pressing and steam generators	Suppliers
Vaccum table TL81 with sleeve arm	Casoli
Vaccum table TCA88 with sleeve arm	Casoli
Steam generator AG92 can feed 2 presses	Casoli

Many manufacturers have similar equipment.

Fusing presses

Compact presses HP220K, HP450K	Hashima
Floor standing HP60LE	Hashima

Many manufaturers have similar equipment.

ANNEX 6

CURRICULUM CHARTS

Both charts show suggestions of how it might be possible to adjust the curriculum to enable more industrial and specialist education to be provided.

Example 1

1	100% Academic
2	
3	60% Academic, 40% general textiles
4	INDUSTRIAL EXPERIENCE. 4 weeks in spinning, weaving, knitting, dyeing & finishing and specialisation
5	100% Specialisation
6	
7	INDUSTRIAL EXPERIENCE. Specialist
8	Diploma work

Some organisation of block teaching which will allow entrance and exit at different levels for management and newcomers.

Example 2

Proposal for the improvement of the education programme of the weaving technician students but which could be used as a model for all.

COURSE SYLLABUS **Long-term Technical Course** **Weaving Textile Technician**	**Semesters**							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
SUBJECT MATTERS								
Portuguese Language/Literature	x	x		x	x		x	x
Mathematics	x	x		x	x		x	x
History	x	x		-	-		-	-
Geography	x	x		-	-		-	-
Physics	x	x		x	x		x	-
Chemistry	x	x		-	-		-	-
Biology and Health Education	-	-		x	x		-	-
English	x	x		x	x		x	x
Art Education	x	-		x	-		-	-
Civic Education	-	-		x	-		-	-
Physical Education	x	x		x	x		x	x

Textile Fibers	x	x		-	-		-	-
Drawing/Technical Drawing	x	x		x	x		-	-
Industrial Studies	-	-		-	x		x	x
Quality Control	-	-		-	x		x	x
Printing	-	x		-	-		-	-
Finishing and / Textile Fibers Processing	-	x		-	-		-	-
Dyeing	-	x		-	-		-	-
Spinning	x	-		x	x		-	-
Weaving	x	x		x	x		x	x
Knit Art and Hisery/Knit A. ..ifacts and Ready-Made Articles	x	-		-	-		-	-
Winding	x	x		-	-		-	-
Warping	x	x		x	-		-	-
Sizing	-	x		-	x		x	-
Drawing-In	x	-		-	-		-	-
Knotting	-	x		-	-		-	-
Pattern plain weave	x	x		x	x		x	-
jacquard weave	-	-		-	-		-	x
Weaving plain weave	x	x		x	x		x	-
jacquard weave	-	-		-	-		-	x
Calculations (Fabric)	-	-		-	-		x	x
Production planning	-	-		-	-		x	x
Management, human guidance	-	-		-	-		x	x
Practice school	x	x		x	x		x	x
Practice industry incl. schooling - 2 days per week - with SENAI outward schooling	-	-		-	-		-	-

Practical Training and Education in the Textile Industry

Practical Training and Education in the Textile Industry

ANNEX 7

TEXTILES AND GARMENT COURSES

Courses in the United Kingdom which could be of benefit for study tours and fellowships are available in the institutions below. Many more offer a wide variety of course provision as does higher education in most other European countries. Full-time courses can be from 1 - 4 years' duration, many with industrial placements. Short courses are very variable. Most institutions can offer degrees, higher degrees and research

BOLTON INSTITUTE

Short courses - Introduction to Textiles, Tufting Technology, Weft Knitting, Warp Knitting, Coloration applicable to various textile technologies.

LEEDS UNIVERSITY

Full-time courses - Textile Studies, Textile Chemistry, Textile Design, Textile Management.

LEICESTER POLYTECHNIC

Leicester Polytechnic can co-ordinate courses to cover more than one academic centre and organise courses for special requirements.

Full-time and short courses - Knitting Technology, Textile Management, Clothing Manufacture, Textile Technology, Fibre and Yarn Technology, Textile Testing, Fashion and Textile Design

SCOTTISH COLLEGE OF TEXTILES

Full-time courses - Textile and Clothing Studies, Applied Textile Chemistry, Textile Industrial Design.

Short courses - Specialist activities in wool yarns, Dyeing, Spinning, Weaving and Knitting.

UNIVERSITY OF MANCHESTER - INSTITUTE OF SCIENCE & TECHNOLOGY

Full-time courses - Textile Techonology and Management, Textile Science and Technology, Management and Marketing of Textiles, Textile Design and Design Management, Clothing Engineering and Management.