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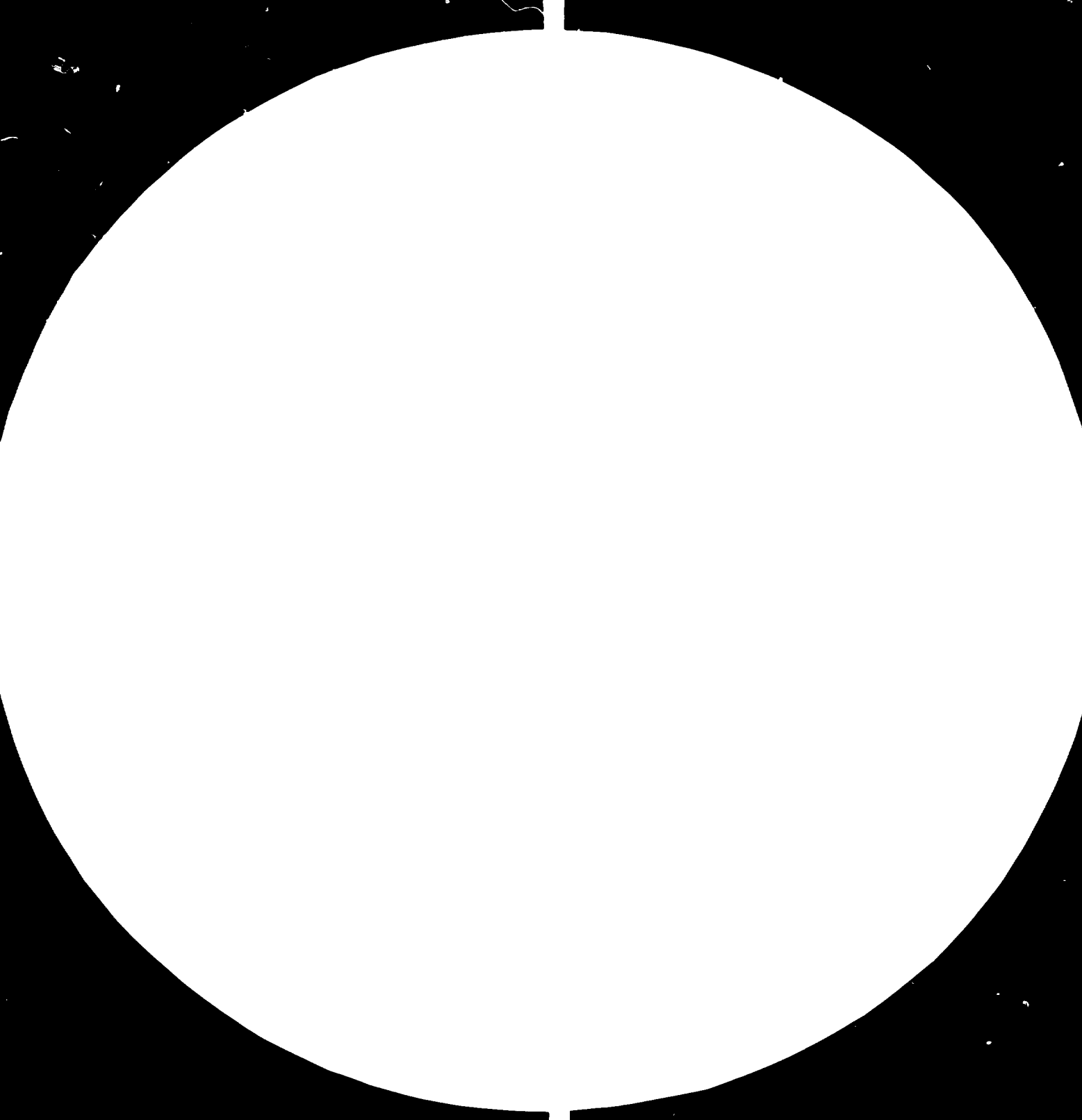
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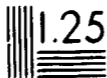
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Resolution Test Chart  
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ENGLISH

REHABILITATION AND DEVELOPMENT OF  
CERTAIN ESSENTIAL INDUSTRIES - THE TEXTILES,  
GARMENT, PAPER AND SALT INDUSTRIES -  
IN MOZAMBIQUE

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Addendum 1

SITUATION REPORT ON THE MOZAMBIQUE  
MAKING-UP (GARMENTS) INDUSTRY

by

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## SITUATION REPORT

### MOZAMBIQUE MAKING-UP INDUSTRY

#### 1. BACKGROUND

The garment industry in Mozambique comprises a total of 34 medium sized production units, most of which are located in the two principal cities of Maputo (20 units) and Beira (12 units). The production (10 million garments - 1979) is based mainly on imported fabric but it is the intention of the Directorate to increase the share of domestically produced fabrics.

The present population is 12 million which is expected to rise to 17 million by the year 1990. To adequately clothe the nation by 1990 the industry needs foreseeably to produce approximately 170 million garments or 10 garments per person.

The industry comprises 3,350 machines and employs 5,700 workers. The predominately male labour force works 250 days per year and averages 44 hours of work per week.

Various studies have been carried out on the productivity of the garment industry and efforts are being made to improve the situation. The Government requested urgent UNIDO assistance to review the situation and the adequacy of the measures being taken to improve productivity. Responding to an official request for a three to six months

expert assignment UNIDO proposed that such assignment be preceded by a brief diagnosis mission to analyse the situation in general and to define a programme of technical assistance, possibly to be carried out through a consulting firm specialising in this industry sector. This report presents the findings in seven factories of the brief one-week diagnostic mission, general recommendations for the industry and specific recommendations and terms of reference for a programme of technical assistance.

