Textiles Committee
Twelfth Session
Geneva, 1991

Vocational training and retraining in the textiles industry

REPORT III
Contents

Introduction 1

1. Structural changes in the textile industry 3

Patterns of structural adjustment in the industrialised countries 3
Europe: A move towards smaller firms 3
United Kingdom and United States: Vertical integration 3
Japan: Production of fashion-oriented textiles 4

Patterns of structural adjustment in the developing countries 4
The growing small-scale sector in India 4
Brazil: A slow transformation 4
Argentina: The employment effects of restructuring 4

Training consequences of structural adjustment 5

2. Technological changes and new training needs 6

The major technological changes in the textile industry 6
Innovations in picking and blending 6
Advances in ring spinning and the introduction of open-end spinning 6
The shift from shuttle to shuttleless looms - The main innovation in weaving 6

Knitting machines 7
Computerised dyeing and finishing shops 7
Computer applications are growing 7
The situation in developing countries 7
Slow rate of re-equipment 7
Underuse of modern machines 8
Lack of training for maintenance staff 8

Training implications 8
Less-skilled jobs 8
Skilled jobs: Operators 8
Skilled jobs: Technicians 9
Skilled jobs: Managers 9
Shorter training, but higher costs 9

How some industries are coping with training needs 10
United States: Training in a large textile company 10
India: The case of a low-income developing country 10
How many to train to meet changes: The case of Hong Kong 10

3. Changes in management and work organisation 11

The trend towards deverticalisation 11
The "mill balance" concept: A trade-off between flexibility and productivity 11

The "quick response" system 11
Product-line-based structures 11
Textile technology and work organisation 12
Plant output versus individual output 12
Quality circles 12
Combinations of advanced forms of work organisation 13

4. The labour force in the textile industry 14

Shrinking of employment in industrialised countries 14
Rising employment in developing countries 14
Effects of reduction of employment on training 15
A decline or an increase in the share of women workers? 15
Low literacy of labour - An obstacle to technological change 16
<table>
<thead>
<tr>
<th>Topics</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion of operatives as a criterion of technological level</td>
<td>16</td>
</tr>
<tr>
<td>Skill shortages</td>
<td>16</td>
</tr>
<tr>
<td>Segmentation of the labour force</td>
<td>16</td>
</tr>
<tr>
<td>Contract employment systems</td>
<td>16</td>
</tr>
<tr>
<td>Expatriates versus skilled nationals</td>
<td>17</td>
</tr>
<tr>
<td>Adjustment of employment patterns to technological change</td>
<td>17</td>
</tr>
<tr>
<td>Improving the industry's image</td>
<td>17</td>
</tr>
<tr>
<td>5. Vocational training and education patterns and trends</td>
<td>18</td>
</tr>
<tr>
<td>Training and education patterns for various occupational groups</td>
<td>18</td>
</tr>
<tr>
<td>Informal on-the-job training</td>
<td>18</td>
</tr>
<tr>
<td>Apprenticeship training</td>
<td>19</td>
</tr>
<tr>
<td>Pre-employment training and education</td>
<td>21</td>
</tr>
<tr>
<td>Training of managers</td>
<td>22</td>
</tr>
<tr>
<td>Training of trainers</td>
<td>23</td>
</tr>
<tr>
<td>Retraining</td>
<td>24</td>
</tr>
<tr>
<td>Current trends in textile education and training in some countries</td>
<td>25</td>
</tr>
<tr>
<td>Concern for general education</td>
<td>25</td>
</tr>
<tr>
<td>General education reforms affect training</td>
<td>25</td>
</tr>
<tr>
<td>Employment and training policies development in the United States</td>
<td>25</td>
</tr>
<tr>
<td>6. Organisation of training</td>
<td>27</td>
</tr>
<tr>
<td>Structure of training institutions</td>
<td>27</td>
</tr>
<tr>
<td>Public training in textiles: The case of Greece</td>
<td>27</td>
</tr>
<tr>
<td>Training structures in India and China</td>
<td>27</td>
</tr>
<tr>
<td>Industry-financed training in Brazil</td>
<td>28</td>
</tr>
<tr>
<td>New vocational training institutions in Eastern Europe</td>
<td>28</td>
</tr>
<tr>
<td>Incentives for training</td>
<td>28</td>
</tr>
<tr>
<td>Major types of levy schemes</td>
<td>28</td>
</tr>
<tr>
<td>Administrative incentives for training</td>
<td>28</td>
</tr>
<tr>
<td>Training incentives for workers</td>
<td>29</td>
</tr>
<tr>
<td>Training curricula and methods</td>
<td>29</td>
</tr>
<tr>
<td>Training packages</td>
<td>29</td>
</tr>
<tr>
<td>Prevention of occupational hazards</td>
<td>30</td>
</tr>
<tr>
<td>Modular training</td>
<td>30</td>
</tr>
<tr>
<td>Distance learning</td>
<td>30</td>
</tr>
<tr>
<td>Collective training – The han system</td>
<td>30</td>
</tr>
<tr>
<td>Action learning</td>
<td>30</td>
</tr>
<tr>
<td>Testing and certification</td>
<td>30</td>
</tr>
<tr>
<td>7. Summary and suggested points for discussion</td>
<td>32</td>
</tr>
<tr>
<td>Summary</td>
<td>32</td>
</tr>
<tr>
<td>Structural changes in the textile industries</td>
<td>32</td>
</tr>
<tr>
<td>Major technological changes in the textile industries</td>
<td>32</td>
</tr>
<tr>
<td>Major changes in management and work organisation</td>
<td>33</td>
</tr>
<tr>
<td>The labour force in the textile industries</td>
<td>33</td>
</tr>
<tr>
<td>Vocational training</td>
<td>33</td>
</tr>
<tr>
<td>The organisation of training</td>
<td>34</td>
</tr>
<tr>
<td>Suggested points for discussion</td>
<td>34</td>
</tr>
</tbody>
</table>
Introduction

At its 240th Session (1988) the Governing Body of the International Labour Office decided that "Vocational training and retraining in the textile industry" would be one of the two technical items on the agenda of the Twelfth Session of the Textiles Committee. In taking this decision, the Governing Body acted upon the wish expressed in the resolution (No. 85) concerning future activities of the ILO in the textile sector, adopted by the Committee at its Eleventh Session (October 1984).

This report has been prepared by the Office as a basis for the discussion of this subject. It comprises six chapters.

Chapter 1, which is devoted to structural changes in the textile industry, analyses the differences in general patterns of structural adjustment between industrialised countries and high- and low-income developing countries, as well as the major consequences of structural changes for training and retraining.

Chapter 2 deals with new training needs arising from technological changes. It describes the major technological advances in carding, spinning, weaving and finishing and the recent applications of computers in textile technologies, and reviews the major effects of technological innovations on job displacement, human resources development and training.

Chapter 3 examines the introduction of new management techniques and forms of work organisation, such as the mill balance concept, the quick response system, just-in-time production and new systems of compensation, and their effects on the training of managers and textile specialists.

Chapter 4 analyses the major features of the textile labour force, as well as the recent trends in employment in industrialised and developing countries. It describes the changing ratios of operatives to professional staff among textile workers, and identifies new requirements in the levels of literacy and skills of the textile workforce and changes in their recruitment sources.

Chapter 5 deals with major patterns of education and training for workers in the textile sector, such as informal on-the-job training, apprenticeship and school-based pre-employment training and education, the training of managers and trainers, and retraining patterns in the textile sectors of industrialised and developing countries. It also describes current trends in textile education and training, such as the participation of employers in the implementation of work literacy programmes, a greater reliance on educational institutions, and the strengthening of post-secondary technical education through specialised schools. Lastly, it describes the increasing need for engineers and the recent trend towards the recruitment of general engineers.

Chapter 6 provides information on some aspects of the organisation of training, including the structure of training institutions and the financial and administrative incentives for participation in training activities. It also describes recent changes in training curricula and the introduction of modular training and distance learning in the textile industry.

As usual, the report concludes with a summary of the main points made in each chapter and a list of suggested points for discussion.
Changes in the international market for textile products, and in methods of organisation of production, over the past five to seven years, have placed increasing demands on training and retraining in the textile industry. Where the industry has been able to foresee and react to these and other changes, it has prospered. Elsewhere, it is characterised as a “declining industry”.

The most important of these structural changes are the following:

• the decline in textile output and employment in industrialised countries owing to the significantly increased import penetration of standard textile products;

• the increasing demand for styles and fashions that the industry is called upon to produce in short runs and at reasonable cost, which has challenged methods of production and required the introduction of flexible manufacturing;

• the increasing concentration and vertical integration in the textile industry of some countries, and the development of a small-scale textile sector in others;

• the substitution of man-made fibres for natural fibres (cotton and wool) and of synthetics for cellulose, and the reorganisation of the industry with the entry of chemical firms;

• the diversification of production processes into new product areas (e.g. the non-wovens), bringing the sector into competition with other industries (the paper, plastic and rubber industry).

Patterns of structural adjustment in the industrialised countries

Europe: A move towards smaller firms

In France the textile industry’s response to structural changes has involved the growing specialisation of firms and the introduction of new technologies and products. In Germany firms have sought to increase flexibility in order to switch to the production of high-quality speciality goods and industrial products, often on a small scale. This pattern was prepared by “deverticalisation” of the industry by promoting medium-sized and small firms as opposed to large ones, and by accelerated modernisation of manufacturing processes aimed at coping with rising wage costs.

Italy has also followed this pattern of adjustment, as evidenced by the proliferation of small firms and co-operatives specialising in specific products or production phases. These small firms, which have proved very efficient, have profited from the installation of special-purpose machinery and the adoption of modern management techniques. In the region of Como, for example, more than 40,000 people are employed in the silk industry, with some 30,000 employed in 1,412 textile firms and nearly 10,000 in 1,579 clothing firms. Furthermore, 2,300 skilled artisans, working in 504 small firms, provide designs and printing services for the silk industry. Silk and silk-like fibres account for the largest share of textile employment, with 12,000 jobs in 700 firms, followed by 10,000 jobs in 270 printing and finishing firms. The average number of employees in silk weaving firms is 17, but almost 60 per cent of the firms have fewer than ten employees. Only 2.5 per cent of the firms have more than 100 employees.

United Kingdom and United States: Vertical integration

The United Kingdom’s strategy can best be depicted as an attempt to increase concentration and vertical integration, complemented by investment in a new generation of textile machinery and mass rationalisation leading to extensive job losses and the disappearance of many small firms. These developments are also responsible for fundamental changes in methods of production and the introduction of various forms of shift systems.

In the United States the most important means of adjustment has been to introduce advanced technology while at the same time aiming at greater flexibility in production. In the last decade the textile industry has become more concentrated, shifting from small family mills to larger multi-establishment firms. The 1982 industrial recession caused many textile plant closures. In that year 43 plants closed permanently in North and South Carolina alone. According to a South Carolina public administrator, the plants “were in many ways victims of technological advances. They just could not effectively compete with textiles’ progress”. The United States Bureau of Labor Statistics foresees that
employment in the textile industry will have increased by an average of 0.8 to 1.2 per cent a year from 1983 to 1995. This evolution is accompanied by growing capital expenditure – from $1.7 billion in 1987 to $2 billion in 1988 and to over $2 billion since then.

Japan: Production of fashion-oriented textiles

Japan has concentrated on modernising its textile industry, particularly through labour-saving equipment (including full automation) and by upgrading and differentiating textile products. The sector continues to aim at producing select goods with high value added rather than common items. In order to respond quickly to the demand for high-grade textile goods, flexible production systems and vertical network systems from manufacturing to retailing have been established in many firms. Manufacturers are producing fashion-oriented textiles and developing new types of fibres and textiles for interior and industrial use. At the same time the Japanese textiles sector is trying to develop a more balanced corporate structure in order to correct its extreme deverticalisation: it comprises a few very large fibre-makers and spinners and a very large proportion (nearly 60 per cent of weaving employment) of family labour mills operated by only a few workers, which are far less able to adjust to changing conditions.

Patterns of structural adjustment in the developing countries

The growing small-scale sector in India

The new policy announced by the Government of India in 1985 proposed to eliminate structural rigidities of the industry and achieve a more balanced development of spinning, weaving and finishing, with greater flexibility of production and use of various fibres and blends. These measures have improved the production capacity utilisation in each stage. Over 20 mills have been modernised in order to reach international competitiveness in terms of productivity and quality.

Side by side with the mill sector (including medium-scale plants with an investment value of between Rs.6 and 50 million and large-scale plants exceeding that value), there is a growing small-scale sector where both powerlooms and handlooms are used. Powerlooms are located mostly near the major textile centres, while hand looms are found everywhere. Between 1986 and 1989 the textile mill sector decreased its share of employment by 20 per cent and the small-scale handloom sector by 10 per cent, while the small-scale powerloom sector increased its share by 30 per cent. In order to ensure the quality and profitability of products, moves are being made to set up co-operatives in the small-scale sector.

In cotton textile manufacturing about 73 per cent of workers are employed by the unorganised sector (consisting of firms employing nine workers or fewer and using power, or 19 workers or fewer not using power), while in the manufacture of woollens, silks and synthetics about 48 per cent of workers belong to this sector. In general, production methods remain highly labour-intensive, focusing on large-batch production and export quality improvement.

Brazil: A slow transformation

Transformation has been relatively slow in the Brazilian textile industry. The use of natural fibres has continued to prevail, although their production has decreased somewhat – from 77 to 75 per cent between 1981 and 1986 – while cellulosic fibres remained at the level of 4 per cent and synthetic fibres raised their share from 18.8 to 20.3 per cent. The industry continued to develop small-scale enterprises (with under 100 employees) which have proved to be more efficient than larger ones and which now account for 87 per cent of all textile firms. In this sector, between 1975 and 1980 the proportion of firms with one to four employees decreased by 30 per cent, while firms with five to nine employees increased by 9 per cent and firms with ten to 99 employees by 12 per cent. The informal sector continued to grow as a consequence of dismissal of skilled workers from large enterprises which were giving them old machines as compensation. Therefore the growing small-scale and artisanal textile sectors are developing their own specific training needs, which will have to be met by appropriate institutions.

