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Distr.
RESTRICTED

DP/ID/SER.A/672
24 January 1986

ENGLISH

15172

DEVELOPMENT OF THE MANUFACTURING INDUSTRY

DP/POR/83/002

PORTUGAL

Technical report: development of the domestic footwear industry

Prepared for the Government of Portugal
by the United Nations Industrial Development Organization,
acting as the executing agency for the United Nations Programme

Based on the work of Odd E. Birkhaug,
expert in the footwear industry

United Nations Industrial Development Organization

Vienna

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ABSTRACT

A consultant in the shoe industry was sent to Portugal for the period 6 October to 5 December 1985 under the project DP/POR/83/002/A.01/37/31.3K/11-02, for which the United Nations Industrial Development Organization (UNIDO) is the executing agency.

The purpose of the consultant's mission was to conduct two courses in production planning and control, and prepare a study tour.

The consultant advised course participants in step-by-step planning of the manufacture of footwear, stressing the importance of studying time and motion and being able to assess the amount of time needed to complete each production process.

In the course of the factory visits, the consultant helped factories to analyse their production planning and control systems as well as to pin-point their shortcomings.

The report contains a number of specific recommendations relating to the subjects of management and planning; procurement and marketing; and training.

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INTRODUCTION

A consultant in the shoe industry was sent to Portugal for the period 6 October to 5 December 1985 under the project DP/POR/83/002/A.01/37/31.3K/11-02, for which the United Nations Industrial Development Organization (UNIDO) is the executing agency.

According to his job description, the expert was attached to the light industry branch of the Direção-Geral da Industria and, in co-operation with Associação Portuguesa das Industrias de Calçado, Componentes, Artigos de Pele e seus Suledanhos, he was specifically required to:

(a) Conduct two theoretical courses in production planning, costing and cost control for technical and management personnel;

(b) Supervise implementation of the systems introduced to one model factory;

(c) Prepare a programme for a study tour and assist in the evaluation of candidates for financing.

Background

In 1979, UNIDO fielded an expert to provide assistance to the tanning and shoe industry in Portugal under project SI/POR/79/801, who prepared a report containing recommendations. 1/ A programme of assistance in planning a national footwear technical centre and quality control laboratory followed, which was financed through a cost-sharing agreement under the project DP/POR/77/020 on standardization and quality control. 2/

The shoe industry in Portugal currently produces about 33 million pairs of shoes annually, of which 16 million pairs are exported. A number of positive changes have taken place in the Portuguese shoe industry since the expert reported on work carried out in 1979 (SI/POR/79/801), however a lack of proper production planning and costing methods means that export orders are often taken elsewhere because the industry finds it difficult to meet delivery requirements and to calculate the real costs of production. More improvements are needed if the industry is to reach international standards.

An average of 950 pairs of shoes, per employee, per year are produced, which is about a third of the average production of countries with a more advanced shoe industry. One reason for the low productivity is the outdated working methods used.

One of the expert's tasks under project DP/POR/83/002/A.01/37/31.3K/11-02 was to analyse the current situation in each factory visited on the study tour and suggest a suitable production planning and control system for each, which

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1/ "Assistance to the tanning and shoe industry, SI/POR/79/801, Portugal: terminal report" (DP/ID/SER.B/217).

2/ See "Assistance to the Government of Portugal in planning a national footwear technical centre and quality control laboratory: terminal report" (DP/POR/77/020/11-06/E/31.3.K).

would encompass the preparation of long-term, medium-term, short-term, and seasonal plans; sales forecasts and budgets for both export and domestic sales; orders for material; and updated means of controlling stock and work-in-progress.

RECOMMENDATIONS

Management and planning

1. Management staff at all levels should participate actively in production control, which should not be left to middle management alone. The participation of sales, production and financial management staff is essential since the factory's performance and investment policy are involved.

2. Planning should be the responsibility of one person, who should be thoroughly acquainted with all aspects of production.

3. Long-term and medium-term plans and sales forecasts should be regarded as vital for future operations; day-to-day or month-to-month decisions are no substitute.