II. SCOPE OF THE STUDY

SURVEY SIZE

<u>TOTAL UNITS</u>	<u>UNITS SEEN</u>	<u>%</u>
34	7	20.58
<u>TOTAL WORKERS</u>	<u>WORKERS SEEN</u>	
5,700	2,594	45.5%
<u>TOTAL MACHINES</u>	<u>MACHINES SEEN</u>	
3,350	1,526	45.5%



### III. FINDINGS

#### 1. PERSONNEL

At all levels of operation within the industry there is a lack of trained managers, technicians and supervisors.

Since 1974 the majority of trained personnel have left the country and those that have stayed are too few to make the impact and improvements necessary to rehabilitate the industry.

The former administrators have left and the present directors (leaders of the Workers' Commission) have received little or no management training.

The companies now have no clearly defined organisation chart and the method of assigning authorities, duties and responsibilities to the varying levels of management, are not consistent.

There is a lack of trained:

- Managing Directors
- Accountants
- Cost Accountants
- Production Managers
- Industrial Engineers
- Designers
- Garment Technologists

- Cutting Room Managers
- Lay Makers
- Line Supervisors
- Machine Mechanics
- Electricians
- Instructors
- Operators

This lack of trained staff and the absence of formal education and training schemes is perhaps the most serious problem facing the industry. It is felt that those technicians who are available or who have come to assist the industry have dedicated their time to working as technicians and done little or nothing to educate or train the local Mozambican labour.

## 2. SYSTEMS

The overall lack of systems mirrors the absence of trained staff.

There are no basic systems of costing and no knowledge or methods in existence for determining the parameters necessary to calculate garment costs.

None of the units visited have material utilisation controls (waste control) they assume that they are achieving proper material consumption per garment. They do not check the cutting order per cutting order to control the waste. Planning and production control

systems were also lacking as were any controls such as:

- hourly line production
- hourly operator performance
- daily operator performance
- lost time control.

None of the factories has industrial engineers or work-study staff and little or no knowledge of how to lay-out a production line and balance it to achieve optimum operator performance.

Quality control systems as such do not exist. Garments are usually inspected prior to despatch but there is no data collection, analysis or feedback systems to improve quality. Quite naturally quality levels throughout the industry are well below international standards.

There are no systems of planned routine preventative maintenance.

### 3. MACHINES

The most pressing problem in this area is the lack of imported spare parts to refurbish and repair the 3,350 machines that are installed. On average 15-20% of the machines are waiting for spare parts and many of these have been cannabalised to maintain the rest of the machines in working order.

Because of the lack of specialisation within the industry most factories are equipped to make a wide range of garments and consequently have a wide range of machines including many specialised machines that are grossly under-utilised.

Some units have up to 13 different makes of sewing equipment which aggravates the spare parts problem and complicates the work of the sewing machine mechanics.

Some factories have new modern equipment, others have machines that are over 15 years of age. However, in practically all the units visited the machines were badly maintained due to the lack of organised routine and preventative maintenance schedules.

#### 4. MATERIALS

The industry relies to a large extent on imported cloth from Portugal, Italy, Rumania, China, India and other sources. Although there have been periods when cloth was in short supply, all the factories visited had sufficient stocks of cloth to meet their present production programmes.

Lack of expertise in pattern making, pattern grading and lay making leads to high waste during cutting.

Accessories such as interlining, lining, stiffeners, zips, buttons, plastic bags and sewing thread are all imported

and many factories are experiencing supply difficulties. Sewing thread is in very short supply and some companies are having to sew garments with threads of a completely different colour to the fabric used.

Expensive imported fabrics are used to make low quality garments for the home market.

#### 5. PRODUCTS

Most factories produce a diverse range of products:

- shirts
- jackets
- trousers
- dresses
- skirts
- lingerie
- knitted goods
- household textiles

It is felt that this policy aggravated by the lack of technicians, complicates the organisational procedures in each unit and calls for a wide range of abilities on the part of the operators. Frequent model and style changes militate against high productivity and require frequent changes in the balancing of production lines.

## 6. PRODUCTIVITY

There is a lack of industrial engineering in the garment industry and this coupled with the absence of formal operator training schemes has led to a situation where productivity is well below international standards.

The industry has not as yet adopted systems of monetary incentives but relies on frequent meetings with the workers to discuss production targets and to deliver exhortations to stimulate higher performance.

#### IV. RECOMMENDATIONS

##### 1. PERSONNEL

The industry should seek all the means available to train as quickly as possible:

- Senior Management Staff
- Accountants
- Cost Accountants
- Production Managers
- Industrial Engineers
- Designers
- Garment Technologists
- Cutting Room Managers
- Lay Makers
- Line Supervisors
- Machine Mechanics
- Electricians
- Instructors
- Operators

On-the-job training should take place in the individual units for production workers and supervisors. Management courses for the senior and middle management staff should take place in suitable quarters in Maputo. Where it is not possible to train personnel within Mozambique (the case of designers and some machine mechanics) the industry should arrange or award scholarships for suitable candidates to study abroad.

Machinery suppliers as part of their supply contract should be asked to supply training to Mozambique mechanics in their own factories abroad.

As a means of gaining up-to-date technical knowledge and training for Mozambican personnel, and as a means of expanding the industry the Government of Mozambique should invite and attract foreign garments making companies to establish units in Mozambique.

## 2. SYSTEMS

The industry should seek foreign technical assistance to install throughout the industry:

- standard costing systems
- quality control systems
- waste control systems
- production planning and control systems
- process control
- line balancing
- time standards
- production incentives
- preventive maintenance systems



### 3. MACHINES

In line with the Government's 10 year plan for the industry, the industry should take stock of its present machines and make plans to purchase the necessary machinery to fulfill the Government's plan. At the same time the companies should order and thereafter maintain a suitable stock of replacements and spare parts.

In drawing up its machine replacement plans the industry should attempt to limit the vast range of different makes of machines in order to:

- reduce spare part costs and stocks
- facilitate the work of machine mechanics

Consideration should be given to reducing the range of garments produced in each unit so that specialised equipment is not under-utilised.