Argentina: The employment effects of restructuring

In the process of restructuring in Argentina between 1973 and 1984, the number of medium-sized textile firms remained quite stable, and they increased their employment (by 6 per cent). The number of larger firms (with more than 100 workers) grew slightly, but employment dropped by 7 per cent. The number of small textile firms dropped by 39 per cent, from 6,125 to 3,707 units. This reduction was accompanied by a significant loss (23 per cent of their share) in textile employment. By 1987 a total of 7,200 textile employees had lost their jobs owing to automation of machinery. Around 2,700 jobs were displaced by open-end spinning machinery and 4,500 disappeared as a result of the introduction of shuttleless looms. Two thirds of the workers concerned were machine operators, mainly weavers and spinners. Of the other third, a half were unskilled auxiliary workers and the rest foremen and maintenance workers. There was no reduction of management staff as a result of automation.

In general, one can identify three major groups of countries with different patterns of structural adjustment in their textile industries. The first group comprises highly industrialised countries where structural adjustment tends to:
be more and more oriented to high value-added and small-batch versus mass production;
• increase flexibility of production and supply while maintaining productivity levels;
• decrease overall labour-intensiveness and improve the skills of management and technical staff.

The second group roughly comprises the high-income developing countries, where the textile industries are characterised by:
• domination of mass production and export orientation with emerging interest in high value-added outputs;
• intensification of technological changes in modern textile firms covering all stages of production side by side with high labour-intensiveness in the growing small-scale and artisanal sectors.

The third group comprises a large number of developing countries, where the industry is geared mainly to the internal market and mass production, with a high proportion of low-productivity small-scale undertakings and high labour-intensiveness but with an emerging concern for productivity improvement.

Training consequences of structural adjustment

Restructuring in the textile sector has had the following general consequences for vocational training and upgrading:
• the main challenge to the skills of textile workers lies in the demand for high value-added products, higher quality, productivity and production flexibility; technological and management changes have greatly raised skill requirements for technical and management staff;
• the costs of modernisation have increased, so that firms unable to invest heavily in textile machinery have had no choice but to remain labour-intensive and give up the idea of upgrading their workers;
• now that more countries have the capacity for mass production of standard textile goods, competition in this sphere has become keener, but it still requires a large labour force with few skills. It has made the textile sectors in industrialised countries vulnerable to competition from cheap foreign labour, so that they are now attempting to increase productivity and improve quality of work by developing the skills and incentives of the labour force;
• the proportion of small-scale textile firms is growing in many countries. In industrialised countries most employees in this sector use modern machinery and are highly specialised and skilled, while workers in developing countries have much less need and opportunity for upgrading because the machines they use are old;
• in the process of restructuring, training and upgrading of the labour force have often been neglected, which has made investment in new machines and technologies less efficient than it might be.

Notes
1 Textile and clothing industries: Structural problems and policies in OECD countries (Paris, OECD, 1983).
Technological changes and new training needs

The major technological changes in the textile industry

Although recent technological changes in the textile industry cannot compare with the major breakthroughs in the electronic industry, for example, there have been important advances in individual stages of the production process. In traditional cotton textile production, there are four main stages, each of which may comprise several steps. In the first stage cotton is blended and cleaned; in the second it is spun into yarn; in the third it is woven or knitted into fabric; in the fourth it is finished. The major barrier to complete automation is the physical nature of fabric, which restricts its automatic manipulation. For this reason, automation has largely been confined to production stages in which the material can be more easily handled, for example in the early stages of fibre cleaning and processing. Thus, modern production processes entail a mix of labour and automation in the individual stages. Chapter 11 of the General Report prepared for this meeting deals with additional aspects of new technologies, including their impact on productivity, competition and the role of multinational enterprises.

Innovations in picking and blending

While in most mills yarn is still made on discrete machines, more plants are adopting a continuous opening-blending-carding operation, known as direct-feed or chute-feed carding. At the opening and picking stage the bales of cotton or synthetic staple are opened and blended to achieve a uniform product or the desired mix of cotton and synthetic. In some enterprises computerised machines have been installed to pick cotton from a programmed sequence of bales; the fibre is then fed by chutes and blowers to the carding machines. This advance speeds up the process and eliminates some of the more unhealthy and unpleasant jobs in the mill. Direct-feed carding greatly reduces the need for unskilled and semi-skilled labour in opening, blending, picking and carding; it obviates the need for picker operators and the workers who move the heavy fibre laps. Without fibre laps, labour for cleaning and maintenance is also considerably reduced.

Advances in ring spinning and the introduction of open-end spinning

The basic principles of ring spinning have changed little, but there have been important innovations in spindle speeds and in the automatic loading and unloading of the spinning (and roving) frames. The biggest advances in ring spinning have occurred in the winding process. Computerised machines and repair systems can locate low-quality yarn, cut out and splice together the resulting ends. This eliminates the need for mechanical adjustments to change the size and shape of the take-up package. These innovations have speeded up operations and improved quality, but the process is still cumbersome and requires low-skilled labour.

The major improvement in productivity and flexibility derives from rotor or open-end spinning machines. These machines, which operate at speeds three to three and a half times those of ring spinners, are a major step towards totally automated spinning. In open-end spinning, roving, spinning and winding are one short procedure. The machine takes the cleaned fibres, turns them into thread and winds them onto the package. Open-end spinning reduces space requirements, maintenance and cleaning requirements and down time. Altogether, it is less labour-intensive, as the process eliminates the need for roving frame operatives; although spinning operatives are still required, the number of doffers (workers who remove full packages) is reduced. The introduction of open-end spinning brings about no great changes in the job content of the machine operator. Supervisory and technical staff, however, must be retrained to run the new technology. Although open-end spinning is replacing ring spinning, the latter is still more prevalent.

The shift from shuttle to shuttleless looms – The main innovation in weaving

In recent years the major innovations in weaving have related to the introduction of so-called “shuttleless looms”, from the rapier loom, which replaces the shuttle carrying its own yarn supply by a weft carrier transmitting only one pick (thread) length at a time, to water and air-jet looms, where the weft is transmitted across the weaving shed by air or water. Shuttleless looms are faster, quieter, cleaner, and considerably more labour-saving than shuttle looms. Some of them can insert over 600 picks of yarn per minute, while shuttle looms insert
about 150. Though shuttleless looms can cost up to ten times as much as shuttle looms, their main advantage lies in the higher quality of the cloth, which has fewer broken ends. The proportion of second quality cloth in the output is one-third to one-fifth of what it was formerly. In addition, the new looms can weave wider fabric. Owing to their high cost, there are greater incentives to produce longer runs of cloth, avoiding costly down time for style changes and reducing idling time for reloading. Labour requirements, particularly for low-skilled maintenance personnel and operators and auxiliary workers, are lower than those for a conventional loom. Shuttleless looms need less maintenance, since they are self-lubricating and electronically monitored to aid maintenance personnel and supervisors. Requirements for operators are reduced because output per hour is greater. No radical changes have taken place in the work of weavers operating automatic looms compared with that of traditional loom operators. However, newer looms require more highly skilled technicians.

Knitting machines

In knitting machines there have been tremendous advances in speed, quality and flexibility by comparison with looms producing woven fabric. Advanced machines are completely programmable and flexible. If spinning can be improved to produce fine yarns, then the whole process of production of knitted fabric will be fully automatised.

Computerised dyeing and finishing shops

In some countries, for example Italy, completely automatised dye houses are in operation. With the emphasis on the “just-in-time” approach for smaller runs, technology has been developed to allow quick changes in production. In the area of dyeing, radio-frequency systems are being tested to reduce dyeing time.

Computer applications are growing

In general, the contribution of electromechanical technologies in the textile sector has been more influential than that of computerisation. Computers have, however, brought some improvement in fibre measurement, colour measurement and matching, automatic control and adjustments, computer-aided design, quality monitoring and change of styles. For example, an impressive computer application is the design of pattern weaves of different colours in fabric production, as is shown by the example of one plant in the United States. “Before fabric can be woven, hundreds or thousands of ends of yarn must be loaded onto a warp beam. Each end is drawn from an individual package mounted on a frame called a creel. Loading the creel is a straightforward if cumbersome process, but if the pattern of colours that must be loaded onto the beam is changed frequently, then it is easy to imagine the headaches involved with scheduling work through the creel. The process is now done with the assistance of a computer ..., and [a] crew is able to load warp beams adequate to produce 1.2 million yards of fabric a week, sometimes in 300 different styles. Previously, using exactly the same equipment, the plant could produce only about 300,000 yards a week in 100 different styles.” Computer-aided design has reduced the time needed for the tedious job of weaving pattern design from several hours to minutes.

Computers have had a great impact on management functions, including planning, information processing and communication, manufacturing and maintenance records. They have performed signal services in maintenance management by recording stoppages, breakdowns and idling time of machines and evaluating their causes. Microprocessors are reducing labour requirements for machine operators and unskilled labour, while upgrading demands on maintenance and repair technicians.

The situation in developing countries

Though the pace of technological innovations has been fairly quick, their spread has been very uneven. The main advances like open-end spinning and shuttleless weaving are widely used in Japan, the United States and Western Europe. However, many developing countries have benefited little from technological innovations owing to lack of capital and skilled managers and technicians. In Pakistan, for example, 40 per cent of the spinning and 85 per cent of the weaving equipment is over 20 years old. In the Philippines, these figures are 45 per cent and 62 per cent, respectively. In Turkey, 70 per cent of the printing equipment is considered to be obsolete. In Portugal, 45 per cent of the machinery in the woollen and cotton sectors (not including knitting) is over 15 years old.

Because machines are obsolete and skills insufficient, average labour productivity is low. In spinning, weaving and finishing in Pakistan, for instance, it was found to be only about 15-20 per cent of that reached in Western Europe. In Turkey and Portugal labour productivity is around 60-65 per cent of that level. In the Indian textile industry 66 per cent of cotton spinning and weaving firms using old machines have low productivity, 31 per cent medium productivity and only 3 per cent high productivity, while the percentage of firms using modern machines and having low productivity is 23.5-25.0.

Slow rate of re-equipment

Cotton ring spinning in Brazil, Egypt, India and some other countries is sometimes being replaced by rotor and air-jet spinning machines, while the weaving sector is equipping itself with shuttleless looms. Doffing and weighting are being automated, electronic cleaners for yarn and high-pressure dyeing are being introduced, the lap feeding system of carding has been substituted for
chute feeding, and the use of robots is growing. However, the introduction of modern technologies is proceeding slowly. In Egypt, for example, 40,000 rotors, 3 million ring spindles and 23,000 shuttleless looms exist side by side with 55,000 shuttle looms. Of the last mentioned, 66 per cent are mechanical looms with low productivity.

In India only around 26 per cent of the total number of looms are automatic, while approximately 50 per cent of the spindles and 82 per cent of the looms are more than 15 years old. Although India has the largest number of installed spindles in the world, the percentage of open-end rotors continues to be one of the lowest. Correspondingly the productivity and efficiency levels are much below international levels. Only about 20 textile mills have modern facilities for the manufacture of man-made fibres.

Underuse of modern machines

International comparisons of labour productivity in textiles give the direct impression of differences in the levels of quality of labour force and management staff. The productivity measures most often applied in the textile industry are the labour/output ratio (operative hours per unit of output), the capital/output ratio (spindle time per unit of output) and the labour/capital ratio (number of workers per unit of machinery). The most indicative comparisons of labour productivity are those attained on modern looms in developing countries with the "best-practice standards" reached in other countries on the equivalent textile machinery.

Such comparisons made between Kenyan, Philippine, Latin American and Indian textile enterprises and "best-practice standards" show the following. In spinning, both Kenyan and Philippine plants achieve roughly 70 per cent of the productivity obtained from similar equipment in best-practice plants in the United Kingdom. In weaving, relative productivity is lower, at 55 per cent (the Philippines) and 68 per cent (Kenya).

In Philippine spinning firms (except those using open-end machinery) excessive product diversity, low spindle efficiency and the operation of ring frames at low speeds combined to yield a productivity level 28 per cent lower than the best-practice level. Running ring spindles below their rated speeds in turn reflects difficulties in employing appropriate engineering procedures and quality control early in the spinning process. Though most Philippine looms are of the conventional automatic type, some of them are used in a semi-automatic mode, which is indicative of a generally low level of technical skills.

Data on the labour/capital ratio for spinning indicate that an average Latin American plant needs twice as much labour per unit of machinery than that indicated by best-practice standards. The productivity of modern textile machines in Turkey and Portugal is also often less than it could be; it was found to be between 75 and 85 per cent of international levels of productivity achieved on equivalent equipment. The same holds true for the percentage of waste.

Lack of training for maintenance staff

Maintenance staff of textile firms in developed countries can receive on-site training when new machinery is installed and can subsequently be sent to machinery manufacturers to update their skills. Textile firms in developing countries, however, often lack the resources to do this. This is yet another reason for the lower productivity and product quality of modern looms in the developing countries.

Training implications

The main question concerning skill changes in the textile industry as in any other is whether new technology increases or decreases textile workers' skills. Generally speaking, machine operators' jobs sometimes require more skills, and sometimes less, than they used to, but craftsmen, technicians and technologists require higher skills than before.

Less-skilled jobs

As for jobs requiring few skills or none, some of them are eliminated by new technologies without new ones being created. For example, the numbers of operative and ancillary staff have been reduced as a result of the introduction of electronic installations. Older and semi-literate workers have been placed in secondary jobs. Similar reallocation of the staff has occurred in the maintenance area. Fewer unskilled maintenance workers are needed where automatic vacuum cleaners and mechanical means of cleaning have been installed. The number of unskilled jobs has dropped sharply in transport and warehouse operations. In some countries the introduction of advanced textile machinery with higher throughput has required more staff for loading and unloading machines. But the general trend is towards an increase in the ratio of craftsmen and technicians to operatives. Thus, in the textile industry in the United States in 1975, there were 4.2 operatives, labourers or service workers for every craftsman or technician, but by 1985 the ratio had decreased to 3.5:1.2

Skilled jobs: Operators

Since they are more sophisticated, the new textile machines sometimes require less demanding operator skills (particularly manual dexterity) than the old, because the quality of input material, the operation of the machines, and the temperature and humidity of the environment are now far better controlled. Even knotting or splicing of broken threads is performed automatically. The process of loading bobbins onto winding machines is also much simplified. A study carried out in Brazil showed that spinners and weavers had their manual operations reduced by approximately
half. In general, it may be concluded that the number of skilled jobs on the shop floor has declined.

Notwithstanding the above considerations, many of the jobs that remain are becoming more demanding. Since modern equipment is much more expensive and productive, losses as a result of breakdowns and operators' errors become higher. Because of the emphasis placed on product quality and preventive maintenance the operator is required not only to load certain information into a computer, to read from its display and to carry out some maintenance procedures, but also to have a broader understanding of the entire production process and the ability to anticipate problems.