4. More staff should be skilled in time-and-motion study. Without full knowledge of the length of time needed for each assembly operation, it is impossible to plan the time a shoe will spend at each work-station.

5. The preselection of products for the collection should be carried out by a team composed of the pattern cutter, the factory manager, the production manager, the production planner, one or two of the best sales staff and, if possible, one or two of the best customers.

6. Day sheets should be introduced in all plants so that the foreman in each department can plan production ahead of the arrival of the work.

7. Store-rooms should be better organized so that it is possible to locate the exact shelf on which a particular item of material or stock is stored. In this way it is easier to monitor incoming and outgoing stock and supplies.

8. A technical description should be prepared for each shoe in production.

9. Hand- or machine-operated clickers should be controlled. Forms could be used, indicating the performance of each cutter, the time taken and the amount of material used for each order.

Procurement and marketing

10. Given the wide variety of machines on the market, experts should assist in the selection of the machinery that is most appropriate for particular production processes. If necessary, outside assistance should be sought.

11. Since changes in fashion and customer demand often necessitate a considerable investment in machinery, a feasibility study, as part of a long- or medium-term plan, should be made before a new product line is introduced.

12. Every trip that factory personnel take abroad should also include a study of market trends.

Training

13. Courses devoted to the study of time and motion, such as the course planned for 1986, should be regarded as essential for the effective planning, and control of production. Specially designed courses should be provided for factories already employing time-and-motion study and for those who wish to begin doing so.

14. The provision of management courses, both for middle and top management, should be treated as a matter of urgency. Outside assistance should be sought if necessary; one source might be the American Management Association.

15. More specialized courses should be carried out, not only for the operation of sewing machines, but also of lasting machines etc., based, possibly, at the Centro de Formaçao Profissional da Industria do Calçado (CFPIC). If needed, outside assistance should be sought.

16. Experienced workers should be trained and engaged for leather sorting and calculating the optimum utilization of material so that waste is avoided.

ACTIVITIES AND FINDINGS

A. Administrative arrangements

A course on production planning and control was held at CFPIC in San João da Madeira and was attended by 15 persons (see annex I). During the course, which lasted from 15 October to 8 November 1985, the participants toured factories in small groups of three to four persons. In agreement with the Direçao-Geral da Industria, a short, intensive course on production planning and control was held in Felgueiras from 13 to 22 November 1985 and was attended by 7 persons. It, too, was supplemented by a study tour of factories (see annex II).

Both courses were to have been given in English, but translation proved to be a problem and so they had to be given in Spanish, which meant that some participants initially only had a partial understanding of the course material.

Among the participants were staff of some of the more well-known exporters, as well as of factories that produce for both the export and domestic markets.

Between visits to factories, the participants met to share their experiences, which gave them an overall view of the planning systems used by the various factories visited.

During the visits, and the analysis of production planning and control systems, shortcomings in processes and operations of individual machines were pointed out. Although this topic was not within the scope of the mission, so keen was the interest in it that the Saturdays available were spent in assisting factories to pin-point their deficiences.

B. Courses and factory visits

Of the main objectives that must be kept in mind when analysing the production planning and control system in any factory are:

(a) To deliver the right product according to the customer's specifications on time;

(b) To make optimum use of all resources, such as plant, manpower and materials;

(c) To keep production time short, consistent with keeping stock and work-in-progress at acceptably low levels.

The course material covered the following topics:

(a) Long-term plans (five to ten years);

(b) Medium-term plans (two to five years);

(c) Budget;

(d) Sales forecast;

(e) Selection of pictures, pullovers, designs etc. for the collection (product development);

(f) Preparation of the collection (samples);

(g) Preparation of the technical description of each sample;

(h) Preparation of sales samples;

(i) Orders received and registered;

(j) Confirming orders and completing customer cards;

(k) Analysis of orders, production planning;

(l) Preparation of work tickets;

(m) Ordering materials:

(i) Analysis of leather for uppers and balance record;

(ii) Stock record of lasts;

(iii) Stock record of heels;

(iv) Stock record of soles;

(v) Sundries record;

(n) Medium-term planning (one week to one month);

(o) Daily planning;

(p) Control of work-in-progress;

(q) Dispatch.

