International Labour Organization

Line planning

Sewing room operations

Factory Improvement Toolset

First published 2019

ISBN: 9789220326558 (web pdf)

Photos: © ILO
Printed in Thailand

Table of Contents

Factory Improvement Toolset

The Factory Improvement Toolset (FIT) is an innovative self-facilitated, activity-based learning approach designed by the International Labour Organization (ILO) to create more decent and sustainable employment. FIT supports manufacturers in global supply chains to improve productivity, competitiveness and working conditions by upgrading production systems and factory practices.

FIT has been developed to be a sustainable, time- and cost-efficient option for supporting factories to enhance productivity through improved business practices and working conditions. FIT focuses on areas of production improvement and actions to be taken specific to each participating factory. It can be utilized as stand-alone learning tools or to complement other training programmes.

With each module lasting no more than 2.5 hours, FIT enables factories to train personnel, whilst minimizing interference with production realities. The easy-to-use methodology makes it possible to rapidly scale the implementation to reach a large cohort of trainees across multiple production facilities.

Working in small groups, participants review real-life situations and engage in discussions to determine improvements to be made in factory without an external trainer or specialist. This self-facilitated, activity-based and highly participatory learning approach positions participants as both student and teacher and makes the toolset self-tailored to the needs and interests of each group.

About this module

This FIT module on Line planning is a training for garment manufacturers to improve sewing room operations. Participants will work on scheduling and planning line operations. This module takes about 2.5 hours to complete.

Upon completion of the training, participants should have:

- Understood what planning for sewing means and why it is important.
- Learnt how to calculate required (line) capacity.
- Learnt how to use and fill-in line loading plans and daily line plans to schedule, plan and track sewing operations.

The **Factory Improvement Toolset** of the **International Labour Organization (ILO)** are developed and provided by the ILO's **Enterprises Department**.

Authors: Alix Machiels, Sara Andersson, Charles Bodwell, Jayantha R. de Silva.

Guidelines for successfully using the training tool

Read out-loud

The FIT tool is designed for participants to take turns reading the instructions in the modules out loud to the group. At least one member of the group should be selected in the beginning of the session to take this responsibility.

Work as a group

Always work in groups of 5-7 during a FIT session. The programme will not be successful if participants work independently or do not collaborate with each other.

Be active

Encourage everyone in the group to actively contribute to the discussion. Ensure that no group member dominates the discussion or does not participate at all.

Monitor the time

Select one member of the group to monitor the time for each activity and remind the group when it is time to move to the next exercise.

Complete the action plan

Complete the action plan at the end of the session. This will help ensure that FIT results in improvements in the factory. Review the plan a while after the session to make sure that actions in the plan has been completed accordingly.

Icons

A set of icons is used throughout the modules to provide easy to recognize reference points for different tasks within each session and activity.

Read out loud

One member of the group should read out loud to the rest of group.

Knowledge link

Knowledge and skills are linked to other FIT learning resources and support.

Time allotted

Indicates how much time each sessions and activity should take.

Supplies needed

Indicates that supplies may be necessary to complete the session.

Begin step-by-step instructions

Indicates that the step-by-step instructions for an activity are beginning.