### 4. MATERIALS

In line with the Government's plans for the industry and the production capabilities of each unit the industry should ensure that there is always sufficient cloth and accessories available to maintain production and high levels of operator productivity.

The industry should choose carefully the type and cost of cloth it imports in order that expensive cloth is not wasted on essentially cheap low quality garments.

Material costs almost always represent the largest part of final garment costs. The industry should therefore mount a campaign to reduce material costs in cutting, and accessories costs in manufacture.

#### 5. PRODUCTS

In line with the Government's plan and the installed capacity of the industry in terms of manpower and machines the industry should be restructured to allow each unit to specialise in a limited number of products. In this way it will be possible to make better use of the limited resources available and:

- maximise machine utilisation
- maximise operator performance
- increase the industries output.

#### 6. PRODUCTIVITY

Operator training, time standards and incentive system should be introduced in all units in order to:

- increase operator productivity
- allow inter-unit comparisons of output and efficiency to be made on an equitable basis.

## 7. GENERAL

The industry should not limit itself to purely producing for the home market but should as quickly as possible achieve those levels of cost and quality that will enable the industry to export. In this way the industry will begin to earn foreign currency to assist in paying for imported machines, spare parts, materials and accessories.

In applying technical assistance in the industry the efforts of foreign experts should be concentrated in specific units to produce the maximum benefits possible and establish model units for the industry rather than diffuse the efforts of the experts across the industry as a whole and only achieve less than maximum benefit.

Mozambican counterparts trained by the foreign experts during the initial phases of technical assistance should then, with continuing guidance, be able to repeat the initial exercise in other units.

V. SPECIFIC RECOMMENDATIONS FOR ASSISTANCE FROM UNIDO.

1. MODEL FACTORY

Technical assistance efforts should be concentrated on the Sabrina factory in Maputo in order to:

- install all the necessary controls and operations systems
- introduce operator/instructor/supervisory training
- increase production by 100%.

2. STANDARD COSTING SYSTEM

A standard costing system should be developed and established that can serve for all the units in the industry.

3. WORK STUDY TRAINING

A work study training course should be run to give the industry a nucleus of industrial engineers who can assist in the process of establishing controls, systems and incentives throughout the industry.

#### 4. PATTERN AND LAY MAKING

A pattern making, grading and lay making course should be run to give the industry technical strength in the area of cutting and waste control.

#### 5. INDUSTRY RATIONALISATION

A study should be undertaken in line with the Government's 10 year plan in order to restructure the industry in terms of specialised manufacturing units and assess the industry's present and future machinery/machinery replacement/spare parts requirements.

VI. TERMS OF REFERENCE FOR UNIDO ASSISTANCE PROJECTS

1. PROJECT I. IMPLEMENTATION OF TECHNICAL CONTROLS  
AND TRAINING IN THE SABRINA GARMENT FACTORY, MAPUTO,  
MOZAMBIQUE.

a) Objectives

The prime objectives of the project are:

- increase production by 100% and bring the operations of the factory to a high level of efficiency.
- improve quality
- improve machine maintenance
- reduce waste
- provide the Mozambique counterpart personnel assigned to the project with the tools and training to be able to continue managing the production division of this factory and others in an efficient manner.
- provide operator and instructor training schemes that can be duplicated to other units
- provide Mozambique with a model unit which can be used to illustrate the level of efficiency, productivity and quality which can be achieved in the other Mozambique mills.

## b) Scope of the Project

The scope of the project embraces the following programmes in the Sabrina factory:

- installation of technical controls in the areas of:
  - production
  - quality
  - waste
  - machine maintenance
- the lay-out of a balanced production line for shirts
- the establishment of time standards for measuring operator performance
- a training programme for line supervisors
- the installation of instructor and operator training courses for sewing machinists

## c) Task of the Consultants

- to determine the production standards and capacities
- establish a production programme to fit the factory capacity
- determine time standards for each operation from cutting to packing
- revise the lay-out as required and establish a balanced production line
- achieve a 100% increase in production from the existing equipment
- develop and install a production and process control system covering all operations

- to train line supervisors on-the-job how to achieve and maintain high operator performance and high quality of work at minimum costs
- to establish standards, tolerances, and sampling frequencies for the inspection of garments at all stages of manufacture
- to establish quality control and data feed-back systems to control and improve quality
- to establish waste standards and develop and install a waste control programme
- to develop and install a preventive maintenance system covering all equipment which will include:
  - cleaning schedules
  - lubrication schedules
  - belt checks
  - partial revisions
  - general annual revisions
  - maintenance reports
- to train the technical managers and counterparts in the operation of the above mentioned programmes in order to maintain a continuity of the programmes after the departure of the consulting organisation
- to develop and implement operator training for sewing machinists
- to train instructors who will be capable of conducting further courses in other units after the departure of the consulting organisation.



- to develop and install management control reports relating to:
  - waste
  - quality
  - productivity
- develop training manuals which will be the basis of training future workers and the retraining of present workers
- develop manuals covering the various phases of work which have been accomplished and which will provide standards, procedures, and guidance to the technical staff and management.

d) Recommendations

The consulting organization will be expected to provide recommendations to the factory management to resolve major problems which come to the attention of the consultants.

e) Qualifications Required

The consulting firm should supply a specialist in:

- cutting
- sewing
- finishing of garments

A specialist in instructor/operator training either or both of these specialists should be industrial engineers well versed in all aspects of garment manufacture.

f) Time Required

Whilst the number of man/weeks has not been exactly determined the following estimates are given for the tenderer's guidance:

Organisation, technical and systems work in production area	21 weeks
Operator/instructor training	17 weeks
Team Leader: Supervision, Preparation, Report Writing	<u>5 weeks</u>
Total	43 weeks

g) N.B.