Taking topics in the order above, a brief discussion of their importance for the factories visited and for the participants is given in the following paragraphs.

Long-term plans (five to ten years)

Throughout the courses and the factory visits, the expert stressed the importance of long-term plans, which allow firms to establish clearly defined policy directions that are based on market trends as well as on technical developments. Naturally the plans must be updated when new developments arise. Unfortunately, none of the firms visited had long-term plans, nor did the participants show much interest in such plans.

Medium-term plans (two to five years)

As regards medium-term plans, even though none of the firms had any medium-term plans, interest was shown in establishing them.

Any medium-term plan should include new plants, and expansions or changes in production, as the case may be. Policy should be well defined and adjusted according to the firm's needs. Budgets for any major change or capital outlays should be set up and revised periodically to keep pace with inflation.

Two to five years' planning time should be sufficient for the preparation of feasibility studies for any major change in order to demonstrate its profitability and possible impact on working conditions.

Budget

In view of the understandable reluctance of the factories to go into detail in the presence of outside visitors, this topic was not treated in depth. Standard budget forms, however, were discussed with the participants.

Sales forecast

No forecasts or predictions of sales are made currently in the factories visited. Collections are based on patterns (copied from fashion magazines), which are either made at the plant or brought there by customers. Big customers often bring their own patterns. Market research abroad, to forecast trends regarding lasts, patterns, materials, and especially colours, is rarely carried out. One recent example of a world-wide trend with financial implications has been the switch from purely jogging shoes to a more all-round type of footwear like Ecco. In the former case, the soles are stuck on to the shoe, in the latter, polyurethane is injected. The investment in machinery is considerable, and should be subject to scrutiny in a feasibility study, as part of a long- or medium-term plan.

No forecasts of the designs, patterns or quantities that would be the most profitable are made in the factories visited. A frequent question asked by participants was what size of plant and how many pairs of shoes per day would give the best production mix. There are no standard answers, but if a complete conveyor system is available in the lasting department it should be operated at the designed capacity of the conveyor system. Normally, the handling capacity of a conveyor system varies from 800 to 1,200 pairs of shoes per eight hours, depending on the type of shoe being produced.

Many ideas surfaced during the courses that could be introduced in the various factories to improve their competetiveness.

Selection of pictures, pullovers, designs etc. for the collection (product development)

The participants were advised on ways and means of developing their products in connection with the preparation of a collection. This should not be the task of one individual like the pattern cutter, but of a team, consisting of the designer, the pattern cutter, the factory manager, the production manager, the production planner, one or two of the best sales staff and, if possible, one or two of the best customers. The participants were encouraged to introduce this team system when preparing new collections. Designs, fashion magazine pictures, photographs or drawings made on visits abroad, pullovers or shoes as well as new lasts provide the basics for the team to work on. Fashion colours for the season ahead, as well as new materials, are no less important.

Preparation of the collection (samples)

After a decision has been taken by the team regarding designs, materials and colours, the pattern cutter makes the patterns, and the samples are made up. When the samples or the collection is finished, the team review it carefully and indicate possible changes in some of the samples, and those

considered least likely to sell or uneconomical for production are rejected. The team should remember that 80 per cent of what is sold normally involves less than 20 per cent of the collection.

In Portugal, exporting firms have greatly reduced the number of their patterns. Some firms work on approximately 12 patterns in a season, which is very good, however firms with 60 to 80 patterns for one season are also found.

Preparation of the technical description of each sample

A shoe specification document has to be created for each shoe ordered, containing all the relevant information necessary for a comprehensive check to be made regarding the availability of materials, components, patterns, dies and markers. In addition it may contain such information as leather allowances, method of cutting and the closing (stitching) capacity. The shoe specification document should also be designed in conjunction with the work ticket.

The pattern cutter then has to prepare a technical description of the shoe, and make a copy of it for each department foreman. The preparation of shoe specifications and technical descriptions is an area where improvements are needed, only one factory had a properly prepared technical description, and that had been prepared by one of their big customers.

The basic contents are an exact drawing of the shoe, onto which every detail is written such as number of threads, number of stitches to the inch, distance from edge, perforating number, types of eyelets, types and length of laces etc.