Think about it

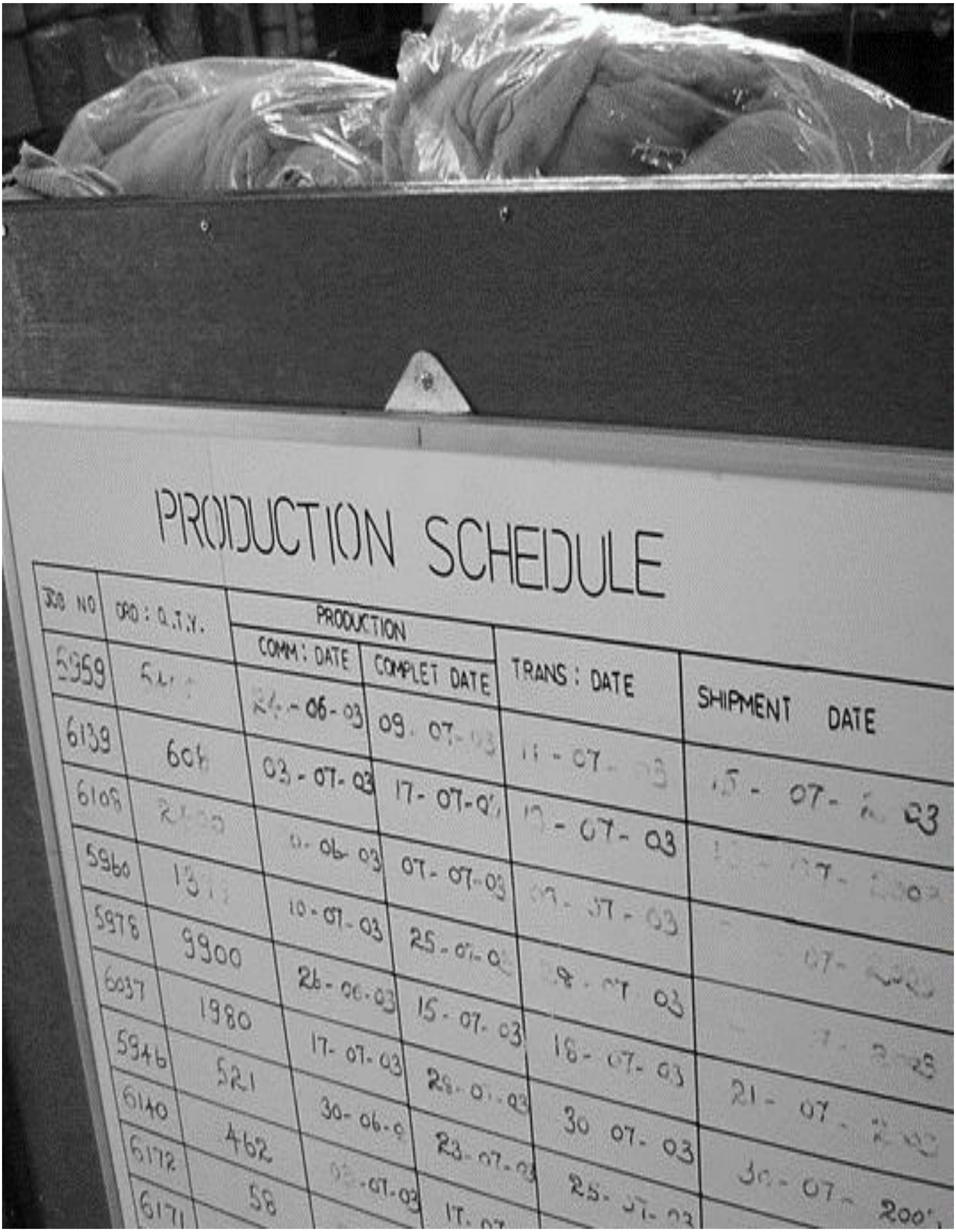
Indicates additional information for the participants to think about.

Measuring your performance

Measuring operational efficiency is a key aspect of running a productive factory. The box(es) below guides you in understanding which measurement indicator(s) can be used to measure and evaluate the performance of your factory in relation to the topics covered by the FIT sewing room series.