The industry will arrange counterparts to assist and be trained by the consultants during the course of the assignment. Whilst the industry will attempt to ensure that the best qualified counterparts are made available, the minimum educational requirements will be education in a recognised educational establishment to pre-university entrance. The counterparts should have a scientific/mathematical/practical bias.

## 2. PROJECT II. WORK STUDY TRAINING COURSE

### a) Objectives

The prime objective of the course is:

- to train a group in the basic principles and practice of work study as applied in particular to the garment industry so that the industry has a nucleus of work study officers to continue the work of the consultants in every unit in the industry.

### b) Scope of the Course

The scope of the course embraces:

- method study applies to:
  - material handling
  - cutting
  - sewing
  - finishing
  - packing
  - lay-outs
- time study applied to operations in:
  - cutting
  - sewing
  - finishing
  - packing
- establishment of standard minute values
  - per operation
  - per garment style.

- incentive schemes
- line balancing
- performance calculations and controls.

c) Task of the Consultants

To train a group in the above mentioned disciplines (theory and practical) so that they are able to carry on the work of the consultants.

The trainees should acquire sufficient theoretical knowledge and practical experience to serve as a base on which they can build by further experience and self-development.

d) Qualifications Required

The consulting firm should supply a work study engineer conversant with the garment industry and experienced in training junior work study officers.

e) Time Required

Whilst the number of man/weeks has not been exactly determined the following estimates are given for the tenderer's guidance:

work study course	12 weeks
preparation, liaison, personnel testing, report writing	<u>1 week</u>
Total	13 weeks

g) N.B.

The industry will arrange counterparts to assist and be trained by the consultants during the course of the assignment. Whilst the industry will attempt to ensure that the best qualified counterparts are made available, the minimum educational requirements will be education in a recognised educational establishment to pre-university entrance. The counterparts should have a scientific/mathematical/practical bias.

It is important to realise that the trainees will become competent work study officers/technicians and not qualified work study engineers.

3. PROJECT III. DEVELOPMENT AND IMPLEMENTATION IN  
SABRINA OF A STANDARD COSTING SYSTEM THAT CAN SERVE  
FOR ALL UNITS IN THE INDUSTRY.

a) Objectives

The prime objectives of the project are:

- design, develop and install a simple standard costing system in Sabrina
- Prepare all the necessary standard forms, operating procedures and manuals to assist in the implementation of the system in other units.
- Provide Sabrina with accurate cost information.

b) Scope of the Project and task of the consultant embraces:

- material costs
- accessories costs
- packing material costs
- waste standards
- cutting labour cost/standard minute
- sewing labour cost/ " "
- finishing/packing costs/ "
- (time standards for all operations and operator and departmental performances will be supplied by systems work in the unit)
- indirect labour/services
- social charges
- general overheads
- administrative charges
- financial charges
- selling charges.

In order to arrive in a systematic manner to a final cost per garment type per design per size.

c) Recommendations

The consulting organization will be expected to provide recommendations to the factory management to resolve major problems which come to the attention of the consultants.

d) Qualifications Required

The consulting firm should supply:

- a specialist experienced in cost accounting in the making up industry.

e) Time Required

Whilst the number of man/weeks has not been exactly determined the following estimates are given for the tenderers guidance:

establish standard costing system	10 weeks
preparation, liaison, report writing	<u>1 week</u>
Total	11 weeks

f) Notes

The industry will arrange counterparts to assist and be trained by the consultants during the course of the assignment. Whilst the industry will attempt to ensure that the

best qualified counterparts are made available, the minimum educational requirements will be education in a recognised educational establishment to pre-university entrance. The counterparts should have a scientific/mathematical/practical bias.



#### 4. PROJECT IV. PATTERN AND LAY MAKING COURSE

##### a) Objectives

The prime objectives of the course are:

- provide the industry with a group of technicians trained in pattern making, pattern grading and lay making.
- improve the quality of cut garments
- reduce waste in cutting
- facilitate sewing operations by marking/notching at cutting stage
- enable the technicians to copy any design of garment

##### b) Scope and Task of the Consultants

To train a group of technicians in:

- pattern making
- pattern grading
- lay-making

##### c) Qualifications Required

The consultant firm should supply a specialist in pattern making and cutting room techniques and procedures experienced in training other technicians.

d) Time Required

Whilst the number of man/weeks has not been exactly determined the following estimates are given for the tenderer's guidance:

Pattern Making and Lay Making Course	12 weeks
--------------------------------------	----------

e) N.B.

The industry will arrange counterparts to assist and be trained by the consultants during the course of the assignment. Whilst the industry will attempt to ensure that the best qualified counterparts are made available, the minimum educational requirements will be education in a recognised educational establishment to pre-university entrance. The counterparts should have a scientific/mathematical/practical bias.

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PROJECT V. INDUSTRY PRODUCT CO-ORDINATION STUDY

a) Objectives

The prime objectives of the study are:

- provide recommendations on the product line specialization in the various units
- determine the industry's present and future machinery/machinery replacement/spare parts requirement.

b) Scope of the Study

The scope of the study embraces:

- analysis of the Government's 10 year plan for the industry in terms of production by type of garment
- details of the present production expertise and manpower/machine capacity of the 34 units in the industry
- inventory by type, make and age of the machinery presently installed in the industry.

c) Task of the Consultants

The task of the consultants is to make recommendations covering:

- the future structure of the industry, in terms of what products each unit should make
- the redistribution of present machinery between the various units to improve manufacturing capability

- machinery replacement plans (including spare parts) for the industry.

d) Qualifications Required

The consultant firm should supply:

a specialist with wide experience of rationalisation planning and a technical knowledge of machinery for garment manufacture.

e) Time Required

Whilst the number of man/weeks has not been exactly determined the following estimates are given for the tenderer's guidance:

rationalisation study	10 weeks
preparation, liaison, report writing	<u>2 weeks</u>
Total	12 weeks