Since badly skived parts were seen in several factories, affecting the quality of the product, the type of foot that should be used for skiving (15 mm, 25 mm, 50 mm) could also be specified in the technical description.

The amount of material needed for the shoe should be specified in detail. The value of the middle size of the range should be used when determining requirements. If the sample size does not correspond to the middle size, a pattern of a corresponding size should be used instead for the calculation. If the firm has an established percentage of difference between sizes, that method could also be used. The Russ and Small method of scaling, using a parallelogram system for calculating the basic material consumption, is one proven method. Another could be to measure the pattern, including the unavoidable waste, electronically: the electronic scanner automatically reads out the pattern area, the "first waste" area and the percentage of the unavoidable first waste. The next most important factor is the percentage that is added to the minimum requirement of material (i.e. the pattern plus unavoidable waste) in order to arrive at the correct consumption figure. The methods seen in various plants of placing the pattern in no defined system onto the material and leaving space between the different parts, and then calculating 10 to 15 per cent on top of that, are not acceptable.

On the back of the technical description form, the operations for the various departments are noted sequentially, giving the length of time taken to perform each operation as well as its cost, if applicable.

Time-and-motion study. The main obstacle to being able to control production effectively is the lack of time-and-motion study people. Some factories have introduced time-and-motion study, but it is still in its infancy. During the factory visits, some of the times given were checked

against the daily production figures of certain operations. Considerable discrepancies were found, in fact only 50 per cent of the time had been used effectively, should the recorded times have been correct. Either productivity was low or the timing incorrect. Production planning is based on the time available in the factory and the utilization of this to the highest degree possible. Since most of the emphasis is put on the closing (stitching) room, an example is taken from this section. If there are 50 workers, working 510 minutes a day, 25,500 minutes of production time are available daily. (A percentage of absenteeism must be taken into consideration.) If one pair of shoes takes an average of 25.5 minutes to produce, the planned target for the day should be 1,000 pairs. Since different patterns of shoes take different times to complete, shoes are usually put into groups for planning purposes, as illustrated below:

Group	Minutes to produce (per 10 pairs)
1	200-240
2	240-280
3	280-320
4	320-360
5	360-400

Currently, none of the factories invited plan their production according to these criteria.

Analysis of orders, production planning

Orders are analysed according to the delivery dates specified by the customer, which may be weekly or monthly. Before the delivery dates are confirmed, a production plan is drawn up taking into account factory, plant and labour capacities. The production plan is also useful for showing the expected production load on the factory.

In analysing the orders other factors are considered such as whether the article is a repeat with the same upper materials and colours. The closing room capacity must also be considered as well as the amount of lasts available, which entails knowing the number of lasts in use from the time they are put on the conveyor system until they are withdrawn. Problems with materials being supplied on time are not uncommon, which partly explains why production has to be put aside when certain materials or components are not available. The golden rule is not to put anything into production until all the materials needed are in stock.

Day sheet and progress sheet. The principle of planning is to know in advance the time when work on any order will be finished in each department or work station. This is only possible when the exact time necessary to complete each operation and the capacity of each department are known. At present this is not the case with shoe factories in Portugal, which put emphasis on completing cutting by a certain date that is sufficient to meet the delivery date. The date when the shoe is supposed to be finished in each department is not specified. As far as the bottom department is concerned, there are no problems since it has the same time at its disposal as the cutting and closing rooms combined.

The shorter the production time, the less work-in-progress, which means that less capital is moving around the plant at any one time. Considerable

differences were noted in the production time of the factories visited, in an exceptional case, the production time was 20 days.

The day sheet is presented to each department so that the foreman or person in charge knows beforehand exactly what work is expected. In some of the factories visited the day sheet was not in use, the cutting room was overloaded with work and other departments registered what they produced, but not according to any plan.

There are various ways of controlling the work flow through the various departments; one is that each department registers the production for the day in a booklet and makes copies. At the end of the day, the original is sent to the planning office so that progress can be registered there. If a coupon system is used (as is the case in Ormig), the coupons are sent to the planning office several times a day.