Moreover, under pressure of demand for flexibility of production, operators have to work more closely with technical staff, develop their communication skills, understand and perform the activities necessary for changing styles, adapt more rapidly to a fluctuating environment, and be prepared to shoulder heavier responsibilities. A higher degree of creativity and professional ambition, more personal identification with the firm's objectives, initiative for problem solving and the capacity for logical reasoning are becoming more and more necessary.

Another urgent need is to raise the level of literacy and numeracy among operators of modern machinery. Although it is still possible to design jobs for operators whose skills in these areas are rudimentary, their work will require more direct involvement of their supervisors, who have to show them how to make even small changes in products and processes.

Literate workers, on the other hand, can follow written instructions. Advanced maintenance systems require more involvement of operators in the diagnosis of problems with their equipment, including the recording of their conclusions on computer terminals. Such activities are impossible for workers who cannot read or write.

As the number of operatives is reduced owing to increased automation, each operative can tend more machines, and a higher level of ability is required. In many cases firms prefer to train newcomers instead of retraining some older workers who may find it difficult to adapt to modern equipment and working methods.

**Skilled jobs: Technicians**

Machinery fixers, maintenance workers and repair technicians also need greater skills and educational preparation than they did in the past. The need for maintenance, especially preventive maintenance, has increased in the modern textile industry, as maintenance jobs become more specialised and skills more sophisticated. For some jobs, like that of foreman, there is a complete change of skill profile as supervision is broken down into functions such as maintenance and preparation of equipment and various kinds of tests.

In the past, loom fixers and mechanics in spinning and knitting mills were almost always promoted from the ranks of machine operators. Working around the machines had already given them a feeling of what was necessary, and the additional training needed to become a fixer was acquired on the job with little or no formal instruction. This situation has changed in textile firms which have installed advanced electronic machines with sophisticated devices such as microprocessors, sensors and yarn splicers and knotters. Maintaining this equipment requires knowledge far beyond what can simply be picked up on the job.

Many maintenance and production managers now require textile technicians to have three years of training or higher-level engineering courses, with curricula containing modules of electronics and microprocessor technology.

**Skilled jobs: Managers**

With textile mill modernisation greater demand has developed for technologically skilled managers who can organise the work with the new working methods and machinery and evaluate various technological alternatives in order to make proper choices. Quality control and ensuring the flexibility of machine operation are also becoming new functions of managers. Technological and management changes have caused a lowering in the ratio of operatives to managers. In the woollen sector in the United Kingdom, for example, the number of operatives per manager has fallen from 20 ten years ago to eight at present.

**Shorter training, but higher costs**

In general, training and education costs for those working with advanced textile machinery have increased, although sometimes the duration of courses is shorter. For example, retraining a ring spinner for open-end spinning may require only a few hours.

In Brazil, training of weavers for shuttleless looms is one-third shorter than for conventional machinery, but the share of training costs in production costs has increased by 26 per cent. The costs of upgrading technicians and maintenance staff have also increased significantly.

In India the cost of pre-employment training in 1981-82 varied between Rs.5,000 and Rs.10,000 for a craftsman, between Rs.30,000 and Rs.50,000 for a technician diploma, and between Rs.100,000 and Rs.150,000 for a technologist degree programme. It is still increasing.
How some industries are coping with training needs

United States: Training in a large textile company

One of the most dramatic changes caused by the upgrading programme in a large United States textile firm was the immediate need for dozens of fixers trained to repair and maintain open-end spinning machines. The firm increased its own efforts and made use of training offered by the machine vendors. But some of the fixers could not keep up with the training and the firm was unable to find students either from among its workers or on the local labour market. It is indicative of the skills problem faced by the firm that of 32 students who entered the fixer training class only six successfully completed the course. Most of those who failed to do so did not have an adequate background in mathematics.

India: The case of a low-income developing country

Changing technology has called for continual upgrading of skills at various levels, notably in the mill (large and medium-scale) sector. For example, the introduction of CAD for textile designs and processes for manufacture of man-made fibres has demanded new skills. In the small-scale powerloom sector training in protection from occupational hazards, particularly in high-speed operation, has become important.

About 90 per cent of the total employment in the Indian textile industry is in the small-scale sector, which includes both powerloom and handloom sectors with investment in plant and machinery not exceeding Rs.6 million. These units are dispersed throughout the country and training facilities are not easily accessible. On the other hand, the staffing constraints are such that the units cannot afford to send workers to distant locations for training. The educational level of owner-managers is low and a large number of them are illiterate. Training programmes for entrepreneurial skill development in this sector will therefore need to be specially targeted.

Owing to the slow pace of technological innovation the textile sector in India, as in other low-income developing countries, has been faced with the acute problem of rehabilitation of displaced and retrenched workers, although this is due more to industrial inefficiency than to modernisation. Proposals have been drawn up for creating employment by organising workers into co-operatives and purchasing looms from units that have closed down or are in difficulties.

How many to train to meet changes: The case of Hong Kong

The Textile Industry Training Board of Hong Kong, when forecasting workforce requirements in 1985, based itself on the following assumptions:

- the demand for additional technologists and technicians in the next few years would level off and training needs at these two levels would be mainly for replacement for natural attrition;
- the use of modern equipment, notably in the knitting and finishing sectors, would require more and better trained maintenance staff;
- the annual attrition rate at technologist, technician and craftsman levels would be around 3 per cent;
- in view of technological and other changes a number of existing workers would need upgrading.

At the time of the survey, 826 vacancies were reported out of a total employment of around 51,000, representing about 1.6 per cent of the textile workforce. About half of the vacancies were in the finishing sector. Based on that analysis, it was forecast that between 1986 and 1991 the average annual demand for new technologists would be 20 to 30, for technicians 110 to 130, and for craftsmen 390 to 440. At the same time around 25 per cent of new craftsmen would be section leaders, who had hitherto normally been promoted from operatives. A part of demand at technologist and technician levels would also be met by internal promotion.

Notes

1 Bailey, op. cit.
5 Vocational Training Council (Hong Kong): Report by the Textile Industry Training Board on the 1985 Manpower Survey of the Textile Industry (Hong Kong, 1985).
As emphasis has shifted to variety of products, textile producers have hoped that new technologies would promote a flexible manufacturing process, but in fact this is only partially the case. During the 1980s there were many experiments in management and work organisation, both industry-wide and within individual companies. Among the latest management advances product-oriented organisational structures and flexibility management, the "mill balance" concept and the "quick response" system are worth mentioning, as is the "just-in-time" concept, which obviates the need for storing large quantities of materials and spare parts.

The trend towards deverticalisation

Deverticalisation is a feature of the textile industry in some industrialised and high-income developing countries such as Brazil, Germany, Italy and Japan, where thousands of small specialised firms maintain close relations with each other and with trading companies. Among the most important sources of flexibility in these structures are the skills of small entrepreneurs and their families, who run and maintain all kinds of machines in their firms. These small firms have been very prompt in adapting to change and in their responses to a volatile market.

In the Eastern European countries and China the textile industries have had to cope with significant evolutions in the national economies, including the transition to a market economy, deverticalisation and development of horizontal industrial integration. This implies that enterprises must take responsibility not only for the implementation of production plans, but also for the cost-effectiveness of their activities. In the USSR the most substantial shifts in management and work organisation are linked with the adoption by enterprises of the "model of economic self-reliance" on the basis of leasing or redemption of the State's industrial property. An enterprise that accepts this system has to pay rent and taxes and cover its costs.

The "mill balance" concept:
A trade-off between flexibility and productivity

Foreign competition and market changes have spurred diversification in the styles of fabrics offered by many firms. The textile industry has become more market-driven in response to consumer demand for more varied and faster-changing styles. Firms have responded by increasing the numbers of styles that they produce. The main problem of efficient management in advanced textile enterprises is to reach the proper "mill balance" between productivity and flexibility. The mill balance is perfect if all equipment is fully utilised, but frequent style changes make this difficult. For example, changing the size of the yarn changes the quantity of fibre that can be processed hourly by a given number of spindles and thereby changes the demands on the machines that prepare the fibre for the spindles. Changing the style of a fabric always leads either to machine idling or to a change in throughput. In some companies a mill balance is maintained by accepting orders for only those fabrics that would be compatible with a balanced flow.

The "quick response" system

Efforts to create flexible production have been focused on a "quick response" system, to shorten the time between receipt of the retailer's orders and delivery of the goods. Managers of textile firms will have to be prepared to receive from retailers orders for only small quantities before the season and to respond quickly to reordering in quantity of the most saleable goods. Installation of the "quick response" system makes sense only for those enterprises which have already reached a high level of productivity. Close attention has to be paid to stock management and building a communication network with the retailers, notably by integrating modern communication technology with flexible manufacturing. The fundamental goal of flexible manufacturing has become a reduction of cost differential between goods produced in long runs and small-batch speciality items. The "quick response" strategy has to be accompanied by internal organisational reform through teamwork.

Product-line-based structures

Another way of achieving greater flexibility is to change a plant's organisational structure. Traditionally, plants have been organised into functional departments. For example, a spinning mill will have carding, drawing, spinning and winding departments which provide a
Textile technology and work organisation

Work organisation in a conventional textile mill is determined by the characteristics of traditional textile technology, where the main features of the work and workplace are as follows:

- unskilled and semi-skilled workers work in isolation;
- a high level of manual dexterity is necessitated by the speed of operations;
- operations are repetitive; workers generally learn to operate one machine and tend as many as they can run, depending on their experience and dexterity;
- jobs are fragmented;
- workplaces are noisy, dusty, hot and damp;
- there is lack of communication and workers feel isolated because of long distances between workplaces;
- reliance is usually placed on a system of equal pay, payment by results or a bonus system.

The challenge of flexibility is now forcing textile managers to turn to advanced methods of work organisation, including teamwork, job enrichment and the introduction of quality circles, accompanied by improvement of communications and new forms of remuneration.

Plant output versus individual output

Many textile mills have been experimenting with teamwork and new forms of remuneration. The innovations often include shifting from narrow, well-defined tasks to better group interaction, in which tasks are shared and a given project is accomplished. For example, experiments with new forms of remuneration in the United States have replaced individual piece-rate systems by a system of bonuses which are paid monthly to employees depending on the total productivity of the plant. This system is based on the assumption that maximisation of plant output is more important than maximisation of individual output. The bonus is calculated at an hourly rate and paid equally to every worker of the plant, including clerical workers, but not to the plant manager.

Some mills, for example in Australia and the United Kingdom, have also been experimenting along these lines, establishing cells of several machine operators, each of whom can perform a number of jobs. In each case a major factor behind these initiatives has been a concern to optimise machine operating time and reduce costs associated with waste. As in the United States, initiatives are shifting the emphasis from maximising the output of the individual operator to optimising co-operation between members of a team in a production process.

However, these attempts to increase production and skill flexibility are facing some obstacles because the broadly applied payment-by-results system is incompatible with increased skill flexibility. Workers who can perform several functions often receive lower wages than those who do just one repetitive job with higher output. Nevertheless, there are several main reasons for improving work organisation on the basis of greater skill flexibility, among them overcoming labour shortages created by relatively high rates of absenteeism and labour turnover; optimising the utilisation of capital equipment and reducing workflow bottlenecks; improving quality; and increasing workers' satisfaction and therefore their commitment to the firm.

Research carried out in Australia shows that from 52 to 90 per cent of people were interested in doing some form of training. In most cases these results ran counter to the fairly negative expectations of management about the willingness of the workforce to develop new skills. But in all cases interest was conditional on not losing income. Some workers said that many textile employees did not want to learn how to operate different machines because they would lose their bonuses if they did so. People could earn more if they did one job.

Quality circles

In many countries quality circles have become very popular. In the textile industry in Japan, for instance, quality circles are already a part of everyday life. Groups of eight to 12 workers from the same area of the plant meet regularly to discuss problems and ways of improving productivity and quality and reducing production costs.
Quality circles have also been organised in many textile enterprises in Australia, India and the United States. The “total quality control” concept and computer application for quality management are becoming increasingly common in China. Teamworking, which includes quality management, has recently received a new impetus in the United Kingdom with the introduction of a new standard of systems and procedures aimed at improving product quality, with which companies are being increasingly pressured to comply. Customers are more and more frequently demanding that their suppliers obtain accreditation in the standard.

Combinations of advanced forms of work organisation

There have been various combinations of the “just-in-time” system with semi-autonomous groups and a quality control system, aiming at making production more responsive to fluctuating market demands and to technological innovations. The practice of many textile firms in Argentina, India, Italy and the United Kingdom has shown that responsibilities on the shop-floor concerning quality control and implementation of maintenance tasks can easily be delegated to groups of workers, provided that they have a certain disposition to work in teams, to learn and alternate several jobs and to be paid on a collective basis. New work organisation directly challenges and begins to break down the traditional demarcations between operators and supervisors. As operators take more responsibility for workflow and quality, the previous role of supervisors is no longer appropriate and they have to be retrained. Introduction of these advanced management and work organisation systems has helped to improve the plants' layouts, reduce their stocks, simplify line management and smooth the production flow. In many cases productivity and flexibility have been increased and down time of machines reduced.

Notes

1 Bailey, op. cit.
The textile industry provides jobs for a large number of people, both directly and indirectly. Its labour force is generally characterised by low literacy and skill levels, a high proportion of women, a regional concentration of employment and relatively low levels of pay. In several countries the textile sector has traditionally provided jobs for minority groups and immigrants with very few skills and little training. For example, 42 per cent of those employed in the textile industry of Australia were born overseas.

In recent years, however, several major changes have been observed in the textile labour force; they concern the volume of employment, shifts in the proportions of various occupational categories, changes in breakdown by sex and rising literacy levels. All these trends have influenced training practices. Chapter 12 of the General Report discusses recent changes in the volume and structure of employment, wages and occupational safety and health.

Shrinking of employment in industrialised countries

The textile industry worldwide has lost much of its labour force (see table 1). The loss occurred mainly in industrialised countries in Europe, with the exception of Greece, and in Australia, Canada, Japan and the United States. Between 1983 and 1989, despite a significant reduction of the textile labour force – by 25 per cent in Canada and France, and by 15 to 20 per cent in Canada, Germany, Spain and the United States – the textile industries have maintained or increased their production levels. These trends are likely to continue in the future as machines in all branches of textiles become more computerised and new methods of production and management are introduced.