Indicator 1	**Target achievement (%)**
Definition	The percentage of the daily production target that was achieved (that was actually sewn in terms of good production). It can be calculated separately for each line, or for all lines together. The closer to 100%, the better.
Purpose	To understand how efficiently each sewing line operates, how realistic production targets are, and begin to identify how to improve efficiency in the sewing room.
Calculation	(# pieces produced today / daily production target) x 100% Notes: The daily target should be based on the SMV, and line efficiency discounted. Target = (working hours x 60 / SMV) x line efficiency %
Frequency	Calculate daily (for each line or all lines), then calculate a monthly average.
Responsible	Sewing room manager, Line supervisors

Indicator 2	**Work-in-progress (WIP)**
Definition	The amount of pieces that have not been completed yet, and are being sewn or waiting in between two work stations. It is calculated separately for each line, or for all lines together. Very low and very high WIP are both signs that lines are not well balanced.
Purpose	To understand how efficiently your sewing lines operate and how well the lines have been balanced, and begin to identify how to better balance sewing lines and improve their efficiency.
Calculation	Total # of pieces fed to the line – Total # of pieces sewn by the line Notes: Total # of pieces fed or sewn refers to the total # of pieces fed or sewn for one specific order, in one specific line.
Frequency	Calculate daily (for each line or all lines), then calculate a monthly average.
Responsible	Sewing room manager & line supervisors


PRODUCTION SCHEDULE
JOB NO
ORD: Q.T.Y.
PRODUCTION
COMM: DATE
COMPLET DATE
TRANS: DATE
SHIPMENT DATE

Session 1

Business case study

Goals

Preparing you for the type of discussions you will have with other group members throughout the learning module and understanding the benefits of being exposed to different perspectives.

Understanding better why good line planning is important in the factory.

Session 1

Overview

One member should read the full session out loud to the rest of group

15 minutes

Learning manual, pens, markers and poster paper

A business case study presents a real-life situation for learners to reflect on and discuss with other group members. By discussing the case, students learn from others' ideas and perspectives, and develop an understanding of the topic at hand within the workplace.

One group member reads the case study out loud

The whole group discusses the case study

Everyone develops a deeper understanding of the topic

Activities

Activity

1

15 minutes

Case study review and respond

The case study below presents a situation that could happen in real life.

Instructions:

1) As a group, listen to one member read the case study below while following along in your learning module.

Sopheak is a new sewing room manager at the HS garment factory. She finds out that the system for scheduling and planning line operations is poor. The sewing lines start processing new orders whenever they finish one or bundles are received from the cutting room, without taking into account the shipment date. Because of this, there are bottlenecks (unprocessed orders accumulate), and bundles pile up, taking up space in the sewing room, and getting exposed to damage. This creates delays, as orders cannot be processed on time for finishing, and buyers are unhappy with this.