Some of the factories used a sort of pin board with different coloured pins to distinguish their customers. Each pin represented a lot and its position on the pin board represented the stage of production the lot had reached. This is a visual way of presenting production plans.

Completion of customer cards. The factory should keep records of all purchases a customer makes, and of payments made for purchases, indicating any unpaid invoices or accounts. Although such records were not found in every factory visited, they are indispensable for financial control and show the credit-rating of each customer.

Ordering materials

When orders are received at the factory, they are analysed and the materials required are ordered according to the material consumption specified in the technical description, taking into account the materials actually in stock.

Analysis of leather for uppers and balance record. Various forms are used in planning the sequence of production. Nevertheless, the use of this form is important since the cost of materials is so high. If a clicker uses only 1 per cent more material than the quantity normally required, that 1 per cent can be worth as much as his or her salary.

The factory order form is printed on both sides. On the front side the balance in stock is registered; what has been ordered and what has been delivered. This corresponds with what factories normally record. On the back of the form the orders for which the leather is planned are specified.

The store-rooms seen during the factory visits ranged from being well organized to totally disorganized. A store-room should be equipped with shelves on which all the materials are stored. The shelves should be clearly identified, using numbers in the horizontal direction and alphabetical letters in the vertical direction. In this way, any material can be located easily if the shelf number is indicated on the appropriate card in the card index. A plastic-covered sheet of paper, which indicates incoming and outgoing stock, should be affixed to each shelf. Only one of the factories visited used such a system.

Stock records of lasts, heels, soles and sundries. Although various types of stock cards were used in the factories visited, generally speaking, the cards seen served their purpose. All the cards in use were based on the assumption that factories tend to order the total amount of material needed for a certain number of orders, or for only one order, if it is sufficiently large.

Shoe costing. In order to cost shoes correctly according to the samples, the factory must have all the information needed to fill in the costing sheet (see annex III).

A medium-sized factory producing 250,000 pairs of shoes a year, selling at an average ex factory price of $US 12 a pair, will make a turnover of $US 3 million a year. The profit varies from factory to factory and will to a great extent depend on the market. If only an error of 1 per cent occurs in the calculation of costs in the example above, that alone amounts to $US 30,000 a year. Many of the factories visited, however, add 35 per cent to the actual costs of labour and materials to cover all other costs. The example above shows that this practice is far too risky for any firm.

In particular, when sales are sluggish, a factory depends on exact calculations in order to assess how far it can reduce prices without actually losing money, but even more so that it knows the percentage of discount that could be given to boost sales.

C. Findings

Some of the factories visited only accepted orders for a minimum of 2,500 pairs of shoes, for which it is relatively easy to plan production. Firms producing for the domestic market, however, need a different planning system, since they have to handle anything between one to a few hundred pairs of shoes per order.

Only three factories will introduce greatly changed, or new, systems; in the rest of the factories, minor or major changes will be made to perfect the systems currently in use.

A few factories have started to use computers for planning; in addition to using them for accounting, they have also just begun to use them for control of stock, including finished goods. Moreover leading computer firms, like IBM, Burroughs and Philips, are developing programmes for the shoe industry, which means that computers can be expected to handle more production planning and control functions in the future.

Annex I

LIST OF PARTICIPANTS IN THE COURSE ON PRODUCTION PLANNING AND CONTROL, CENTRO DE FORMACAO PROFISSIONAL DA INDUSTRIA DO CALCADO, SAN JOAO DA MADEIRA, AND NAMES OF FIRMS VISITED

Name of participant	Firm	Title
Santos de Oliveira	Sociedade de Calçado Fémina, Lda.	Co-manager
Manuel Antònio	Sociedade de Calçado Fémina, Lda.	Production manager
Luis Lima	Freitas, Teixeira & Ca. Lda.	Control manager
Fernando Ferreira*	Aco-Fàb. Calçado Lda.	Production and quality technician
Leandro Melo	Laboratório APICCAPS	Quality control
Normando Faria	IAPMEI	Technician
Pinto de Oliveira	Pinto de Oliveira & Irmáos Lda.	Production technician
Edite Dias	Almeida Bastos & Dias Lda.	Production technician
Melo Arruda	Direcçao Geral das Industria	Technician
Gomes da Silva*	Osvaldo Pinto Lda.	Pattern cutter
Paulo Martins	Carlos Pereira de Castro & Irméo Lda. (Marina)	Study pattern cutting
Fernandes Afonso	CFPIC	Director of production
Arlindo Martins	CFPIC	Teacher
Alberto Abreu	Gonçalves & Abreu Lda.	Production technician
Manuel Lima	UIC-União Industria Calçado Lda.	Production manager