For example, between 1990 and 1995 the textile workforce in France is foreseen to drop by 16 per cent. Although the changes in the French industry have had a significant effect on the number of people employed in textiles, they have also affected the characteristics of jobs that remain. The jobs have shifted towards more skilled occupations, and there has been an increase in the skill requirements of jobs within most occupational categories.

The size of the labour force of the textile industries in the Eastern European countries has also declined. In the USSR, for example, the number employed in the industry dropped by 21.4 per cent between 1980 and 1989; for Poland, this figure was 45 per cent. In these countries the reduction in the labour force has been accompanied by a fall in manufacturing output.

### Table 1. Employment trends in the textile industries, in selected countries 1975-84/85 (thousands)

<table>
<thead>
<tr>
<th>Country</th>
<th>1975</th>
<th>1980</th>
<th>1984-85</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Centrally planned economies</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Czechoslovakia</td>
<td>227.0</td>
<td>221.0</td>
<td>217.0</td>
</tr>
<tr>
<td>Hungary</td>
<td>136.0</td>
<td>117.0</td>
<td>104.0</td>
</tr>
<tr>
<td>Poland</td>
<td>483.0</td>
<td>440.0</td>
<td>352.0</td>
</tr>
<tr>
<td>USSR</td>
<td>2 188.0</td>
<td>2 252.0</td>
<td>2 189.0</td>
</tr>
<tr>
<td><strong>Developed market economies</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>59.0</td>
<td>50.0</td>
<td>47.0</td>
</tr>
<tr>
<td>Canada</td>
<td>99.0</td>
<td>92.0</td>
<td>75.0</td>
</tr>
<tr>
<td>France</td>
<td>357.0</td>
<td>291.0</td>
<td>233.0</td>
</tr>
<tr>
<td>Greece</td>
<td>68.1</td>
<td>73.4</td>
<td>72.5</td>
</tr>
<tr>
<td>Italy</td>
<td>352.0</td>
<td>291.0</td>
<td>261.0</td>
</tr>
<tr>
<td>Japan</td>
<td>907.0</td>
<td>757.0</td>
<td>673.0</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>507.0</td>
<td>349.0</td>
<td>366.0</td>
</tr>
<tr>
<td>United States</td>
<td>996.0</td>
<td>986.0</td>
<td>840.0</td>
</tr>
<tr>
<td><strong>Developing countries</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Argentina</td>
<td>161.4</td>
<td>89.2</td>
<td>71.4</td>
</tr>
<tr>
<td>Egypt</td>
<td>285.4</td>
<td>305.2</td>
<td>304.8</td>
</tr>
<tr>
<td>Indonesia</td>
<td>165.0</td>
<td>229.9</td>
<td>238.3</td>
</tr>
<tr>
<td>Republic of Korea</td>
<td>318.7</td>
<td>392.8</td>
<td>368.7</td>
</tr>
<tr>
<td>Mexico</td>
<td>158.0</td>
<td>215.0</td>
<td>204.0</td>
</tr>
<tr>
<td>Pakistan</td>
<td>n.a.</td>
<td>217.4</td>
<td>202.3</td>
</tr>
<tr>
<td>Turkey</td>
<td>151.1</td>
<td>165.0</td>
<td>180.0</td>
</tr>
<tr>
<td>Yugoslavia</td>
<td>205.0</td>
<td>224.0</td>
<td>264.0</td>
</tr>
</tbody>
</table>


Rising employment in developing countries

In general, employment in the textile industries of developing countries has continued to be high, mainly because the introduction of new machinery with electronic and computer components has been accompanied by the resiting of the old machinery in other mills or in the informal sector. This has been the case in Brazil, India and Turkey.
In Turkey the increase in employment (1 to 6 per cent over the past five years) has been accompanied by an increase in total output.

In India there has been a slight reduction in the number of people employed in the mill sector but this has been offset by an increase in employment in the small-scale handloom and powerloom sectors.

In Brazil the textile labour force increased by 30 per cent between 1983 and 1987. In places where textile industries have improved their international competitiveness, for example China, Hong Kong and the Republic of Korea, manufacturing and employment have also increased.

**Effects of reduction of employment on training**

Structural changes and reduction of employment in the textile industries of some countries with average technological levels have had several effects on training. Firstly, large numbers of experienced textile workers have been brought onto the labour market as an additional source of skilled but semi-literate manpower, thus reducing the incentives of prospective employers to invest in training. Secondly, the reduction of employment has led to a lower rate of staff turnover. In Portugal, for example, owing to the low rate of turnover approximately 85 per cent of companies are considered to be overstaffed. In some countries, for example Spain, it has not been possible to replace outdated skills by taking on skilled workers. In other countries labour laws protect workers by giving them high compensation for loss of employment, and this in turn impedes reorganisation and skill upgrading as a company does not acquire expensive new equipment which can replace 20 or 30 workers if it is obliged to keep them on its payroll anyway. Therefore the effect of new technology has been an improvement in the quality of products rather than more productive operation.

**A decline or an increase in the share of women workers?**

Traditionally, the textile industries of some countries have been major employers of women. The high proportion of women among blue-collar workers has been associated with relatively low skill levels. At the same time, the ratio of white-collar to blue-collar workers has been substantially lower than in manufacturing as a whole. As a result, both the average educational level of the labour force and its skill intensity have been low. The sector's reliance on a relatively unskilled, largely female labour force, frequently concentrated in areas with fewer alternative employment opportunities, has made it possible for textile firms to obtain labour at relatively low rates of pay. Chapter 4 of the General Report provides information from several countries on the number of women workers in the textile industry.

There have recently been changes in the sexual composition of the textile labour force. In some industrialised countries there has been a decline in the proportion of women employed. This decline may have resulted from a combination of technological change, the trend towards round-the-clock working and the transfer of mass production units to the developing countries. In the United Kingdom, for example, new technology has not aided women as much as men, even though it eases the physical strain of many jobs. With new technology three-shift working is the norm rather than the exception, and until 1988 women could not work on the night shift without prior permission from the Department of Employment. The law changed in 1988 so as to allow women to work on all shifts, but nevertheless very few of them are doing so. Therefore, the number of women workers has declined at a more rapid rate than that of men.

The management structure in the United Kingdom textile industry is 98 per cent male. Nevertheless, special courses are being devised to encourage women to move into management positions. Also, as is occurring in most countries of Western Europe, companies are coming to rely more and more on women returning to industry after raising families, and this could significantly change the structure of the textile labour force over the next few years.

In Brazil there has been a transfer of occupations from female to male textile workers, and the textile industry is now predominantly male, although women still account for 43 per cent of the total, compared with an average of 22 per cent in other industries. Men have begun to fill production and maintenance jobs along with other arduous or high-risk jobs. Women work in yarn preparation and processing, loom operation and quality control.

In the textile industry of Hong Kong the total proportion of women has been around 30 per cent, with women workers in over 60 per cent of unskilled jobs. In the United States and Australia, the proportion of women in the textile industry has been around 50 per cent and has not significantly changed.

In the Eastern European countries the number of female workers has increased. In Czechoslovakia, for example, in traditional spinning and weaving occupations the workforce is nearly 100 per cent female. In Poland the vast majority of employees (60 to 70 per cent) are also female. There is a gradual upward movement in the number of women employed in the administration areas in the USSR.
Low literacy of labour – An obstacle to technological change

Employment of large numbers of illiterate or partially literate workers by the textile industries has become an obstacle to technological change. In Brazil, for example, over 75 per cent of textile workers have not completed compulsory schooling. In Egypt over 70 per cent of textile workers are illiterate or barely literate. In Spain over 65 per cent of textile workers have had only elementary schooling or no schooling at all. In a typical Portuguese textile company 80 per cent of the employees do not have any specific training (this figure includes between 4 and 6 per cent who are illiterate and approximately 66 per cent who have only four years' basic education).

Employers have realised the disadvantages resulting from inadequate levels of schooling in the light of technological change, and are taking steps to encourage textile workers to improve their levels of education.

Proportion of operatives as a criterion of technological level

The introduction of new textile machines has led to a change in the ratio of operatives to technical staff in the textile labour force, while introduction of new methods of work organisation has in many cases decreased the proportion of supervisory staff.

In the United States the proportion of operatives and labourers in the textile labour force decreased from 67.2 to 63.8 per cent between 1975 and 1985, while the share of technical staff increased from 3.2 to 4.7 per cent and that of management staff from 7.4 to 7.9 per cent. In France the numbers of blue-collar textile workers have dropped by 15 per cent and the numbers of engineers and managers have risen by 4 per cent over the past few years. In Canada the share of textile operatives dropped by 18 per cent and of management staff by 10.3 per cent. As a direct result of a decrease in the number of operatives in the textile industry in Japan, there has been an increase in the number of people employed in the clerical, sales and research sectors. In Germany there has been a reduction in the number of operative jobs owing to re-equipment, but the textile companies are now employing more people in design departments, warehouses and distribution of goods as part of a "just-in-time" approach. This process has been very slow in some developing countries, for example Nigeria, where by 1989 there were only two supervisors to every 100 workers.

Skill shortages

In many countries training systems have not been able to provide an appropriate mix of skills. Particular shortages are felt in the areas of textile engineers, maintenance engineers and textile design. With modernisation, electronic and computer skills are required at all levels within the firms. In some countries there are no training courses for textile mechanics and reliance has had to be placed on general engineering knowledge. A similar situation exists in the dyeing and finishing sector, where chemists are having to be trained in textile skills in order to keep plants going. There is also a growing demand for skilled personnel in stock management, marketing and exporting.

In Greece there are acute shortages of sewing machine mechanics, dyers, overlookers, planners and production managers. There are also shortages of knitters and sewing machinists. Employment opportunities also exist for foremen, supervisors, inventory clerks, electronic operators and computer programmers, maintenance technicians, quality control specialists, designers and marketing specialists. In Spain particular shortages are felt in the areas of textile engineers, maintenance engineers and, probably most keenly, textile design.

Segmentation of the labour force

Spain is a country where the labour force is sharply segmented. "Regular workers" in this labour force are those who possess a contract of employment of indeterminate duration and who can join unions and are covered by collective bargaining. The second are "autonomous workers" or drapaires; basically freelance weavers located mainly in Sabadell, who constitute a group that has traditionally covered seasonal increases in activities. The majority of them are installed in rented premises in old, closed-down factories with very poor health and safety conditions. They work alone, or with the help of their families, or with two or three employees at most. They constitute a group which varies between 300 and 600 units.

A third group, "irregular workers", are subject to more precarious conditions, though the dividing line between irregular workers and employees in small workshops can be blurred. Irregular workers do the worst-paid work, often in illegal conditions, mainly because they are the weakest social group – poorly qualified workers and especially women. With the introduction of value-added tax, pressures for the regulation of these activities have appeared now that the manufacturers require receipts. This is bringing about the legalisation of labour in part of the sector as workers acquire autonomy, form co-operatives and obtain contracts of temporary and part-time employment.

Contract employment systems

Some countries have tried to increase the flexibility of their labour market through contracts of temporary and part-time employment. In Spain, for instance, such contracts, accompanied by training, are offered to young
people aged 16 to 20 and last from three months to three years. Training may not take up more than half or less than a quarter of working time. In Portugal, around 11.3 per cent of all employment in the textile industry is on the basis of fixed-term contracts, including 4.7 per cent of senior managers, 8.3 per cent of middle managers, 9.3 per cent of craftsmen and 23.0 per cent of unskilled workers. Transfer from temporary jobs to the permanent staff depends on the worker's attaining a higher level of skill and is thus a kind of incentive. In China in 1982 the Government also introduced a contract employment system and the textile industry took the lead in developing it. By 1988 around 22 per cent of the total textile workforce were employed under the system.

Expatriates versus skilled nationals

In some developing countries, for example Nigeria, most high-level technician posts in the industry are occupied by expatriates. This employment structure is often supported by the structure of foreign ownership, which in many cases prevents local technicians and managers from obtaining promotion. This has resulted in the emigration of competent national cadres and thus represents a waste of national educational resources. In Ghana, on the other hand, technician and management posts have passed into the hands of national cadres, and intensive retraining and transfer of foreign know-how have become important tasks.

Adjustment of employment patterns to technological change

In some countries, like the United States, programmes to protect workers from the adverse effects of changes in machinery and methods of production are incorporated into union contracts, or there may be informal arrangements to this effect between workers and management. Formal labour-management agreements, which cover only 15 per cent of the workers in the United States textile industry, exist with the Amalgamated Clothing and Textile Workers' Union and with the United Textile Workers of America. Plant-wide seniority rights, which are recognised in all agreements, provide a measure of job security when technological changes take place. In general, seniority rights apply to lay-offs, recall and similar situations. Even though training and retraining (generally associated with technological change) are usually not mentioned in the contracts, seniority is often a pertinent consideration when training or retraining is offered.

Although requirements for advance notice of changes are usually not included in agreements, it is often the practice to inform unions of the intended introduction of new technologies. Some agreements require one to two weeks' notice to the union of changes in workload or job assignments. A continuous work schedule involving round-the-clock operation of a mill seven days a week has become more prevalent as the industry has adopted costly machinery. Some agreements in the northern United States provide for severance pay in the event of permanent separation from a company as a result of technological change. Only about 6 per cent of the production workers employed in cotton and man-made fibre mills in the south-east have formal provisions for technological severance pay.

Improving the industry's image

In many countries the image of the textile industry is discouraging potential recruits. The general impression outside the industry is that work is dirty, dusty and hence unhealthy, pay is low and, with the advent of new machinery, security non-existent.

In the USSR every three years around 40 per cent of graduates of vocational schools quit their jobs in the textile industry for industries where conditions are not considered as hard and which offer higher wages (in 1990 the average textile wage was 206 roubles per month compared with 241 roubles per month in industry as a whole). In France a video has recently been produced which has been shown in cinemas to try to overcome the image problem, and a variety of other schemes are being tried out in other countries.

Notes

1 OECD: Textile and clothing industry ..., op. cit.
2 Windsor, op. cit.
3 Vocational Training Council (Hong Kong): Report by the Textile Industry Training Board ..., op. cit.
Training and education patterns for various occupational groups

There are two general types of training: formal and informal. Formal training combines general education subjects with vocational instruction. Informal training is usually given outside the regular academic cycle. While it may include general education subjects, the emphasis is on raising skills which are relevant in the conditions of a given enterprise and in real-life situations.