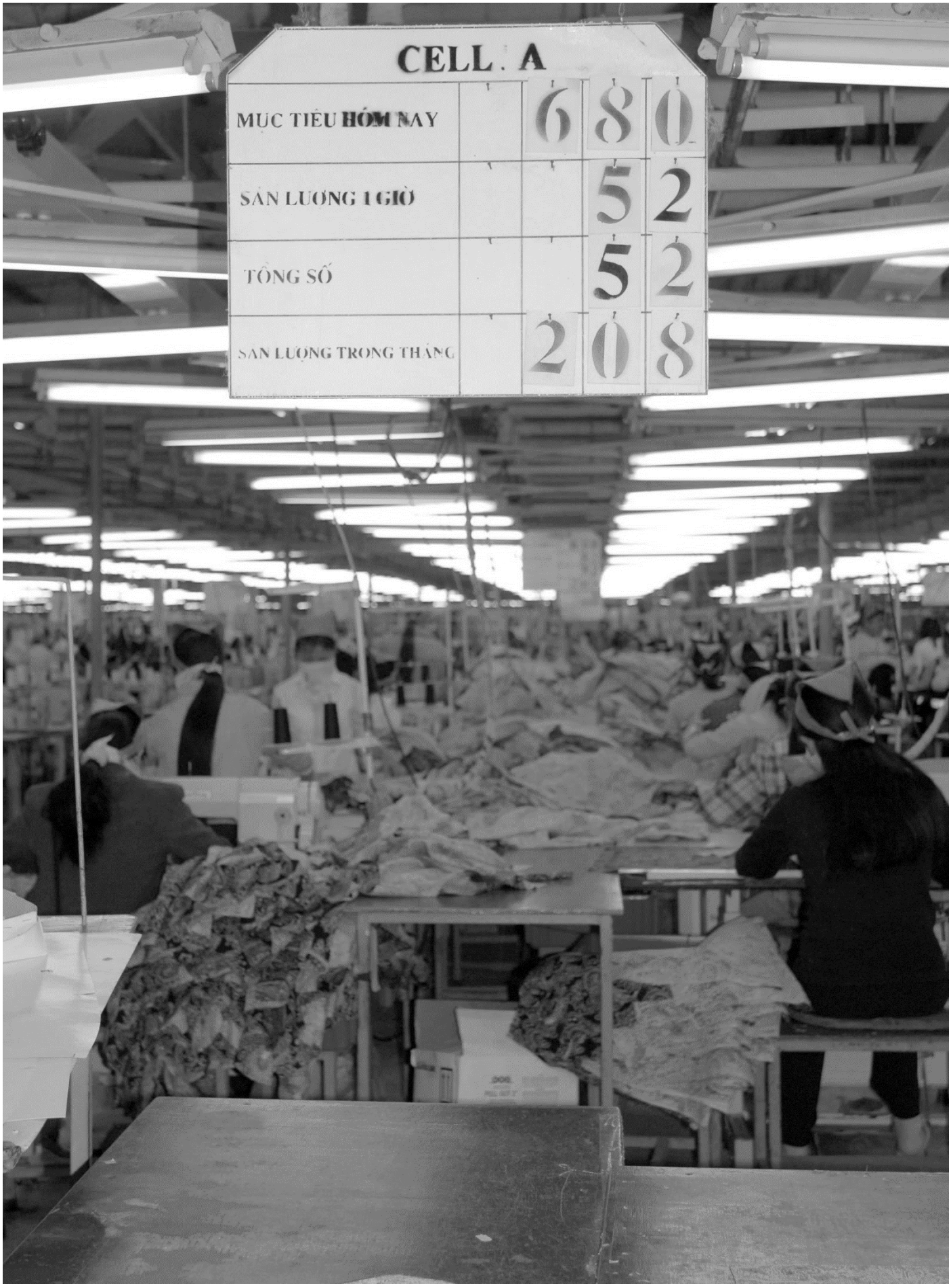
To solve these problems, Sopheak sets up a new line planning system. Based on the operation bulletin, the time required to process each order is calculated. Then, she uses this information to make a monthly line loading plan. Based on the schedule, she drafts a daily line plan, showing which line should produce how much and when. She then trains line supervisors on using this system.

Thanks to these changes, sewing operations are planned in advance, and orders are completed on time. Bottlenecks, WIP piling and delays are avoided. Line supervisors know what their daily targets are, and can communicate them to the operators. The system also allows them to track production, and use this information to make the system even more accurate.

2) Together, discuss Sopheak's situation by answering the three questions in table 1 on the next page.

Table 1. Questions about Sopheak's situation
1. What problems has Sopheak identified? What impact do these problems have on the factory and its workers?
2. What does Sopheak do or change in order to solve these problems?
3. What are the results of Sopheak's solutions for the factory and its workers?

This page has been intentionally left blank and can be used for note taking.


CELL : A
MỤC TIÊU HÔM NAY
6 8 0
SẢN LƯỢNG 1 GIỜ
5 2
TỔNG SỐ
5 2
SẢN LƯỢNG TRONG THÁNG
2 0 8

Session 2

Learning about the topic

Goals

Understanding what good planning is and why it is important for productivity and profitability.

Learning how to calculate required line capacity.

Learning how to use and fill-in line loading plans to better schedule production.

Learning how to use and fill-in daily line plans to plan and track production.