## VII. INDIVIDUAL COMPANY REPORTS

### 1. COMPANY : SOVESTE

a) Location : Maputo

b) Director : Sr. Manolane

c) Description

This state owned factory, which was established in 1976 by fusing three smaller units, is situated on the outskirts of Maputo on a site with ample space for expansion. The unit comprises 240 machines of which only 175 (73%) are functioning and employs 498 operators of which 419 (84.1%) are engaged in direct work. The factory operates a 44 hour week and works 250 days/year.

d) Product Mix

The factory produces:

shirts	20%
trousers	30%
bikinis	20%
bras	8%
corsets (girdles)	16%
uniforms	) 6%
and other products	)

e) Plant Engineering

i) Building

The one storey building is not properly maintained, has insufficient lighting facilities, and needs to be repainted.

ii) Stores

The store areas are poorly laid out, expensive imported fabrics are piled one roll on top of another and left uncovered to collect dust and dirt.

iii) Factory Lay Out

The sewing area is under-utilised, there is no logical material flow through the factory and the lay out has produced cramped operating conditions and excessive transport of in-process and finished goods.

iv) Machines

There are more than 10 different makes of machines (perhaps caused by merging three units) and many of these machines are already 15 years old and in need of replacement. The more modern machines are in poor condition and obviously not sufficiently maintained, lubricated and cleaned. Spare parts are in short supply and many of the older machines have been cannibalised to preserve the other machines in working order. Expensive equipment such as steam presses and fusing presses are idle due to lack of spare parts.

The plantograph equipment for lay-planning and optimising cloth utilisation so vital in a situation where the majority of cloth is imported cannot be used for lack of raw materials.

f) Manufacturing Engineering

There is an evident need for:

- process engineering
- work standards
- material handling techniques
- operator work aids

and as a consequence production lines are out of balance.

g) Quality Control

- i) Stores - non existent (no inspection of raw materials)
- ii) Cutting - Defects are cut out during laying up
  - Cut pieces are not controlled.
- iii) In process - non existent
- iv) Final Inspection - is carried out after the garments have left the production area.

Quite naturally rejects are high mainly due to material faults. However cutting and sewing quality can only be described as being well below international standards.

#### h) Labour Characteristics

The predominately male labour force has not been sufficiently trained to handle cloth, to use the machines properly or produce good jeans. Absenteeism is running at 21%.

#### i) Labour Productivity

As a consequence of the lack of adequate training, poor layout, excessive number of indirects, and low operator performance productivity is well below international standards.

<u>Product</u>	<u>Workers</u>	<u>Units Produced (per 7 1/2 hour day)</u>	<u>Time Unit (man-mins.)</u>	<u>International Standard (man-minutes)</u>	<u>Increase in Productivity Available</u>
Shirts	94	869	48.6	16.0	203%
Trousers	72	456	71.05	18.0	295%
Bras	28	562	22.41	8.0	180%
Girdles	16	518	13.9	6.8	104%
Briefs	21	1283	7.36	1.25	488%

#### j) Costing Systems

The costing system employed in this unit is extremely rudimentary and consists of:

- materials : cloth  
                  accessories  
                  + 5% waste
- labour cost. Standard time (minutes) x 2.E\$00
- overheads and profit (1 + 2) x 0.25



k) Comments

- i) The factory when based on international standards, has 66% more workers than are necessary.
- ii) Expensive specialised machines and equipment are being under-utilised
  - e.g. button hole
  - button sew
  - fusing presses
  - shirt folding
  - trouser press
- iii) An industrial engineering approach should be adopted towards:
  - process flow
  - process control
  - process layout
  - time standards
  - incentives
- iv) Operator and supervisor training should be installed.
- v) Quality control systems should be introduced at all stages of processing.
- vi) The product mix is too wide and necessitates a greater range of skills than are available. Therefore the unit should produce:
  - either shirts
  - or trousers
  - or lingerie and briefs.
- vii) A basic standard costing system should be installed.
- viii) Cutting waste is well above international standards and opens opportunities for substantial reduction.

2. Company: INVESTCO

- a) Location : Maputo
- b) Director : Sr Gravatta
- c) Description:

This state owned factory is situated on the outskirts of Maputo in a narrow fronted building occupying approximately 2000 m2. The unit comprises 260 machines of which only 180 (69.2) are operating due to lack of spare parts. There are 420 employees of which 345 (82%) are engaged on direct productive work. The factory operates a 44 hour week and works 290 days a year.

d) Products

The factory produces:

shirts	16.0%
trousers	55.0%
jackets	24.0%
safari shirts	)
shorts	)
ties	) 5%
shirts	)
waistcoats	)
etc.	)

At the time of the visit the unit was fully engaged on producing military and police uniforms.

e) Plant Engineering

i) Building

The building is long and narrow, badly lit, in need of maintenance and not suitable for a making-up unit.

ii) Stores

The raw material store is neat and tidy and housed on the third floor of the building above the cutting section. Cloth is brought into the store by an elevator. The finished goods store at the end of the production lines is cramped and untidy.

iii) Factory Lay-Out

The 3 production lines zig-zag back and forward across the manufacturing area, causing operating conditions to be extremely cramped and production from the first production line to be transported the length of the building to reach the stores. Production lines running the length of the building would be more suitable.

iv) Machines

Many machines are already more than 10 years old but appear to be in good condition. Spare parts is considered to be the most pressing need at the moment. The unit has 20 presses for trousers and jackets which are considerably in excess of their production requirements. Excess capacity also exists on specialised machines such as:

button hole  
button sew  
bartack  
sleeve set  
shirt fold  
fusing press

The unit has a plantograph equipment which is not working due to lack of raw materials.

f) Manufacturing Engineering

There is a need for introduction of:

- process engineering
- work standards
- material handling techniques
- process control
- work aids.