In the textile industry, as in many others, these general types of training follow three main patterns:

- informal on-the-job training with gradual promotion of the most capable workers to more skilled jobs;
- apprenticeship training, which comprises a number of schemes offering various combinations of on-the-job and formal training;
- pre-employment education and training of workers in training institutions with or without on-the-job training.

Informal on-the-job training

As in many traditional industries, employment in the textile industries in many countries is based on internal promotion and informal on-the-job training. The most capable unskilled and semi-skilled workers are progressively promoted to more complex jobs and, if they express interest in learning, are then trained as skilled workers, supervisors or foremen. Most training is done on the job, though individual firms provide some in-plant courses. With the exception of generic occupations such as air-conditioning mechanic or electrician, skilled workers often have no formal training at all.

This internal promotion system has evolved in the textile industry owing to several reasons, but mainly because the traditionally low technological level, low wages and bad working conditions in the industry have not attracted individuals with good general education and a broader technical background, who have more attractive options elsewhere. Moreover, textile workers have used machines and technology which could only be found in their industry. Employers have therefore had no choice but to promote unskilled and poorly educated workers to more complex jobs. As a result, skilled workers, like unskilled workers, usually have little education.

All this has resulted in a lack of tradition in organised textile vocational training. Even in a technologically advanced country such as the United States a high proportion of the skilled textile workforce have obtained their skills through long years of experience without having any theoretical training. In Australia no formal training is provided for 95 per cent of textile employees.1

In developing countries the textile industries have often shown little interest in imparting systematic training to the labour force: most workers simply follow the internal promotion pattern. For example, in the textile industries of Ghana, India and Nigeria, operatives are recruited straight from schools without any previous training and receive on-the-job instruction. Lack of training tradition has led to situations where even existing training facilities are not properly used.

In some countries and territories in-plant informal training programmes have been developed. In the Philippines, for example, basic handloom training lasts five days, covering fibre classification, yarn properties and weaving tools. Advanced handloom training lasts ten days and includes designing, weaving and dyeing techniques. In Brazil open-end spinners are trained for six to seven weeks, and shuttleless loom weavers for 11 to 12 weeks. In Hong Kong, weavers and fabric repairers receive eight weeks, and drawing-in workers four weeks, of full-time pre-employment training at the operative level. In Pakistan in-plant operative training lasts from two to eight weeks.

Although it is adequate for older technologies, informal on-the-job training is becoming more and more irrelevant in the light of technological changes and market demands for quality products and flexible manufacturing. The following shortcomings have been identified:

- lack of systematic training adversely affects labour productivity and quality of production, and proper operational care and durability of machinery; it is also an obstacle to rapid modernisation;
- informal training is often provided by another worker or a supervisor whose own training has been
Apprenticeship training

Another traditional pattern in the textile industry has been apprenticeship training for operatives, craftsmen, technicians and technologists. A high-standard apprenticeship consists of systematic training based on relevant job standards and specialised programmes. It is conducted on the job by experienced workers or specialised instructors. Related theoretical training is provided through compulsory attendance of an apprentice at a technical course on a day-release basis.

The increasing use of new technologies and the need for improved quality and productivity have caused some changes in the curricula of apprenticeship training of operatives in some countries. Manual skills have given way to mental skills. Some companies train their apprentices in all the jobs related to the particular range or process on which they are to work. In the United Kingdom, for example, operatives employed in wet processing, which now has numerous computer controls, need to have a high level of intelligence enabling them to run the whole range of controls, a task which was formerly performed only by the leading hand. This has been shown to increase interest in the job and hence improve job satisfaction as well as quality and productivity. The more an operative identifies with the process as a whole, rather than with only one part of it, the greater is the chance of improved performance.

Apprenticeship training in companies in the United Kingdom involves systematic on-the-job training with increased emphasis on computer literacy and skills, which are taught largely off the job.

In Brazil apprentice operatives and electricians often have only four years of primary schooling, i.e. they are literate but have little education. Maintenance mechanic apprentices have to have completed primary schooling and usually also take a variety of short courses.

The length of apprenticeship may vary depending on the level of general education. In the event of a very low educational level (primary schooling or no schooling at all) it may be very long. In Egypt skilled operator apprenticeship lasts three years. In Poland, where young trainees combine three days a week of theory classes with two days in the factory, a “skilled worker” certificate is awarded after a three-year course.

In India the apprenticeship programme introduced by the Government has not yet taken root in the textile sector, where the total number of apprentices trained every year is only a few thousand. Only seven conventional trades are covered by the apprenticeship programme; important trades such as bleaching, dyeing and processing are not included. Over 90 per cent of the textile labour force in the unorganised sector have never undergone any formal training. In 1988 only 3,895 out of 7,058 vacancies for apprentices in the textile sector had been taken up.

In some countries, such as Belgium, where training trends are more towards cross-sectoral than sector-specific knowledge. In order to bridge the gap between what companies need and what providers of external training can give, more in-company courses are being developed by the textile sectoral training agency. Between 1984 and 1989 the number of companies to which it provided in-company courses increased from 90 (with a total of 500 workers) to more than 250 (with a total of 2,000 workers).

Apprenticeship training

Another traditional pattern in the textile industry has been apprenticeship training for operatives, craftsmen, technicians and technologists. A high-standard apprenticeship consists of systematic training based on relevant job standards and specialised programmes. It is conducted on the job by experienced workers or specialised instructors. Related theoretical training is provided through compulsory attendance of an apprentice at a technical course on a day-release basis.

In the contract that is usually signed between an employer and an apprentice the obligations and rights of the parties and the periods of apprenticeship and probation are fixed. The apprenticeship contract is sometimes liable to registration with the training authorities. Upon completion of a course an apprentice is awarded a certificate. In some countries, for example Belgium, textile trainees sign an apprenticeship contract not with the firm, but with the Textile Industry Social and Guarantee Fund, and the firm has no obligation to employ the trainee subsequently.

In some countries apprenticeship takes the form of strict formal training where training curricula have to be approved by training boards, but in many developing countries its pattern is close to that of informal on-the-job training and it thus offers a limited range of skills, neglecting matters such as quality control or adjustment of electronic devices.

Textile operatives may enter apprenticeship at various educational levels. In Europe they are generally recruited at the age of 16 direct from schools. They are usually given unskilled jobs to start with and if they show promise they receive further training for skilled jobs. Their apprenticeship training is often conducted at the firms' training centres, which are common in large and sometimes even in medium-sized firms, and which train operatives and technicians under the supervision of foremen or instructors. Maintenance staff are trained partly on the job, in much the same way as production workers, and they attend specific courses.

In Brazil apprentice operatives and electricians often have only four years of primary schooling, i.e. they are literate but have little education. Maintenance mechanic apprentices have to have completed primary schooling and usually also take a variety of short courses.

The length of apprenticeship may vary depending on the level of general education. In the event of a very low educational level (primary schooling or no schooling at all) it may be very long. In Egypt skilled operator apprenticeship lasts three years. In Poland, where young trainees combine three days a week of theory classes with two days in the factory, a “skilled worker” certificate is awarded after a three-year course.

In India the apprenticeship programme introduced by the Government has not yet taken root in the textile sector, where the total number of apprentices trained every year is only a few thousand. Only seven conventional trades are covered by the apprenticeship programme; important trades such as bleaching, dyeing and processing are not included. Over 90 per cent of the textile labour force in the unorganised sector have never undergone any formal training. In 1988 only 3,895 out of 7,058 vacancies for apprentices in the textile sector had been taken up.

The increasing use of new technologies and the need for improved quality and productivity have caused some changes in the curricula of apprenticeship training of operatives in some countries. Manual skills have given way to mental skills. Some companies train their apprentices in all the jobs related to the particular range or process on which they are to work. In the United Kingdom, for example, operatives employed in wet processing, which now has numerous computer controls, need to have a high level of intelligence enabling them to run the whole range of controls, a task which was formerly performed only by the leading hand. This has been shown to increase interest in the job and hence improve job satisfaction as well as quality and productivity. The more an operative identifies with the process as a whole, rather than with only one part of it, the greater is the chance of improved performance. Apprenticeship training in companies in the United Kingdom involves systematic on-the-job training with increased emphasis on computer literacy and skills, which are taught largely off the job.

Apprenticeship is also resorted to for training more highly skilled workers such as craftsmen and technicians. A "craftsman" is a worker who is able to apply a wide range of skills to his work with minimum direction and supervision. The term "technician" is applied variously to a range of occupations depending upon a particular country's attitude and point of view. In some countries the loom tuner (fitter, mechanic) is called a "technician",
while in others he is a "craftsman" or "master craftsman". The dyer is called a "technician" in some countries and a "technologist" in others.

In the United Kingdom the definition might well depend upon the academic qualifications the worker possesses rather than on the job description. In practice the term "technician" is applied to occupations for which the period of training is upwards of two years and includes loom mechanics, yarn production mechanics, dyers, colourists and laboratory technicians.

Generally a technician is a more educated worker than a craftsman as he has to be familiar not only with technological processing but also with its principles. Both craftsmen and technicians, however, require an ever wider range of theoretical knowledge and practical skills to work with modern textile machinery. They are strongly influenced by technical and other production changes simply because they are the main implementers of these changes on the shop-floor. They are therefore often the first to need retraining.

Training of skilled textile workers has followed many paths. Some countries prefer theoretical training before employment, others see advantages in training patterns mixing a full-time job with highly formalised off-the-job theoretical training. The United Kingdom education system appears to be one of the least rigidly structured as regards both basic education and continuing training. Technician trainees may enter the industry via a number of routes: direct from school at age 16 to 18 or from a college at age 20. A 16-year-old apprentice would be expected to have completed General Certificate of (secondary) Education standard in mathematical and scientific subjects (including chemistry, if the trainee wishes to enter the wet-processing industry). In-company training is complemented by further education on either a part-time day-release basis or a block-release basis or by distance learning.

Thus, a loom overlooker first undergoes junior apprenticeship training for at least 18 months, during which he learns to operate weaving machines and ancillary equipment. After this period he graduates to senior trainee. Training at this level is for a further period of two years, during which he is trained in the principles and practice of loom overlooking. The trainee is required to undertake vocational education complementary to his training. This may be obtained by attendance at a local college on a day-release basis or by distance learning. Successful completion of a vocational education course results in the award of the City and Guilds of London Institute Certificate in Textile Techniques. A similar pattern is followed by trainee technicians in the spinning sector.

Loom mechanics in the United Kingdom follow a course of electronics training provided by their union, in addition to the usual training. Wet-processing technician trainees also undergo training in microprocessor operation. These developments are relatively new and reflect the trade union's perception of the need to have its members trained to the highest possible standards. Generally speaking, however, textile vocational education in the United Kingdom follows the Business and Technical Education Council programme, which is more academic. The award on completion of this programme is a National Certificate in General Textiles.

In Germany, Austria and Switzerland apprenticeship has become a highly formalised training system, known as the "dual system". Instead of including practical subjects in school curricula these countries prefer to incorporate school subjects in on-the-job training.4 After ten years of regular schooling students take up a job in the occupation they choose, working three or four days a week in an enterprise under the supervision of a master craftsman. The remaining days are spent in training centres studying technological subjects. At the end of two or three years students must pass a test. A current problem of the dual system is improvement of standards of on-the-job training.

In some developing countries and areas craftsmen and technicians are also trained largely in a formal apprenticeship scheme inside or outside the industry. Sometimes they may attend long-term courses either in vocational training centres - basically as mechanics, electronics servicemen and electricians - or in textile machinery manufacturers' training centres. In the textile industry of Hong Kong, for example,3 three routes are recommended for training textile technicians: completion of a four-year organised technician apprenticeship with attendance at a technician course on part-time day release; completion of a full-time technician course followed by a minimum of two years of organised on-the-job training; or attendance at evening courses in general studies followed by a technician course and on-the-job training.

Technicians in the Nigerian textile industry are mostly trained on part-time or full-time courses at technical colleges or polytechnics. They usually have six years of primary schooling, sometimes with secondary schooling. In Ghana craftsmen are either trained in technical institutions or promoted from worker level; textile craftsmen with industrial experience are released by their employers to take institutional courses at the technician level. Developing countries with relatively small textile industries normally rely on a system of initial training in general mechanics or electrical work at a training school or centre with further specialisation at the enterprise. In many countries textile enterprises employ craftsmen trained in other industries.

A large proportion of technologists are also trained through a system of long apprenticeship where the new recruit begins work as an operative, a graduate apprentice or a trainee and attends evening or day-release courses at a technical college delivering a diploma. This system is applied in the United Kingdom and in parts of the world with similar education systems.
In the textile industry of Hong Kong, for example, the main training paths for technologists are the following:

- completion of a relevant degree/associateship course leading to a recognised professional qualification, e.g. from the Textile Institute (TI) or the Society of Dyers and Colourists (SDC); a further minimum of two years' on-the-job training; a further two years' experience in a position of responsibility;

- completion of a three-year higher diploma course and passing Group I or Group II of the TI associateship examination or part of the SDC associateship examination, plus further part-time courses of the TI or SDC with associateship examination and a minimum of two years' on-the-job training; two years' experience in a position of responsibility.

Technicians have to attend part-time TI Group I and/or Group II courses or SDC courses; they must also attend further part-time courses and pass the associateship examination of the TI or SDC with a minimum of two years' on-the-job training and two years' experience in a position of responsibility.

In general, apprenticeship has proved to be a reliable form of training which has been very popular in the textile industry since it has several advantages for both employers and employees. For the employers, apprenticeship offers an opportunity to produce skilled workers with sound knowledge of their enterprise. Moreover, they have a unique opportunity to influence the education process in an area where they can promote the most promising workers. For textile employees, apprenticeship offers a choice of a large number of training paths, though all of them, as illustrated by the cases mentioned above, are fairly long.

Pre-employment training and education

Pre-employment training and education are usually available at three levels: craft certificate level for craftsmen in a variety of textile skills; diploma level for technicians, supervisors and foremen; degree level for graduates of higher education institutions: textile technologists, managers and so on. Every level has its entry requirements; duration of courses also depends on the level of educational qualification sought, though it may vary from one country to another.

In some European countries the training of operatives, craftsmen and technicians seems to be centred more on full-time pre-employment courses than in the United Kingdom. In France, for example, technical and vocational secondary schools provide full-time instruction in skills and regular school subjects. In the lace industry pre-employment training is the norm even for operatives, since a high calibre of trainees is required. Skilled workers are trained in vocational secondary schools and technicians in technical secondary schools, higher institutes of technology and university institutes of technology (UITs). Managers must be graduates of universities and schools of engineering. France has a total of 13 schools authorised to award vocational diplomas for textile managers and technicians: five schools of engineering, one research and training institute providing engineers with specialist textile skills, four higher secondary schools for textile technology and three UITs. For lower-level technician and skilled worker training there are 26 centres with 13 specialisations.