Session 2

Overview

One member should read the full session out loud to the rest of group

110 minutes

Learning manual, pens, and markers

This training module aims to help you improve the way your sewing room operates by focusing on line planning. Line planning is the process of scheduling and assigning orders to the sewing lines based on style considerations and shipment dates. Good line planning makes your sewing room more productive by ensuring that deadlines are met and by avoiding bottlenecks or delays. Throughout this module, you will work on the three steps below.

Calculating capacity

Scheduling sewing orders

Planning line operations

First, you will discuss what good line planning is and why it is important. Then, you will learn how to calculate required line capacity, how to make sewing schedules and line loading plans, and how to use them to schedule, plan and track sewing operations.

Activities

Activity
2a

25 minutes

Understanding planning

Line planning means scheduling orders and assigning them to sewing lines in order to complete the order on time. Good planning helps your factory save a lot of time and money! In this activity, you will discuss what good line planning involves and why it is important.

Instructions:

1) Together, discuss the four questions in table 2 below.

2) Together, discuss:

- What happens if an order is scheduled too early?
- What happens if an order is scheduled too late?

3) Together, read through the list of statements in table 3, and decide for each whether it is true or not by putting a ✓ in the corresponding column. Solutions are at the bottom of the page.

4) Together, discuss:

- How can good line planning help you be more productive?
- How can good planning help you save time and money?

Table 2. Line planning

What?	How is line planning done in your factory? How does it link to overall production planning?
Who?	Who is involved in and in charge of line planning in your factory?
When?	When does line planning take part? What comes before / after?
How?	How do you plan lines in your factory? Using which documents?

Table 3. Line planning		
Good line planning helps you…	**Yes**	**No**
Example: Translate customer orders into sewing / line orders.	✓	
1. Minimize production costs (fabric, tools, labour, etc.).		
2. Sew the entire order as soon as possible.		
3. Meet the customer's deadlines.		
4. Decide when the order will be ready to be shipped.		
5. Use up all of the fabric received in the stores for that order.		
6. Prepare for line setting (duration, labour, machines, etc.).		
7. Set and reach daily production goals.		
8. Determine the type of stitches and seams needed.		
9. Avoid delays and bottlenecks for other departments.		
10. Calculate thread utilization.		

Scheduling for line feeding should be coordinated with the progress of other departments (cutting room especially). If an order is scheduled too early, bundles may not be ready on time. If an order is scheduled too late, it creates a bottleneck.

Solutions: 1. Yes, 2. No, 3. Yes, 4. No, 5. No, 6. Yes, 7. Yes, 8. No, 9. Yes, 10. No.

Activity

2b

30 minutes

Calculating capacity

Before scheduling and assigning line operations, you need to calculate the **required line capacity** (number of days). It can be calculated easily based on information available in the operation bulletin (OB). In this activity, you will learn how to calculate line capacity.

Instructions:

1) Together, discuss: Do you calculate line capacity in your factory? If so, how? Do you currently use an operation bulletin or similar tool?

2) Have a participant read aloud the two steps in table 4 and make sure everyone understands. If you need more information, look at the text boxes on the next page.

3) Together, look at table 5, and fill in the shaded cells using the formula from Step 1 below (available capacity). Line 1 has been filled in to guide you. Solutions are in table 2.

4) Together, look at table 6, and fill in the shaded cells using the formulas from Step 2 below (required capacity). Line 1 has been filled in to guide you. Solutions are at the bottom of the page.

Table 4. Calculating line capacity

- **Step 1:** Calculate available capacity per day

Available capacity is the total amount of minutes that all the operators for one line work in one day, taking into account absenteeism (absent workers) and line efficiency.

Capacity available = [(operators x minutes/day) – absenteeism] x line efficiency

Absenteeism is the amount of time lost due to absent workers. It can be calculated by multiplying the capacity by the absenteeism rate (in this example, it is assumed to be 10%).