Factories visited

Gonçalves & Abreu Lda.
Pinto de Oliveira & Irmáos Lda.
UIC - Uniao Industria Calçado Lda.
Almeida Bastos & Dias Lda.
Fémina

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*Participated for only one day.

Annex II

LIST OF PARTICIPANTS IN THE COURSE ON PRODUCTION PLANNING AND CONTROL, FELGUEIRAS

Name of participant	Firm
Artur de Castro	Carlos Pereira de Castro & Irmão Lda. (Marina)
Joaquim Costa	Fabrica de Calçado Killas
Josè Castro	Fabrica de Calçado Sozè
Josè Galhardo	Fabrica de Calçado Zala Lda.
Alcino Pereira	Fabrica de Calçado Zala Lda.
Alberto Carvalho	Fabrica de Calçado Zala Lda.
João Oliveira	Ameluca Industria de Calçado Lda.

Annex III
COSTING SHEET

		Description	Grade
Upper material	Outsides, sq ft		
	Outsides, sq ft		
	Outsides, sq ft		
	Quarter linings, sq ft		
	Vamp linings		
	Side linings and backers		
	Top band and facing		
			Upper cost
Bottom materials	Outsole		
	Insole		
	Welt or rand		
	Heel covers, sq ft		
	Runner		
	Half middle		
	Seat lift		
	Heel and top-piece		
	Shank and filling		
	Sock (including stamping)		
			Bottom cost
Sundries	Binding or strip		
	Loops or tabs		
	Button or buckle		
	Eyelets		
	Stiffener		
	Puff		
	Trimming		
	Laces		
	Carton and tissue		
			Sundries cost
Grindery			Grindery cost
Labour	Clicking		
	Preparation		
	Closing		
	Press room		
	Lasting		
	Finishing		
	Shoe room		
	General		
			Labour cost
	Variable rents		
	Social security		
	Damage allowance		
	Carriage cases etc.		
	Sample and shoe loss		
			Cost
Overheads			Total
	Factory overheads	%	
	Office expenses	%	
	Selling expenses	%	
		%	
	Total factory cost		
	Discount % on sales price		
	Profit %		
	Selling price per dozen pairs		
	Selling price per pair		

GLOSSARY

bottom: a term that refers to the whole of the bottom of the shoe as opposed to the upper. It generally includes some of the following components: insole, welt, bottom filling, middle sole, runner sole, heel, heel lifts, top-piece

clicking: traditional word in the shoe industry for cutting

closing: the joining together of various upper parts by sewing

counter: (stiffener) a reinforcement placed between the upper and lining, at the heel end of the shoe, to maintain its shape

heel: a support placed under the rear part of the shoe to raise it to the desired height in relation to the front part

insole: the inside layer of the shoe upon which the foot rests and to which the upper is attached in the process of lasting

last: wooden, metal or plastic mould upon which the shoe is built

puff: a reinforcement placed under the toe part of a shoe upper before lasting, to maintain the lasted shape and protect the toes

quarters: back portion of the upper

shank: a strip of metal, wood or hard plastic used to reinforce the waist of the shoe

skiving: thinning and reducing the edge of the upper to make the joints neater and less bulky

sole: one of the layers forming the base of the shoe upon which the foot rests (insole, outsole, middle sole, half sole)

top-piece: the part of the heel in contact with the ground

upper: the part of the shoe that covers the top part of the foot

vamp: the separately cut part of an upper covering the whole of the front of the foot, or the front except the toes, if the toes are covered by a toe cap

welt: a strip of leather used in welted construction that is attached to the margin of the upper, which in turn is attached to the top surface of the sole