The German vocational education system is well known for the clearly defined qualifications it provides for trainees. There are direct links in the textile industry between vocational training curricula and qualification levels, of which there are six:

- level 1: textile machine operator: two-year full-time training course after lower secondary school, or two years of dual training;

- level 2: textile mechanic: one-year course after level 1 training, either full time or under the dual system;

- level 3: textile industry specialist: two years following the upper vocational school level alternating with practical experience in firms;

- level 4: textile technician: two years at a technical institute after the upper vocational school level, supplemented by specific practical experience in firms;

- level 5: technical and vocational textile engineering diploma: three or four years of university-level courses following upper vocational school (two or three years);

- level 6: technical diploma in textile engineering: five years after the technical school-leaving certificate, plus specific practical experience.

In Italy higher secondary education is structured around three general streams: general secondary schools, technical schools and vocational schools; courses at all these schools last five years. Technical schools award textile specialist diplomas in different types of products and processes. Courses for textile process operators provided for graduates of lower secondary schools last from one to two years full time.

There has been further integration of regular schooling and vocational training subjects in Portugal, where seventh-, eighth- and ninth-form curricula in some schools include the rudiments of textile and fabric manufacture. In the tenth, 11th and 12th forms the curricula embrace such subjects as spinning technology and practice, weaving technology and practice, dyeing and printing, electricity and electronics and so on. Up to 16 hours a week are spent on textile subjects in the tenth and 11th forms and 22 hours in the 12th form.

In the same country there are three main patterns of entry to higher education from supplementary
secondary education (from the tenth to the 12th year of school attendance):

- one-year vocational courses followed by six months' apprenticeship with both technical and educational aspects, supervised by trainers from enterprises. Graduates in employment have to attend three-year courses in order to complete their vocational training;

- three-year technical vocational courses, preceded by the study of technical and scientific subjects during the vocational training period; these include an option of specific training in textiles;

- university courses in production engineering, textile engineering and other specialised textile subjects, offered by two universities, with degrees after four to six years of study.

Vocational schools in the USSR train skilled operatives, while technical schools train technicians for the textile industry. Both accept persons over 15 years old with eight to ten years of general education. The period of study in vocational training schools is one to three years depending on educational level and occupation. On graduation from a vocational school a certificate in grade 4 or 5 of the appropriate occupation is awarded and graduates are employed by textile enterprises without any further apprenticeship. In technical secondary schools courses last for two-and-a-half to four-and-a-half years depending on the occupation. The number of graduates of vocational training schools for the textile industry decreased from 48,700 in 1980 to 43,500 in 1988. Evening classes and correspondence courses are also available. In 1990 an estimated 45 per cent of all textile students in technical schools were trained in day classes, 25 per cent in evening classes and the rest by correspondence.

Among the industrialising countries, Brazil has developed a system of vocational training that seems quite successful. Its main advantage is that it maintains very close links with the labour market and with industry. The National Vocational Education Service (SENAI), which is run by the employers' association, offers vocational education courses – full-time long-duration courses for young people aged 14 to 18, or night classes for working students. Qualification courses – evening courses of flexible duration – are offered for persons over 16 years of age who are qualifying for a skilled job. Other paths for workers to improve their skills are upgrading courses – evening courses of variable duration – and extension courses which can be attended by those who have completed vocational education courses or qualification courses and who wish to specialise in a narrow field within their occupation.

SENAI also offers full-time technical courses for middle-level technicians. A regular technical course, intended for young people with complete primary education, lasts four years and includes school attendance and a supervised training period in industry. Its graduates are eligible for college entrance examinations. The 18-month intensive technical course provided for secondary-level students consists basically of occupational subject-matter.

In many developing countries national textile education systems have also continued to grow. Many Nigerian textile professionals formerly received their formal textile technology qualifications from France, Germany, the United Kingdom and the United States. Prior to 1979 all Nigerian graduate fibre scientists, textile technologists and engineers received their degrees from abroad. In 1979 a Nigerian university started awarding an M.Sc degree in polymer science and technology with fibre option. In 1980 the first University Department of Textile Science and Technology was established at the Ahmadu Bello University for the award of a four-year B.Sc.Tech. honours degree in textile science and technology. In 1981 the Federal University of Technology in Owerri began awarding five-year B.Sc.Tech. and B.Eng. honours degrees. The M.Sc. and Ph.D. degree programmes started in 1989.

Also in Nigeria, the teaching of local crafts like textiles is included in primary-school education. The junior secondary-school curriculum includes introductory technology, which comprises the use of simple equipment for working on a wide range of materials including textiles. This kind of pre-vocational training helps to identify and foster the aptitudes of individual students for further education. The national policy also makes it clear that technical teachers must have industrial experience.

In India, around 200 craft certificate-level training courses are provided for seven textile trades, mainly in weaving and finishing, with an entry level of eight years of secondary schooling. The duration of courses can vary from one to two years. Diploma-level courses offered by 36 polytechnics take secondary-school graduates and last for three years, while degree-level education is provided by 17 colleges which accept students who have completed 12 years of schooling. Degree-level education lasts four to five years. Post-degree-level education is available in six institutions in selected subjects such as textile technology, design and management.

In cotton textile manufacturing 0.9 per cent of workers have diplomas. About 3.8 per cent of workers have degrees, but only 0.7 per cent have technical degrees. In 1987 the textile institutes took 2,111 diploma-level students and 647 degree-level students. These training facilities serve mainly for the mill (large and medium-scale) sector.

**Training of managers**

Management staff in the textile industry have been traditionally recruited from the shop-floor, but in recent times the situation has changed. Now that university education is open to everyone in industrialised countries, a smaller proportion of those choosing to enter industry
on leaving compulsory education has management potential than was formerly the case. Though some companies still tread the well-worn path of promotion from the shop-floor, many others are changing their approach to management selection and development.

Striving for flexibility and for reduced costs is requiring more delegation of responsibilities to the middle-management and supervisory levels. The challenges imposed by new technologies and growing market competition, the introduction of quick-response systems, the need for better work organisation in order to increase workers' job satisfaction, energy saving and pollution control, and reduction of machine down time through better maintenance – all these are urgent tasks that cannot be successfully handled by poorly trained managers.

Managers also need to be retrained to cope with rapid technological change, which has a strong influence on organisational structures, in-company communication systems and decision-making. The preferred way of retraining is "action research", where managers retrain themselves by designing and running in-firm development projects with participation of external consultants. The process of continuous management education on the basis of short courses in management development institutes is also becoming more popular.

Nowadays management in many textile firms is recruited from among university graduates, including persons with higher degrees in business administration. In the United States, for example, these graduates may have studied textile technology as a major discipline together with some management science, or they may have studied management as their main subject. The company devises a programme of in-company training based on the established needs of the graduate trainee. Early responsibility is encouraged, experiment endorsed and failure forgiven. To complement in-company training, off-the-job training and education are usually done in the employee's own time.

In many developed market economies a manager today is expected to be properly trained before joining the company, but must still expect to do a period of apprenticeship in his chosen function and to be judged on his performance. The previous assumption that managers have to be familiar with at least several major production operations is being challenged today on the ground that the skills learned in practical work periods will be obsolete in a few years' time. Therefore a basic objective of future managerial apprenticeship is to gain an awareness of the social climate on the shop-floor and of workers' attitudes towards their jobs, remuneration and management. For middle managers the larger companies run internal training programmes largely taught by their own training staff. Medium-sized firms usually send their managers on short external courses. Many small companies, however, claim that they have neither the time nor the money for management development.

In Japan companies all agree that their managers are key assets that cannot easily be replaced and therefore must be developed. Japanese companies engage a good proportion of the best university graduates. They then adopt what has been called a "slow-burn" developmental procedure of progressive job rotation. It is supplemented by formal reviews and assessments and a variety of types of formal study, including research into company problems, classroom instruction in company courses and, most importantly, self-development private study and correspondence courses. Individuals accept this approach because they can expect a lifetime career in the same organisation. Companies favour it because it enables them to build up a stock of managers who are versatile, well educated and unlikely to want to leave.

In many developing countries textile firms are traditionally family managed. Young managers are often educated abroad in business schools but have little knowledge of technology. So while they are familiar with management techniques they are often unable to apply them satisfactorily. Productivity and efficiency in many firms have been poor and they are now beginning to appreciate the need for training in technological subjects. Owner-managers in the informal sector of developing countries have never received any training and are often illiterate or partially literate.

In Eastern European countries little attention has traditionally been paid to management training in the textile industry. Managers have often been political appointees and their training curricula have until recently included only political and economic subjects, neglecting management science and textile technology. Training systems for managers are now being established and are slowly shifting to Western management training practice with the move towards economic self-reliance of enterprises. This concept is difficult to apply for managers without proper training.

Training of trainers

Trainers are usually industrial specialists with extensive practical experience. They are trained in refresher and advanced courses by experts from established institutions and from industry. In some countries there is a very strict system of trainers' certification. In SENAI (Brazil), for example, teachers are divided into three groups: general education teachers, specialised vocational teachers and training instructors or human resources development specialists. Vocational teachers must have three to five years of work experience and undergo special technical training.

Some 38 per cent of the teachers have completed higher education and 87 per cent secondary education; 25 per cent of them have worked six to ten years in the industry and 64 per cent of them have had at least six years of practical experience. The teachers undertake regular retraining, including pedagogic upgrading. Thus, in 1987/88 alone, about two-thirds of the teachers'
contingent participated in at least one training course supplied by SENAI. The majority of them attended personal development training and some of them took technological upgrading and teaching techniques specialisation courses. The trainers are normally registered in the Ministry of Education.

In Egypt, at least three years of experience are required to become a trainer. Trainers from the government training agencies usually receive a one-year course in teaching methodology in the instructor training institute. At the same time most of the company instructors train themselves occasionally according to their abilities and personal interest. In Ghana trainers are selected from those who have completed degree courses in textiles at universities. Some of them have completed teacher training courses, while those teaching without a teacher training certificate are given leave to study at the local technical teachers' training college.

In the Eastern European countries the training of trainers was until recently centrally planned by the textile ministries, which specified the amount and frequency of retraining to be given. At present, trainer training availability depends upon the plans of the higher educational establishments and other training institutions. In the USSR, this has resulted in a decrease of the number of trainers retrained.

Problems of trainer training commonly encountered are, firstly, that many trainers in the textile industry, although experienced workers, have received no particular instruction as trainers; secondly, and on the contrary, trainer training in some countries is conducted as a highly centralised process with centrally written curricula and rigid, centrally determined standards, where industry has no say in what is included.

Fortunately, however, there is a growing perception in some companies of the importance of in-company trainer development. Many companies, particularly small ones, do not have their own trainers. The traditional role of the company trainer is changing owing to the quick pace of technological innovations and the related need for retraining. In many companies emphasis now needs to be on adult training and retraining rather than on the initial training of school-leavers. A new group of trainers is required to act more as analysts and facilitators than as director instructors. Company trainers will need to identify training needs for managers and advise them on the most suitable methods. The status of trainers needs to be enhanced; they must be carefully selected and properly remunerated, especially in textile companies undergoing rapid change.

Retraining

The most common reasons for retraining are the introduction of new machinery, technology and methods of production, the improvement of productivity and flexibility and the retraining of retrenched workers.

In the case of new machinery or technology, it is common for technical staff to undergo short intensive courses on operation and maintenance at the machinery manufacturer's or to be trained in-company by the manufacturer's technicians. The company technicians then train the operatives.

For productivity, quality and flexibility improvement special programmes of production, organisation and management development have become popular in industrialised countries. These programmes are designed to achieve:

- improvement in textile production and processing (e.g. reducing bleaching times by use of high-temperature processing, changing the techniques of spinning, introduction of continuous processing);
- simplifying the range of products while still meeting customer specifications;
- improvement of work organisation, planning and control and reaching the best mill balance;
- satisfaction of customers' requirements in terms of quality, price and delivery time.

These development programmes are backed up by human resources development programmes which include both retraining and team creative activities. These programmes aim at supervisory development, upgrading and the acquisition of a wide variety of skills, increased flexibility and improvement of motivation.

Development and retraining programmes are not often found in developing countries, where productivity has had lower priority than employment. Nor is a flexible workforce a priority in these countries. Low rates of pay and government subsidies make the textile industry competitive in price terms even with a large workforce. Refresher training is often neglected, mainly because there are no trained instructors to carry it out. This results in bad work habits being maintained, impairing both quality and productivity. In many developing countries textile supervisors are often mechanics who are given supervisory responsibilities without the skills of leadership, motivation and organisation to exercise them effectively.

Retraining programmes are therefore largely designed for retrenched workers. Workers who do not fit new jobs are reassigned to other, sometimes less skilled, jobs. Women workers have been especially affected by this policy. This has created serious problems.

There are a number of higher educational and training institutions in many countries providing upgrading training for textile workers. Such courses are also provided by employers' associations and trade unions. In Portugal, for example, universities offer various practical and theoretical courses (one to five days), and 20- to 40-hour courses including colorimetry, dyeing, spinning, weaving and quality control, which are attended by technicians and training specialists from the
industry. They also hold 120-hour courses designed for technical staff from small and medium-sized enterprises.

The extensive training and retraining opportunities existing in many countries are not always used satisfactorily. Sometimes retraining opportunities exist side by side with a continuing shortage of some skills. For example, research conducted in Brazil has revealed serious shortcomings in the operation and maintenance of textile machines and equipment, in methods of work organisation and planning, and health and safety at work.

**Current trends in textile education and training in some countries**

Some new trends have evolved in textile education and training. In the United States, for example, there is a growing concern for the quality of workers’ general education, more use of the community colleges system to upgrade skills of current textile employees, and an increase in training conducted by the large textile firms and equipment manufacturers.

**Concern for general education**

Although textile firms in the United States do not require workers for many of their production jobs to be high-school graduates, employers are contacting local high schools and have instituted workplace literacy programmes, encouraging their workers to improve their literacy and reach high-school standard. In some of the companies a “renewal education programme” has been established offering workers three different levels of instruction. In basic literacy classes participants learn to read elementary texts; at the second level they learn to read what is written for public consumption; at the highest level they learn to read more advanced materials such as job-related technical manuals and to acquire computer skills.