- **Step 2:** Calculate required capacity

Required capacity is the total amount of time that it will take for a certain line to complete one style order. To calculate required capacity, you need two formulas:

Capacity required (in minutes) = order quantity x style SMV

Style SMV (number of minutes that it takes to produce one garment for a specific style) can be obtained from the operation bulletin.

Capacity required (in days) = capacity required in minutes / capacity available

An **operation bulletin** is a list of all operations needed to make a style, together with estimated time, labour, and machine requirements. To learn more about how to make an Operation Bulletin, ask your facilitator for the “Making an operation bulletin” module.

Table 5. Available capacity

Line #	No. of operators / line	Minutes / day (8hrs x 60)	Capacity (in minutes)	Absenteeism loss (10%)	Line efficiency	Capacity available (in minutes)
Line 1	20	480	9,600	960	80%	6,912
Line 2	15	480	7,200	720	80%	
Line 3	18	480	8,640	864	80%	

Line efficiency is how efficient workers are at their work. There is no 100% efficiency, as workers can be tired, distracted, or make mistakes. Here, it is assumed to be 80%.

Table 6. Required capacity

Order #	Line #	Order qty	Style SMV (in min.)	Capacity required (in minutes)	Capacity available (in minutes)	Capacity required (in days)
45216	Line 1	2000	28	56,000	6,912	8
56782	Line 2	3000	25		5,184	
45786	Line 3	5000	20		6,220	

Reminders:

- **Style SMV** (the number of minutes it takes to sew one garment for a specific style) can be obtained from the operation bulletin.
- **Capacity available** was calculated in Table 1.

Solutions: Line 2 → Capacity required = 75,000min / 5,184 = about 15 days. Line 3 → Capacity required = 100,000 / 6, 220 = about 16 days.

Activity

2c

25 minutes

Scheduling orders

To **schedule sewing orders**, the sewing manager makes a line loading plan for all lines. It includes ongoing orders and orders based on the order book / board prepared by merchandising, considering the available capacity. In this activity, you will learn how to make a line loading plan.

Instructions:

1) Together, discuss the following questions:

- Do you make line loading plans? Why or why not?
- What information should appear on a line loading plan?

2) Together, look at the line loading plan in table 8. Then, have a participant read aloud the example in table 7, and make sure everyone understands how it was filled in the plan.

3) Have a participant read aloud the scenario in table 7, then use the information to fill in the blank line loading plan in table 8 by shading the cells as in the example. Mention line setting days, buffer days, and order # as in the example.

Table 7. Scheduling sewing orders

Example: Order #56782 was assigned to Line 1. Required capacity is 11 days. The order needs to be completed on April 14. Sopheak adds a buffer day (B) on April 13. This means the order needs to start on 13-11=2, April 2. Sopheak plans 1 days for line setting on April 1.

Scenario: There are 3 lines in Sopheak's factory. For June, she needs to schedule 5 orders. She allows 1 day before starting the order for line setting, and one day after the order as a buffer in case of delays.

- Order #54549 was assigned to Line 1. Required capacity is 7 days. The order needs to be ready on June 12.
- Order #45216 is assigned to Line 1. Required capacity is 8 days. The order needs to be ready on June 26.
- Order #56782 is assigned to Line 2. Required capacity is 15 days. The order needs to be ready on June 18.
- Order #54575 is assigned to Line 2. Required capacity is 6 days. The order needs to be ready on June 30.
- Order #45786 is assigned to Line 3. Required capacity is 16 days. The order needs to be ready on June 22.