None of the production lines are balanced and time lost waiting for work is high.

g) Quality Control

- i) Raw material stores - non existent
- ii) Cutting - " "
- iii) Making-up - responsibility of line supervisors
- iv) Final inspection - combined with thread cutting and packing function.

The level of second quality and rejects is stated to be less than one per cent. A sampling of the work in process however failed to find one garment that could be considered of reasonable international standard. The principle faults were:

- irregular sewing
- missed stitches
- cutting faults
- and - shading of cloth

Uniforms were found with distinct shading between sleeves, pockets and legs and one garment with several shades of belt loops.

#### h) Labour Characteristics

The majority of the labour force is male and absenteeism is high. Non-productive time is increased by political meetings and cultural activities which take place during working hours.

#### i) Labour Production

As a consequence of lack of training, poor lay-out, excessive number of indirects and low operator performance productivity is well below international standards.

j) Month of March

Product	Units produced/ operator	Hours worked	Time/ unit (man mins)	International standard (man mins)	Increase in productivity available
Shirts	73.5	182.5	148.9	17.0	777%
Trousers	69.0	182.5	158.6	20.0	693%
Jackets	11.0	182.5	995.4	65.0	1566%

k) Costing System

The costing system employed in this factory is extremely rudimentary and consists of:

- raw material accessories = raw material cost  
5% caste
- time per garments x 2.£00 labour cost
- overheads and profit = (1 + 2) x 0.25

l) Comments

i) 34% of the work force could man the equipment and produce more than twice the present production

ii) Production targets in this factory have been approved by the workers

iii) Expensive specialised equipment being under utilised:

- e.g. Jacket presses
- trouser presses
- button hole
- button sew
- fusing presses
- band knife

- iv) An industrial engineering approach should be adopted towards
- process flow
  - process control
  - lay-out
  - incentives
- v) Operators and line supervisors should be trained.
- vi) The unit should specialise in:
- shirts
  - or trousers
  - or safari jackets
- vii) A basic costing system should be installed.
- viii) Equipment in excess of the factory's needs should be allocated to other making-up units.

3. Company : MANUFATOS

a) Location : Maputo

b) Director : Sr. Sousa Pinto

c) Description

This state owned factory, taken over in 1976, consists of two single storey buildings separated from each other by approximately 50 meters. A knitting factory now stands on the site between the two buildings, one part of the factory produces suits and uniforms, the other knitted goods.

The unit comprises 270 machines of which only 201 (74.4%) are in working order and employs 511 operators of which 360 (70.4%) are engaged on direct work. The factory operates a 44 hour week and works 290 days/year.

d) Products

trousers	41%
safari suits	25%
jackets	13%
knitted blouses )	
underwear )	
skirts )	21%
children clothes )	



e) Plant Engineering

i) Buildings

The buildings are not suitably maintained, extremely poorly lit, and in need of repainting.

ii) Stores

The store areas are clean, tidy and appear to be well organized.

iii) Factory Lay-Out

The sewing areas have been well utilized. There is a natural flow of work from cutting, through sewing and finishing to the stores.

iv) Machines

Those machines that are working, although old, have been reasonably well maintained. The 69 machines that are not working have been cannabalised to provide spare parts for the machines in use.

f) Manufacturing Engineering

The director of the factory has attempted to take time studies and balance his production lines. Unfortunately he lacks as yet the knowledge to derive accurate standard times, then use these to properly balance the production lines and achieve maximum operator utilisation.

The targets established for this factory are well below what should be achieved with operators who have been trained, organised and motivated.

g) Quality Control

- |                      |  |
|----------------------|--|
| i) Stores            | - non existent   |
| ii) Cutting          | - non existent   |
| iii) In process      | - non existent   |
| iv) Final inspection | - garments are checked during the process of thread cutting and packing. |

The level of seconds was stated to be 5%. Although the standard was well below international standard it was much higher than that seen at Soveste or Introveste. The uniforms made in this unit again suffered from excessive shading.

## h) Labour Characteristics

The predominately male labour force with few exceptions lacked the necessary skill to achieve a good performance. Absenteeism is running at about 15%.

## i) Labour Productivity

As a consequence of no training, the excessive number of indirect workers, poor targets, and lack of operator skill, labour productivity is well below international standards.

<u>Product.</u>	<u>Workers</u>	<u>Units/ Day</u>	<u>Time Unit</u>	<u>Intern. Standard</u>	<u>Increase in production available</u>
T. Shirts	34	1350	11.33	1.48	660%
Briefs	48	2000	10.8	1.25	760%
Trousers	85	400	95.62	20.0	378%
Jackets	66	80	371	65.0	470%

## j) Costing System

The costing system employed in this unit was basically as follows.

$$\frac{\text{Total Overheads and all labour costs}}{\text{no. of machines}} = \text{cost per machine (A)}$$

Number of machines in trouser line x A = cost per trouser  
number of trousers per day (B)

Cost per trouser + (material cost + 5%) + 25%(B + C)  
= total cost of trouser

h) Comments

- i) The factory could operate with only 34% of the present complement and produce more goods.
- ii) Production targets in this factory bear no relation to what could be achieved.
- iii) Due to lack of spare parts expensive equipment is laying idle.
- iv) An industrial engineering approach should be adapted to:
  - process flow
  - process control
  - material managing
  - line balancing
  - incentives
- v) Operators and line supervisors should be trained.
- vi) A basic costing system should be installed.
- vii) The unit should be specialised for example: uniforms
- viii. Quality control should be installed at all stages of manufacturing.

4. Company : SABRINA
- a) Location: Maputo
- b) Director: Sr. Albino
- c) Description

This state owned factory is situated on the outskirts of Maputo on a well maintained site. The unit comprises 135 sewing machines the majority of which are in good condition and employs 308 operators of which 280 (90.9%) are engaged on direct work. The factory operates a 45 hour week; 5 days per week for 239 days per year.

d) Products

The unit produces:

shirts	50%
hospital uniforms	50%

e) Plant Engineering

i) Building

The building is clean, tidy, well maintained and well illuminated.

ii) Stores

The stores areas are secure and well organised but white cloth destined for hospital uniforms is left uncovered and collecting dirt.