Although community colleges in the United States have not been a source of large numbers of new recruits for the industry, they have been more successful in upgrading experienced textile workers. For example, the North Carolina Vocational Textile School offers two-year programmes for technicians and repair personnel, one-year programmes for machine operators, and extension programmes which are usually conducted at mills. Enrolment in these courses doubled between 1982 and 1987. Although the school provides theoretical education, it is engaged almost exclusively in practical education in which students spend a great deal of time operating and repairing textile machines. Needless to say, such training must be conducted on advanced textile machines by the trainers familiar with the latest technological and organisational innovations; contacts between colleges and firms must therefore be very close.

There are 58 other schools which also provide either direct extension programmes or upgrading programmes for current employees. This type of upgrading is attractive to the textile industry since it is consistent with the popular pattern of internal promotion and can avoid the direct hiring of educated workers for skilled jobs. Enrolment in the four-year textile schools dropped sharply between 1965 and 1985, but since then the trend has been reversed. Some schools have introduced a curriculum reform that increases the number of standard business courses such as finance, marketing and management.

Machinery manufacturers in the United States have also been providing more training, especially for open-end spinning frames and shuttleless looms. A typical programme may last a few weeks and take place at a central site. More recourse is also had to “efficiency training” – short courses in the use of new machines and techniques. In knitting mills, too, installation of new systems has required considerable technical upgrading.

**General education reforms affect training**

It has been found that the pace at which new technologies are acquired does not depend exclusively on vocational training programmes but is closely related to the level of basic education of the workforce. In fact, in some countries the majority of those at present employed by the textile industry lack even the minimum level of basic education. Therefore not only vocational training programmes, but also educational systems, must be adjusted. In Spain, for instance, it is considered that sufficient preparation for work in modern industry requires workers to receive general education up to the age of 16 supplemented by job training. Secondary education is therefore being reformed by raising the school-leaving age to 16 years and introducing a unified course of general education for all 14 to 16-year-olds. Young people will not be able to enter the first level of vocational training until the age of 16, while the second-level training will be open to those who have completed the more specialised courses of the second phase of secondary education.

**Employment and training policies development in the United States**

There are two main strategies under consideration concerning employment and training policies in the United States textile industry which may be of interest to other countries. One consists of hiring skilled workers and technicians from vocational schools and community colleges, which is a move away from the traditional internal promotion system. This approach has several attractive features for textile companies. It allows them to get rid of the internal training burden, while professionalising skilled workers. It also increases the mobility of skilled workers and thereby decreases the firms' investment in keeping long-term commitments to them. In this way the textile industry will move closer to other industries, where firms have been reducing internal job ladders and relying more on short-term and part-time workers at low levels and on the educational
credentials of specialised professionals at higher skill levels.

However, despite the increasing needs for skills for running, maintaining and repairing machines, the United States textile industry has not moved towards direct hiring of workers with higher levels of general education, mainly owing to apprehensions about disruption of the traditional wage structure because of the higher cost of educated workers. Moreover, the tradition of internal promotion is still very strong in the textile industry. Indeed, it is more and more concerned about upgrading the general education level of employees and incorporating training programmes into the traditional internal promotion system.

Hence the alternative strategy would be to raise the entry requirements for lower-level workers so as to enable them to handle the new environment in the mills and to continue to be a source of skilled workers. In this way the industry would benefit from the strengths of the current internal promotion system while acting to overcome its weaknesses. The main problem is that owing to the unattractiveness of the industry the raising of entry requirements would further reduce the inflow of capable workers.

Notes

1 Windsor, op. cit.
2 Vocational Training Council (Hong Kong): Report by the Textile Industry Training Board ..., op. cit.
3 European Centre for the Development of Vocational Training (CEDEFOP): Exploratory study of the role and activities of "Centres of excellence" in the textile industry in four EEC member States (Berlin, 1988).
5 Serrão Andrez and Caldeira Dias, op. cit.
7 Bailey, op. cit.
8 Homs, Salmurri and Viladés, op. cit.
Structure of training institutions

Industrial training at the national level is often split between various ministries. In Austria, for example, in-plant training is the responsibility of the Federal Ministry of Commerce, Trade and Industry, while vocational schools come under the Ministry of Education and Arts. In India all policy matters related to craftsmen and apprenticeship training are the responsibility of the National Council for Vocational Training and the Central Apprenticeship Council. Government involvement in training is normally through the training agencies and their corresponding schemes.

Vocational education and training for the textile industry are provided by various types of institutions: national educational establishments - universities, colleges, technological institutes and vocational secondary schools and technical schools; educational departments of individual enterprises; training organisations established by a group of enterprises or industries; vendors' and unions' training centres and consulting firms.

Textile industries may sometimes establish their own training boards which are in charge of formulating industrial training policies. Institutes and centres often have to be authorised by agreement with the governmental agencies, national or industrial training boards and to enjoy their technical and financial support.

Sometimes individual institutes and centres, for example the Federal Vocational Training Institute in Germany and the National Textile Training, Retraining and Reconversion Centre (CEFRET) in Belgium, are designated to formulate national training standards.

One of the main problems in the existing structures of training institutions is their weak ties with textile firms. This has many undesirable results, including graduates with the wrong skills and out-of-date curricula. Insufficient co-ordination and poor exchange of training expertise amongst training institutions themselves often leads to lack of standards in skills and trades and prevents proper testing and certification.

Public training in textiles: The case of Greece

In Greece, the public sector offers vocational training programmes through a series of intensive technical training and apprenticeship programmes. Intensive training programmes last three weeks, with two-thirds of time devoted to practical training. Some training is conducted in collaboration with the cotton organisation and the associations of knitters. Enterprises willing to provide training for their staff on their own premises and machinery receive access to approved training programmes and government grants. On-the-job training is also funded by the European Social Fund.

Training structures in India and China

Training institutions in the largest textile manufacturing countries have highly diversified structures. For example, the textile industry in India draws on technical manpower from 20 engineering colleges and 40 polytechnics. Training for semi-skilled and skilled workers is provided under the Apprenticeship Act and the craftsmen training scheme by the industrial training institutions established by the central and state governments. The government industrial training institutes include textile apprenticeship schemes and craftsmen and foremen training institutes. Training and retraining facilities are also organised by the textile promotion agencies for all levels of workers.

Management training for textile firm administrators is available in the Indian Institute of Management, administrative staff colleges, etc. Many professional associations conduct technical and management training and human resources development projects for the industry. The new element in this structure consists of the training centres for the growing informal sector under the Government of India's sponsor training programmes.

In China the administration of training also has a regional structure, with a textile bureau in every province. The textile bureaux co-ordinate training provided in their provinces by the central universities, secondary polytechnic schools, schools for skilled workers, training centres, cadres' schools and local universities and colleges.
Industry-financed training in Brazil

SENAI in Brazil is playing the main role in vocational training in many industries. It is a private, non-profit institution financed by industry and managed by the National Confederation of Industry. SENAII has a nation-wide network with more than 700 educational units. There are two technological centres, a vocational education centre and a training centre for the textile trades. These centres provide programmes for 12 occupational groups. Apart from these SENAII runs courses for textile workers and for those of other industries. In 1989 it conducted a preparation programme for those intending to take up self-employment.

New vocational training institutions in Eastern Europe

In Eastern Europe there are growing numbers of training associations and private institutions, which exist side by side with the state training institutions. In the Polish textile industry, for example, training is provided by the Trade Training Centre, the Association of Polish Textile Workers and the Association of Polish Mechanical Engineers and Technicians, which train skilled workers and textile technicians, including those who wish to become self-employed. In other Eastern European countries private training and consulting institutions deal very little with training of workers and technicians and operate mainly in the area of management training.

Incentives for training

Most training schemes enjoy various kinds of public subsidies. While the central government budget allocations may be a vulnerable source of finance as severe budgetary constraints and instability face many developing countries, there could be various financial and administrative ways of encouraging employers to train and retrain their staff. In a number of countries, mainly in the middle-income bracket, payroll levies on enterprises have provided a reliable source of finance for training. They have proved to be a particularly useful device for the building of training institutions, especially in the development of national training agencies.

Major types of levy schemes

With some variations there are basically two major types of levy schemes for financing training, reflecting rather different objectives. The first is used in some Latin American countries and generates revenues to finance training provided by the private sector. For example, SENAII (Brazil) is financed by a compulsory tax paid by all industries equivalent to 1 per cent of their employees' monthly payroll. Companies with more than 500 employees pay an extra 0.2 per cent.  \(^2\)

One alternative is the levy grant, or rebate, scheme which reimburses enterprises for the costs of training. It seems to be the preferred form of payroll levy scheme in many countries. In France, for example, about 37 per cent of textile companies spent at least 1.2 per cent of their wage bills on training in 1985. By 1988, 72 per cent of textile companies were doing so, and the percentage is increasing.

Some countries use a mix of levy schemes. In Nigeria, for example, grants are made to institutions from the levies collected by the Industrial Training Fund in respect of students who undertake the approved training, while the employers can reclaim part of the costs incurred in the training of their staff.

Administrative incentives for training

Directors of Chinese textile enterprises are obliged to include their responsibilities in their contracts for education and training. If these responsibilities are not fulfilled, the directors' promotions will be affected. Another incentive for training and retraining at the enterprise level in China is related to the grade system, under which enterprises of different grades are obliged to set different training goals: an enterprise cannot be promoted to a higher grade unless it has met its training goals. Moreover, according to the legislation, every enterprise has to allot at least 1.5 per cent of its payroll for training purposes. Some enterprises spend up to 3 per cent of their payrolls for retraining their workers. A special procedure of setting training goals, in which trade unions have an important say, has been developed as a way of co-ordinating their interests with those of management.

In the Eastern European countries, textile ministries have until recently instructed enterprises regarding conditions and norms for retraining various categories of workers, and financing has been provided at the enterprises' cost. Now, however, the situation is changing. The USSR Textile Ministry, for example, no longer fixes any stringent norms, while enterprises themselves are obliged to administer the retraining of their staff and to make their own arrangements with training institutions. Needless to say, since Soviet enterprises are given no financial incentives to invest in training, it has become difficult for many managers to resist the temptation to save on training costs.

The same situation may well be expected in other Eastern European countries shifting to a market economy. They have discarded rigid administrative management but not yet adopted flexible financing schemes. An element of cost sharing has, however, been introduced in recent years in the USSR. Now enterprises have to pay partial compensation to the State for the cost of higher education of specialists at the rate of 3,000 roubles per graduate.

Training incentives for workers

In general, there is much evidence that the workers are not sufficiently interested in retraining, and that
motivation schemes are lacking. Improved productivity and product quality, while of interest to employers, bring few direct advantages to workers. This problem is more serious among older employees. In many textile firms no career paths have been found for the majority of employees.

Restructuring of industrial awards

In Australia the chances of getting promotion from machine operator to leading hand or supervisor were formerly less than one in ten, and eight out of ten textile companies paid all machine operators at the same rate. In spinning and weaving there were significant variations in the ability of workers to operate more than one type of machine or perform more than one operation on a single machine. In other cases, because of the way most bonus systems operate, multi-skilled machinery operators have earned less money than operators performing a single repetitive task. A vast potential of labour skill development has thus been neglected.

However, some recent national wage decisions have been taken with a view to promoting an increase in skill levels in exchange for wage increases. This has become necessary owing to significant changes in wage-fixing principles. Traditional employment classifications are being rewritten to bring them up to date. Award restructuring is intended to establish a framework to promote training for more highly skilled and more rewarding jobs. Some companies have moved ahead to create their own career paths based on payments higher than those stipulated in the awards so as to create a salary scale that differentiates on the basis of skill level.

Some textile managers in the United Kingdom hold the view that the economic stability of their enterprises is a prerequisite for workers' motivation in the long term. A promising alternative would be a stable balance between employer and union interests reached on the basis of collective agreements according workers a fair share of the returns on their training efforts.

Certification

Some disincentives to training lie in the lack of certification systems. Many textile workers have no certificates, and one cannot distinguish between multi-skilled and moderately skilled workers.

In the textile industry of the USSR a narrow range of occupational grades for workers has become an obstacle to their upgrading. Thus, the highest grade for weavers is the fifth, while the entry grade for vocational school graduates is usually already the fourth or the fifth. Weavers are thus virtually deprived of career prospects.

Security of employment

Although security of employment for trained workers remains a difficult problem in many countries, others have been more successful in tackling it, and this also serves as a training incentive. In India, for example, a special system of registration of trained workers has been established. As soon as an appropriate vacancy occurs, trained workers are given preference over others and they are sent to undertakings on probation, during which they are paid a nominal salary.

In Brazil, where the training school attendance period usually ranges from one to three years, a vocational education contract must be signed between the employer and the student. These contracts serve to some extent as an employment guarantee.

In general, incentives for training are necessary for both employers and workers. As the main purposes of vocational training and retraining are improvement of an enterprise's efficiency and expansion of employment, a government has to establish a sound policy which makes training investments popular and appreciated by employers. Employers also have an interest in ensuring sound career paths and individual training incentives for their employees.

Training curricula and methods

Regular instruction methods for the textile trades include lectures, audio-visual methods, group discussions, study of the technological cycle, job instruction and group instruction, case studies and modular training. In retraining of management staff business games, action learning and other management development methods are used.

In Portugal some training centres have built model factories for training purposes to demonstrate the manufacture of specialised products with emphasis on high quality. Other countries are showing interest in the idea of mobile training centres.

Though there are some mills and training institutions in every country keeping abreast of the latest innovations in training, modern instruction methods have as yet made few inroads in the textile industry. Some examples of those that have are given in the following paragraphs.

Training packages

In the textile industry of Egypt some new training packages aiming at productivity improvement have been successfully introduced, among them vocational training which applies modular and "from A to Z" approaches; industrial engineering packages covering production planning, control, productivity improvement, preventive maintenance and work study; an industrial safety package including training regarding industrial hazards, pollution and occupational diseases; packages covering fabric and yarn faults and how to remedy them; training programmes for spinning and weaving operator training packages.
Prevention of occupational hazards

Training curricula for the textile trades have to include items related to the prevention of occupational hazards, which in some countries is stipulated by national legislation. In the United Kingdom, for example, these items are identified by the Health and Safety at Work Act of 1974 and are to be included in training curricula for most occupations.

In Japan, according to the law, education on health and safety is compulsory and is conducted with the participation of the trade union. Much attention is paid to the psychological aspects of self-protection from occupational hazards. The subjects covered by courses include safety control, the psychology of safety and special self-safety inspection.