Table 8. Line loading plan

Line Loading Plan - Example

Month	April 2020	**Sewing manager**	Sopheak
Prepared on	15 March 2020	**Signature**	

Line	1 April	2 April	3 April	4 April	5 April	6 April	7 April	8 April	9 April	10 April	11 April	12 April	13 April	14 April	15 April	16 April	17 April	18 April	19 April	20 April	21 April	22 April	23 April	24 April	25 April	26 April	27 April	28 April	29 April	30 April
1	LS	**Order #56782**											B	LS	**Order #44432**															
2			B	LS	**Order #36915**																				B	LS	**Order #48997**			
3	**Order #25894**							B	LS	**Order #12762**																		B	LS
4					B	LS	**Order #56137**																								
5	B	LS	**Order #46782**							B	LS	**Order #46278**												B	LS	**Order #845678**				

Line Loading Plan - Practice

Month	June 2020	**Sewing manager**	Sopheak
Prepared on	15 May 2020	**Signature**	

Line	1 June	2 June	3 June	4 June	5 June	6 June	7 June	8 June	9 June	10 June	11 June	12 June	13 June	14 June	15 June	16 June	17 June	18 June	19 June	20 June	21 June	22 June	23 June	24 June	25 June	26 June	27 June	28 June	29 June	30 June
1																														
2																														
3																														

A **line loading plan** should be prepared well in advance (for instance, two weeks). However, adjustments can be made on the last day before the next month start to take into consideration the current status of orders.

Activity

2d

30 minutes

Making a daily line plan

Based on the line loading plan, the sewing manager makes a **daily line plan**, which indicates when a style is fed to the line, how many pieces should be produced in a day, and when the order will be completed. It can also be used to record sewing operations, and track progress. In this activity, you will learn how to make a line plan.

Instructions:

1) Together, discuss the following questions:

- Do you use line plans in your factory? Why or why not?
- What kind of information should appear on a line plan?

2) Have a participant read aloud the text box below and make sure everyone understands. Then, discuss: Do you take into account learning and closing curves in your target calculations?

3) Together, look at the line plan example in table 9. Then, have a participant read aloud the example in table 10, and make sure everyone understands how it was filled-in in the line plan example.

4) Together, discuss the three practice questions in table 10 using the filled-in line plan. Solutions are at the bottom of the page.

5) Have a participant read aloud the two scenarios in table 11, then use them to fill in the two blank line plans (shaded cells) in table 12 as in the example.

Daily production targets are often calculated in a linear way (the target is the same every day). But, in reality, production is not linear. It is lower for the first 3 days as workers get familiar with a style (this is called the **learning curve**), and higher at the end as workers are able to produce more, faster (this is called the **closing curve**).

Table 9 – Line plan example

Week: 1 ~ 7 April 2020		**Line:** 1		**Line supervisor:** Khem		
Date	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**
	April 1	April 2	April 3	April 4	April 5	April 6
Planned	Line-setting, order #56782, Qty 2000	300	400	500	600	200
Cumulative		300	700	1200	1800	2000
Actual						
Cumulative						
Variance		**Variance = Planned - Actual*				

Table 10. Line plans

Example: Order #56782, assigned to Line 1, starts on April 1. Order quantity is 2000. Required capacity is 4 days. So, the daily production target is 500 garments. The line supervisor knows that this target will only be achieved by Day 3. So, he sets the target for Day 1 at 300 pieces, Day 2 at 400, Day 3 at 500 and Day 4 at 600. April 6 will serve as buffer day to close the order (200 pieces). April 1 is line-setting day.

Practice questions

1. What is planned cumulative production on April 3?

2. If actual production on April 2 was 300, and 500 on April 3, what would actual cumulative production be on April 3?

3. If actual production on April 3 was 500, what would variance be on April 3? Would they be ahead of or behind schedule?

Line plans can be prepared weekly or monthly for each line. Line supervisors use them to achieve daily production targets. They can also be used as production reports, to record daily sewn quantities. To learn more, ask for the “Tracking production” module.

Solutions: 1. 700 pieces; 2. 300 + 500 = 800 pieces; 3. 100 pieces, ahead of schedule.

