

The paper plane game

Operations Management

Overview

- ◎ Production team + a customer
- ◎ Three phases:
 1. Craft production
 2. Mass production
 3. Lean production
 4. Mikkeli Ops production?
- ◎ 5 minutes running per phase + debrief / re-organization
- ◎ **Clear your desks: Create a straight production line with 4 chairs + space in between + 1 final basket**



Metrics



Metrics

	1. Craft	2. Mass	3. Lean
Time used	5 minutes	5 minutes	5 minutes
Finished products			
Good products			
% good products	Good/finished as %		
Work In Process (WIP)			
Cycle time (= time used per good product)	5min / X good products		
Throughput time (= WIP x CT)			
Productivity (= good products / (time used x employees))	Good prod/ 5 x 4		

1. Craft production

- ◎ Art rather than Science
- ◎ No standards

- ◎ 4 craftspeople
- ◎ 1 or more Quality Manager
- ◎ 1 or more Production Manager



Timer

5 mins: www.youtube.com/watch?v=fnf-GBHn-18

2. Mass production

- ◎ Piece part metrics
- ◎ Assembly line
- ◎ Division of labour
- ◎ **4 Workers**
- ◎ **1 Quality Manager**
- ◎ **1 Production Manager**



Roles: 6 students in Mass Production

1 Employee

One fold

2 Employee

Two folds

3 Employee

Two folds and draws a STAR

4 Employee

Two folds

5 Quality Manager

Checks the quality of End Products (straight wings + a real star on the left)

6 Production Manager(s):

Calculates the table

	1		2		3		4	5
Raw materials	Work Centre	WIP	Work Centre	WIP	Work Centre	WIP	Work Centre	Quality Check



3. Lean production



Lean Principles

Quality at source

- Production Manager checks the quality at each stage
- Employees check the quality also themselves

Minimize WIP

- There can only be one item processed in each phase or in the respective Kanban area

	1		2		3		4	5
Raw materials	Work Centre	WIP (Kanban)	Work Centre	WIP (Kanban)	Work Centre	WIP (Kanban)	Work Centre	Finished goods (Airplanes)



Roles: 6 students in Lean

1 Employee

One fold

2 Employee

Two folds

3 Employee

Two folds and draws a STAR

4 Employee

Two folds

5 Quality Manager

Checks the quality in each stage

6 Production Manager(s)

	1		2		3		4	5
Raw materials	Work Centre	WIP	Work Centre	WIP	Work Centre	WIP	Work Centre	Quality Check



YOUR learning points from the game:

No.	Learning point
1	
2	
3	
4	
5	

Learning points of the exercise:

Learning points

Craft Production is the least standardized, most flexible and most random of the three production processes. However there is room for creativity and innovation. Plane production was clearly short & fat process here. However due to craft based nature of production the variation in the quality of the end product was huge.

Mass production example is heavily routinized, standardized and least flexible. It also did not have integrated processes as each work station strives to achieve maximum production without taking into account the rest of the system

Lean system is the one with the least inventory (WIP). There is a continuous emphasis on communication and quality monitoring. Therefore it has the least faulty end products. Since it has the least WIP it is the most cost efficient and also has the lowest throughput and cycle times

Bottleneck was clearly the third stage where the inventory piled up in the mass phase. In an assembly line, the bottleneck (i.e. the slowest stage in the operations) govern both throughput and inventory in the system. An hour lost at a bottleneck is an hour lost for the entire system. An hour saved at a nonbottleneck stage might not impact the total throuput at all if the bottleneck is not addressed.

Thank you!