In some countries training curricula have begun to include environmental protection and items related to the treatment of wastes. In China, for example, there has been a campaign on the treatment of three wastes (water, gas and slags).

Modular training

New training methods continue to be based on thorough analysis of jobs with further modularisation of both vocational and management training. Vocational training modules have been developed and successfully introduced in the textile enterprises of Bulgaria, China, Egypt and other countries. In Bulgaria, for example, around 500 learning elements have been developed for 11 textile occupations and modular training is conducted in 13 centres. In some countries training modules have been developed and applied with assistance from ILO experts.

Distance learning

Another new technique which has found favour in the training of textile technicians is distance learning. Many trainee technicians are not able to avail themselves of vocational education in an institution for geographical or other reasons.

Distance learning allows trainees to choose their place and time of study and the pace best suited to them. Evidence collected so far indicates that it is pedagogically at least as effective as conventional modes of training. It has been adopted for textile technician training in a number of Australian and United Kingdom companies. In the United Kingdom, for example, City and Guilds courses are available in distance learning formats.

Application of various distance learning packages seems important mainly in the developing countries, where technicians have usually undergone very limited training at the time of machinery installation and have no follow-up or refresher training, and where permanent training centres with skilled trainers are in short supply. One of the main problems of the distance learning application in the developing countries is that the trainees have to have a sound basic education and skills to be able to understand the packages.

Collective training – The “han” system

Among the training techniques the han system of collective training, which is widely applied in Japanese training institutions, is attracting increasing interest abroad. Small training groups are becoming the core units for the development of discipline and individual skills and motivation to leadership, since teachers delegate much responsibility for classroom management to the students themselves. Through frequent rotation of roles and responsibilities all students have a chance to acquire initial management skills and a team spirit which further manifest themselves on the shop-floor.

Action learning

Another popular training technique is “action learning”, which is broadly used for the training of technical and management staff. Trainees are encouraged to make a practical diagnosis of various problems existing in their textile mills on the basis of work study with a view to corrective action under the supervision of management consultants and consulting engineers.

In general, training curricula and methods applied in the textile industry greatly depend upon the level of literacy and motivation of the trainees. The proportion of theoretical instruction rises with the skill and educational levels of workers. However carefully designed the training programme may be, however proficient the training instructors or however up to date the training techniques, they will not be effective if selection of trainees is not given high priority.

Testing and certification

An important task in some countries has been the creation of reliable testing and certification systems that provide information on the results of a training institution's activities. Sometimes there are certain difficulties with certification systems, since employers fear that they may lose workers to competitors once they have been trained. But these negative effects are likely to be small compared with the overall benefits received by all the parties. In some countries there is a growing tendency to recognise the value of textile qualifications. In the United Kingdom, for example, the Government has already undertaken reforms in the system of vocational qualifications, including certification of operatives on the strength of their competence and skills.

In States Members of the European Economic Community some research and consultations on comparability of vocational training qualifications at skilled worker level in the textile industries have been undertaken under the leadership of the European
Centre for the Development of Vocational Training (CEDEFOP). There is much diversity among national standards in every one of the 22 occupations considered (largely textile mechanics and machine operators) in terms of national designations, titles of certificates, diplomas, other vocational training qualifications and kinds of organisations entitled to award them.\textsuperscript{4}

Experts agree upon the descriptions of practical vocational requirements and content of activities for every occupation, which have been stated fairly loosely. In Belgium, France, Germany and Spain certificates or diplomas exist for each occupation concerned. Italy and Portugal are in an intermediate position with certificates for about half of the occupations. In Ireland certificates are awarded mainly on the basis of in-company training. In Denmark, Greece, Luxembourg, the Netherlands and the United Kingdom there are no programmes of formal training or any certificates or diplomas. The European Community's comparison of qualifications may be of value for some other regions with high concentration of the textile industry and high mobility of textile workers.

Notes

\begin{enumerate}
\item I. Drimousis and A. Zisimopoulos: \textit{Vocational training in the textiles and clothing industries in Greece} (Berlin, CEDEFOP, 1988).
\item Windsor, op. cit.
\item Comparability of vocational training qualifications at skilled worker/skilled employee level in the textile industry sector (Berlin, CEDEFOP, 1990).
\end{enumerate}
Summary

Structural changes in the textile industries

Structural changes in the textile industries worldwide have not invariably followed similar patterns, even in countries with comparable levels of economic development. In the highly industrialised countries, for example, the objectives of restructuring have consistently centred on the production of internationally competitive high value-added textile products, greater production flexibility and continued high productivity. But the means to these ends have ranged from a shift towards small firms and small-batch manufacturing (as in Italy and Germany) to growing specialisation (France) and vertical integration (United Kingdom and United States), the only common threads being the reliance on accelerated technological modernisation and the introduction of new management techniques. These changes have, of course, required new qualifications and skills in the textile labour force, especially as regards technical and managerial staff.

The picture has been markedly different in the textile industries of developing countries which, in recent years, have continued to focus on standard textile products and their own internal markets. The scarcity of capital and a shortage of training facilities have hampered efforts to restructure, and industrial practices and training patterns have consequently undergone little change. The sector thus remains characterised by low productivity and highly labour-intensive and artisanal units, using older machines manned by unskilled workers with low levels of literacy. The need and opportunity for training and upskilling are both much lower than in the industrialised countries.

Major technological changes in the textile industries

There has been little modernisation in textile processes since modern looms were introduced some 20 to 30 years ago. Nevertheless, a number of new techniques are becoming widespread, including a continuous opening-blending-carding operation known as direct-feed or chute-feed carding, automatic loading and unloading of frames and automatic splicing of thread. Also, the use of rotor or open-end spinning machines and shuttleless looms is growing. In some countries a computerised dyeing and finishing shop has become a reality. Computers are also used in fibre measurement, colour measurement and matching, fabric design and quality control.

These recent technological advances have had a considerable impact on training. They have led to significant job displacement, as in many cases it has proved easier to train new employees in modern textile machine operation than to retrain older workers. Some unskilled jobs have been eliminated without a corresponding creation of new jobs. Computerisation, for instance, has tended to reduce the number of operatives and maintenance and other workers. In general, however, the decrease in the number of operatives has been accompanied by a greater need for craftsmen and technicians, although some new machines require fewer skills on the part of operators than the older machines they replace.

Firms that have introduced sophisticated new technologies have found that their training and human resource development needs are broader now than in the past. Textile workers in modern plants need certain "unconventional" skills: the ability to interact with others, the ability to anticipate problems, a broader understanding of the production process and the ability to operate in a more uncertain work environment. The operatives of modern machines rely less on manual dexterity, and more on their knowledge of and skills with computers. But this is not a universal trend; the skills of other shop-floor workers are downgrading.

The skills needed by many categories of workers, including maintenance and repair technicians, often exceed what can be provided by traditional approaches to on-the-job training to persons with little or no formal instruction. In most cases, the operators of modern textile machines are no longer qualified to fix, maintain or repair their machines, unless their traditional skills are complemented with some training in electronics. The need for more advanced technological training extends to managers and supervisory staff, as well.

The spread of technological innovations has been very uneven in the developing countries; in general, major advances have failed to make much of an inroad. Few firms in these countries have been able to afford the massive installation of rotor and air-jet spinning machines and shuttleless looms. Textile mills that have invested in modern looms are often unable to match the
productivity and quality levels of their competitors in the industrialised countries owing to the lack of adequate education and training facilities for upgrading their technicians and maintenance staff. For this reason, and also because of inadequate training and support from the manufacturers or suppliers of advanced equipment, these looms often require twice as much labour per machine. As regards the small and artisanal production units in developing countries, their training needs are unlikely to be met by a mere expansion of national education and vocational training facilities; what is needed is greater attention to the background and educational level of the trainees.

Major changes in management and work organisation

Several new developments in management and work organisation, many of which have originated in other industries, have begun to filter into the textile sector. They include just-in-time production, total quality control, product-oriented organisational structures, the mill balance concept and the quick-response system. Management systems based on the mill balance and quick-response concepts have shown much promise in advanced enterprises and seem to hold the key for textile mills striving for a combination of greater productivity and production flexibility.

Efforts have been made to develop new forms of work organisation in textile mills to overcome the rigidity of the existing division of work in highly specialised operations. Some textile manufacturers have experimented with monthly bonuses as a substitute for the individual piece-rate system. Other radical changes in management structures and manager and supervisory staff retraining have followed from the transition of central and eastern European countries to market economies.

Unfortunately, technological changes have often been introduced without the necessary changes in management, work organisation, team work and pay systems. It is not uncommon, for example, for managers and supervisory staff not to receive adequate training to accompany the introduction of technological innovations.

The labour force in the textile industries

The textile labour force continues to be relatively illiterate, low-skilled and poorly paid; it has a high proportion of women and is regionally concentrated. In most countries the sector is highly labour-intensive. Even though textile employment worldwide has continued to fall, the textile industries remain a major employer, and many developing countries have managed to increase employment in the sector by transferring older machines to small and artisanal units. These countries now face the dilemma of striking the correct balance between adequate levels of employment, productivity and quality of production.

Employment trends in industrialised countries have had some adverse effects on training practices. Where retrenchments have been massive, there has been a disincentive to invest in training. And where labour legislation protects workers by prescribing high compensation for dismissal, there are lower rates of staff turnover.

The process of restructuring has had a significant impact on the occupational profile of the textile labour force. The ratio of operatives to technical staff is a fair indicator of the sector's technical level. In the highly industrialised countries this ratio is lower than in the developing countries.

The traditional image of the textile industries as labour intensive and low skilled, offering poor working conditions and low wages, has hampered efforts to recruit a more highly qualified workforce. This represents a serious obstacle to the sector's future success, inasmuch as the increased sophistication of textile equipment demands greater numeracy and literacy, as well as improvements in the quality of training. At present, there seem to be two avenues open to the sector. It must either find new sources of recruits if its traditional sources continue to exhibit inadequate educational levels, or increase its investment in the training of the textile labour force. Either way, the sector must gain access to more highly educated employees and offer rates of pay that are comparable to those prevailing in other countries.

In Europe, given the drop in the number of young people entering the job market, the textile industries will most likely have to rely on women returning to the labour market as a primary source of recruitment; this, of course, would render the sector's labour force once again predominantly female.

Vocational training

Informal on-the-job training is the most common form of training in the textile industries, for both shop-floor workers and technicians. Textile firms often combine on-the-job training for operatives with instruction in internal courses for a period of several weeks or months, depending on the technical content of the worker's tasks. The importance of in-house training has increased in recent years.

In several European countries training most commonly takes the form of apprenticeship; this approach has been successful for all occupational groups in the textile industries, including craftsmen, technicians and even technologists. This type of training is normally conducted on the job by experienced workers or instructors, and complemented by the apprentice's compulsory attendance at technical courses on a day-release basis. Although the term is sometimes used rather loosely, apprenticeship training programmes at their best, can produce multi-skilled operatives and highly skilled technical staff.
Textile pre-employment training is available at three levels: the craft certificate level for craftsmen; the diploma level for technicians, supervisors and foremen; and the degree level for textile technologists and managers. Pre-employment training and a solid basic education have acquired greater importance, given the sector's technological restructuring, leading some countries to review and redefine their training and educational systems. Added emphasis has been placed on workplace literacy programmes and the introduction of textile training curricula in the general education system. Other efforts have been made to strengthen post-secondary technical education and to expand textile education programmes.

Worldwide the sector has experienced an increasing need for engineers, which it has met in part by recruiting general engineers and providing them with additional textile training. Thus, it is likely that a significant proportion of the more highly skilled employees in the textile industries (excluding workers in design and machine operation) will in the future have a non-textile diploma or certificate.

In general, little attention is paid to textile trainer training, but the more advanced enterprises are making efforts to develop their internal trainer-consultants with a view to enhancing staff retraining programmes and thus boosting productivity and improving quality.

As markets and technologies continue to present a challenge, much more emphasis on education and training of the workforce is required, including growing recognition by textile manufacturers that a sound basic education and vocational skills are essential. Textile education and training systems in some countries have recently found new and useful roles, such as the implementation of workplace literacy programmes, instituting textile training curricula in general schools and strengthening post-secondary textile education.

The organisation of training

Although the structure of textile training institutions varies from country to country, training activities nearly everywhere tend towards decentralisation, with the bulk of training provided by the enterprise or by machinery suppliers. The role of employers' organisations in training is also expanding.

Training offered by national vocational training institutions continues to provide the sector with access to approved training programmes and skilled trainers. Such institutions are most effective where they have preserved their links with the textile sector. Where the co-ordination between these institutions and the textile industries is poor, there is generally a mismatch between the skills provided and those needed by the sector.

Among the economic and administrative incentives for training, the payroll levy schemes are becoming very popular for building training institutions and encouraging employers to train their staff. Sometimes, however, these incentives are ineffective because they are not accompanied by measures to motivate workers. For example, where all machine operators are paid at the same rate, multi-skilled operators may earn less than operators who perform a single repetitive task. Some countries have addressed this problem through national wage decisions which remunerate increased skill levels with wage increases, while some companies have sought to create their own career paths and provide a salary scale that recognises different skill levels.

In general, however, the transition to new training and instructional methods has been slow. The most popular methods have been modular training and distance learning.

Suggested points for discussion

The following points are offered as a basis for the Committee's discussion, and to facilitate its adoption of conclusions on the most important questions under consideration. The Committee is, of course, free to modify these points as it wishes.

1. How can training policies and programmes be oriented to take account of the structural changes taking place in the textile industries of industrialised countries, of countries in transition towards a market economy and of development countries?

2. What role can governments, employers, workers, private training institutions and equipment manufacturers play in the planning and provision of training, including the training of trainers, in the textile industries?

3. What kind of incentives might stimulate employers to provide more opportunities for training, and workers to take greater advantage of these opportunities?

4. How can training and retraining best reflect the changing skill requirements arising from technological changes, while at the same time mitigating the adverse employment effects?

5. How can training be strengthened in developing countries, especially in the growing informal textile sector?

6. What measures should be taken to facilitate access to skill development programmes by textile workers with low levels of literacy?

7. What specific training requirements are needed by operatives, maintenance workers and technical or management staff in the light of ongoing developments? What changes in training patterns would be relevant for these workers?

8. How can training best be financed in countries where training facilities and resources are scarce?
9. What needs to be done to improve the selection, certification and training of trainers?

10. To what extent can the ILO assist its member States in the development of social and tripartite policies to cope with the effects of structural and technological changes on training requirements for the textile industries?