Table 11. Scenarios

Scenario 1: Line supervisor Jane (line 2) is making a line plan for the first week of June 2020. According to the line loading plan, she needs to plan the following order: Order #56782, starts on June 2. June 1 is line-setting day. Required capacity is 4 days. Order quantity is 1,000. So, average daily target is 250 pieces. Think of how to plan daily line targets, taking into account learning and closing curves.

Scenario 2: Line supervisor Tom (line 3) is making a line plan for the first week of June 2020. According to the line loading plan, he needs to plan the following order: Order #36915, starts on June 1. May 31 is line-setting day. Required capacity is 5 days. Order quantity is 2,500. So, average daily target is 500. Think of how to plan, taking into account learning and closing curves.

Table 12 – Line plans practice

Line plan – Scenario 1

Week: 1 ~ 7 June 2020	**Line:** 2	**Line supervisor:** Jane

Date	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**
	June 1	June 2	June 3	June 4	June 5	June 6
Planned						
Cumulative						
Actual						
Cumulative						
Variance						

Line plan – Scenario 2

Week: 1 ~ 7 June 2020	**Line:** 3	**Line supervisor:** Tom

Date	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**
	June 1	June 2	June 3	June 4	June 5	June 6
Planned						
Cumulative						
Actual						
Cumulative						
Variance						

Session 3

Action items

Goals

Summarizing and revising the new knowledge gained.

Identifying concrete applications of the new knowledge that benefit your factory.

Session 3

Overview

One member should read the full session out loud to the rest of group

20 minutes

Learning manual, pens, and markers

Throughout this module, you gained new knowledge on how to calculate required capacity, schedule orders, and plan line operations for better line planning.

Calculating
capacity

Scheduling
sewing orders

Planning
line operations

In this session, you will think of ways to apply your new knowledge to improve line planning in your sewing room by reviewing best practices and drafting your own action plan.

Line loading plan and daily line plan templates are available online for you to print out and use in your own factory. To obtain it, contact your factory's FIT coordinator!

Activities

Activity

3a

5 minutes

Best practices checklist

In this activity, you will review best line planning practices as a next step for evaluating your own and implementing improvements.

Instructions:

1) Together, look at the list of best practices in table 13, and put a ✓ in the column on the right if you use these practices in your factory.

Table 13. Line planning

Best practices	✓
1. Required capacity is calculated for each order assigned to each line.	
2. Orders are scheduled monthly using line loading plans.	
3. Line loading plans are made based on calculated required capacity.	
4. Line operations are planned weekly or monthly using daily line plans.	
5. Daily line plans are made based on line loading plans.	
6. Available production capacity is compared with actual production capacity available, with the aim to improve efficiency.	

Activity

3b

15 minutes

Your action plan

In this activity, you will think of ways to apply your new knowledge to improve line planning in your factory by drafting your own action plan.

Instructions:

1) Together, fill in the action plan (table 14) on the next page. Identify a key problem that you want to solve and write down the solutions you identified while working on this module.

Table 14. Line planning – Action Plan

Problem identified				
Solutions identified	**Action(s) to be taken**	**Person responsible**	**By when?**	**How will improvements be measured?**

Line planning

The Factory Improvement Toolset (FIT) is an innovative self-facilitated, activity-based learning approach designed by the International Labour Organization (ILO) to create more decent and sustainable employment. FIT supports manufacturers in global supply chains to improve productivity, competitiveness and working conditions by upgrading production systems and factory practices.

FIT is being piloted in Asia under the regional Decent Work in the Garment Sector Supply Chains in Asia project funded by the Government of Sweden.

Decent Work Technical Support Team for East and South-East Asia and the Pacific

United Nations Building, 10th Floor
Rajdamnern Nok Avenue,
Bangkok 10200, Thailand
Tel.: 662 288 1234 Fax. 662 288 3058
Email: BANGKOK@ilo.org

ISBN: 9789220326558 (web pdf)