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iii) Factory Lay-Out

There is ample space in the factory and the production lines have been laid out logically. There is space available for at least one more shirt line.

iv) Machines

The machinery is relatively new, clean, and well maintained. One fusing press and 2 folding machines are out of order awaiting spare parts.

f) Manufacturing Engineering

There is a need for:

- process engineering
- work standards
- material handling techniques
- operator work aids

and as a consequence all the production lines are out of balance. There are far more specialised machines than are necessary.

g) Quality Control

The only form of quality control practiced in this unit is an inspection before buttonholing. The quality of shirt produced is low compared to international standards.

h) Labour Characteristics

The labour force is approximately 50/50 male/female. Absenteeism is 12%.

i) Labour Productivity

The lack of any training and the absence of a manufacturing engineering approach leads to low labour productivity. The number of operators employed in thread cutting, folding and packing is roughly 5 times what is necessary according to international standards.

<u>Product</u>	<u>Operators</u>	<u>Units/ Day</u>	<u>Time/ Unit (mins)</u>	<u>International Standard (minutes)</u>	<u>Increase in Production Available</u>
Shirts	120	650	99.69	17.0	488%
Hospital Uniforms	160	350	246.8	50.0	392%

j) Costing System

Unfortunately no one was quite clear what costing system they were using. The system appeared to be

- raw material and accessories + 5%
- labour cost (figures calculated in 1975)
- + 40% (for overheads and profit)

No balance sheet had been produced for this company since 1977.

k) Comments

- i) 280 direct operatives is well in excess of what is required to achieve the modest production targets of this unit.

ii) An industrial engineering approach should be adopted towards:

- process flow
- process control
- material handling
- line balancing
- incentives

iii) Quality control should be installed at all stages of manufacturing.

iv) Operators and line supervisors should be trained.

v) A basic costing system should be installed.



5. Company: SOBERANA
- a) Location: Maputo
- b) Director: Sr Costa
- c) Description

This company, situated in the centre of Maputo was founded in 1940 as a private company but is now owned 2/3 rds by the State and 1/3 rd by private owners. The factory consists of a two storey building with 245 machines of which only 115 (79.6%) are in working order. The unit employs 400 operators of which 309 (77.25%) are employed on direct work and operates a 44 hour week for 250 days a year.

d) Products

trousers  
shirts  
safari jackets  
windjammers  
skirts  
jackets  
sheets  
pillow cases  
table cloths  
bedcovers

e) Plant Engineering

1) Buildings

The building is poorly maintained, very poorly illuminated, dirty and in need of repainting.

ii) Stores

The stores are relatively neat and tidy and appear organised.

iii) Factory Lay-Out

The shirt line is reasonably well laid out considering the space available. The trouser and jacket lines appear confused particularly the finishing sections.

iv) Machines

The factory has no spare parts and is unable to service and maintain its machines. The 'Soabar' machine has no paper tape, so five operators are employed on numbering pieces. The bandknife is now using the last blade available, fusing presses and collar presses are not working and 6 cutting machines are waiting for spare parts.

The technicians see the factory gradually coming to a standstill.

f) Manufacturing Engineering

There is a lack of:

- process engineering
- process control
- work standards
- material handling techniques
- operator work aids

and as a consequence the production lines are out of balance.

g) Quality Control

Garments are only inspected at the pre-packing stage. Quality is low on trousers and particularly on shirts. The company makes shirts from checked and striped fabric but have no supply of the special paper required for the making the lay-plan, as a consequence of this and the lack of any check before attaching the collars the shirts can only be considered as 2d quality.

h) Labour Characteristics

The mixed labour force 65/35 male/female has not been trained to handle cloth, to use the machines properly and produce good seams. The unit has 3 machines in the collar trim operation, unfortunately two are without knives because of lack of spare parts and the operator on the shirts machine does not use the trimmer knife because she is afraid of damaging the cloth. One collar trim machine should be sufficient to meet the production needs of the unit.

i) Labour Productivity

Lack of training, lack of spare parts and low operator performance have led to a level of labour productivity well below international standards.

<u>Product.</u>	<u>Operators</u>	<u>Unit Day</u>	<u>Time Unit</u>	<u>Internation. Standard</u>	<u>Increase in production available</u>
Trousers	132	600	99	20	395%
Shirts	106	500	95.4	17	461%
Safari jackets	25	70	160	35	358%
Wind jammers	46	70	295	65	354%

j) Costing System

The costing system in use consists of (raw materials + 5% (waste) + labour cost) x 120%. There is no real knowledge of labour costs or overheads.

k) Comments

- i) The company is overstaffed considering the present production levels.
- ii) An industrial engineering approach should be adopted towards:
  - process flow
  - process control
  - material handling
  - line balancing
  - incentives

- iii) Quality control should be installed at all stages of manufacture.
- iv) Operators and line supervisors should be trained.
- v) A basic costing system should be installed.
- vi) The unit should specialise in shirts or trousers.
- vii) Expensive equipment is laying idle due to a lack of spare parts.

6. Company: FACOL

a) Location: Beira

b) Director: Sr Voi You

c) Description

This privately owned company, established in 1976, is situated in the centre of Beira. The unit comprises 196 sewing machines of which 5 (26%) have never been used due to lack of cloth for trousers. Another 2 machines are out of order awaiting spare parts. The unit employs 182 workers of which 168 (92.3%) are engaged on direct work. The company has been asked by the Government to export shirts to Angola and its first order for 62,500 shirts was being produced at the time of the visit.

d) Products The factory produces shirts.

The unit was set up to make trousers as well and has 51 new machines purchased in 1975 which have not yet been used due to lack of cloth.

e) Plant Engineering

i) Building

The high-roofed one storey building is unsuitable for a making-up unit and badly illuminated. However, being relatively new it is clean and well maintained.

ii) Stores

The raw material stores are well organised. Tidy but somewhat cramped. Finished goods are stored in the middle of the factory floor.

iii) Factory Lay-Out

The factory lay-out takes no account of the logical flow of work in shirt manufacture. The cutting area is at the opposite end of the factory to the sewing area and the lay-out of the sewing lines is confused.

iv) Machines

There are more than 13 different makes of sewing machines in this unit. However all the machines appear clean, well lubricated, and in very good condition.

f) Manufacturing Engineering

The unit had foreign technicians, who have now returned to their own country and have left no trained personnel behind them, as a consequence the workers are following the methods implemented without any real understanding of the reasons for these methods.

Waste is extremely high because the cloth width (1.50 m) is unsuitable for the shirts they are cutting. 45 operators are engaged on thread cutting, folding and ironing of shirts, and the unit has five button-hole and five button-sew machines for a production of approximately 1830 shirts per day, many of which are short sleeved.

Production lines are not balanced and no standard lines exist.

#### g) Quality Control

The only inspection that takes place is at final inspection before packing. There are no checks of raw material, cut pieces or in-process work quality quite naturally, was low.

#### h) Labour Characteristics

The predominately male labour force is untrained and unable to take advantage of what work aids exist and the relatively good machinery installed, absenteeism for April was 10.77% which is low compared to other units in the clothing sector.

#### i) Labour Productivity

The absence of work standards and process control coupled with an excessive number of indirects and poorly trained machinists has led to low labour productivity.



Period (February, March, April)

<u>Product</u>	<u>Units Produced</u>	<u>Operators</u>	<u>Units Day</u>	<u>Intern. Standard</u>	<u>Increase in production available</u>
Shirts	133,818	150	12.22	32	162%

The design of shirt produced in this factory is extremely simple to produce.

j) Costing

The costing system used in this unit was rudimentary and consisted of:

raw materials and accessories + 5%

+

33% for labour costs

+

25% for overheads and profits.

k) Comments

- i) The factory is overstaffed for its present production level.
- ii) Expensive equipment is being under-utilised.
- iii) The factory has also 182 knitting machines purchased in 1978. These are still in crates awaiting the completion of the factory.
- iv) An industrial engineering approach should be adopted towards:

- process flow
- process control
- lay-out
- incentives

- v) Operator and supervisor training should be installed.
- vi) Quality control systems should be installed.
- vii) Waste control systems should be installed in cutting.
- viii) The company has need of a basic standard costing system.

7. Company: BELITA
- a) Location: Beira
- b) Director: Sr Smambuca
- c) Description:

This unit, housed in a three storey factory on the outskirts of Beira was taken under State control in August 1975. There are 180 sewing machines of which 25 (13.8%) are not functioning due to a lack of spare parts. The unit has 275 operators of which 250 (90.9%) are engaged on direct work. The factory operates a 47 hour week for 250 days per year.

d) Products

The factory produces:

ladies dresses  
safari jackets  
trousers  
shirts  
skirts

e) Plant Engineering

i) Building

The building is dirty and untidy and needs to be painted and properly maintained.

ii) Stores

The raw material store is small and cramped. The accessories store has adequate space but is untidy

and disorganized. The finish goods store consists of finished garments, some in boxes, some lying on the floor, all spread over a large area.

iii) Factory Lay-Out

The factory lay-out is completely unsuitable for garment manufacture.

iv) Machines

The unit has many relatively new machines and some machines that are now over 20 years old and no longer suitable. Because of the availability of 'blind stitch' machines there are thousands of dresses piled on the floor and covering machines waiting for the one operation. The machines are all badly maintained and the mechanic's workshop looks like a dumping ground for machines that are beyond repair.

f) Manufacturing Engineering

There is a complete lack of:

- process engineering
- work standards
- material handling techniques
- operator work aids

and as a consequence the whole flow of work through the factory is out of balance.

g) Quality Control

It was stated that there was quality control at all stages of manufacture except raw material inspection. The quality of finished goods can only be described as 'terrible' and does not reflect the presence of even the minimum amount of care.

h) Labour Characteristics

The labour force is predominately male (65% male, 35% female) and has received no formal training. There was a power cut during the factory visit and therefore it is impossible to comment on the ability of the machinists. Absenteeism is running at rate of 11%.

i) Labour Productivity

No clear production figures were made available. The following analysis assumes the factory was fulfilling its annual production targets:

<u>Product.</u>	<u>Daily Product.</u>	<u>Operators</u>	<u>Time Unit</u>	<u>Internation. Standard</u>	<u>Increase in Production Available</u>
Dresses	300	57	85.5	11.0	677%
Safari jackets	150	38	114.0	35.0	225%
Trousers	300	62	93.0	20.0	365%
Shirts	200	56	126.0	17.0	641%
Skirts	320	37	52.0	8.0	550%

Productivity appears extremely low and must be due in part to the lack of any form of production engineering in the making up unit. The lay-out is poor as mentioned earlier and there is an excessive number of indirect workers in sewing and finishing.

j) Costing

The part time accountant was not available during the visit and the director of the unit was unclear regarding the costing system. It appeared to consist of:

- materials and accessories = 5%
- labour cost (based on the per unit)
- overheads and profit at 25% on material and labour

k) Comments

- i) The factory appears to have an excessive number of workers
- ii) Expensive equipment is being grossly under-utilised
- iii) An industrial engineering approach should be adopted towards:
  - process flow
  - process control
  - lay-out
  - time standards
  - incentives
- iv) Quality control systems should be installed at all states of manufacture.

- v) The unit should specialise in one type of clothing
- vi) A basic standard costing system should be installed
- vii) Expensive imported fabric suitable for trousers is being wasted on low quality womens dresses.



