Conceptual Framework of Production Systems

Course: Production Management and Logistic Systems [10592713]

Economia e management (Latina Campus)

AA 2024-2025 | Prof. Alessandro Pietrogiacomi

SAPIENZA
UNIVERSITÀ DI ROMA

Latina 5 March, 2025

Lesson Plan for Wednseday, March 5

Overview of the lesson, and educational objectives,

Topic: Conceptual Framework of Production Systems

Time: 14:00–17:00

Duration: 3 hours

Learning Objectives

By the end of this lesson, students will be able to:

- Understand the systems approach to production and its key components.
- Identify and differentiate between the types of production systems.
- Analyze and create production flow diagrams for various industries.

Lesson Outline

1. Introduction (15 minutes)
2. Systems Approach to Production (45 minutes)
3. Types of Production Systems (45 minutes)
4. Production Flow Diagrams (45 minutes)
5. Recap, Q&A and Homework Assignment (15 minutes)

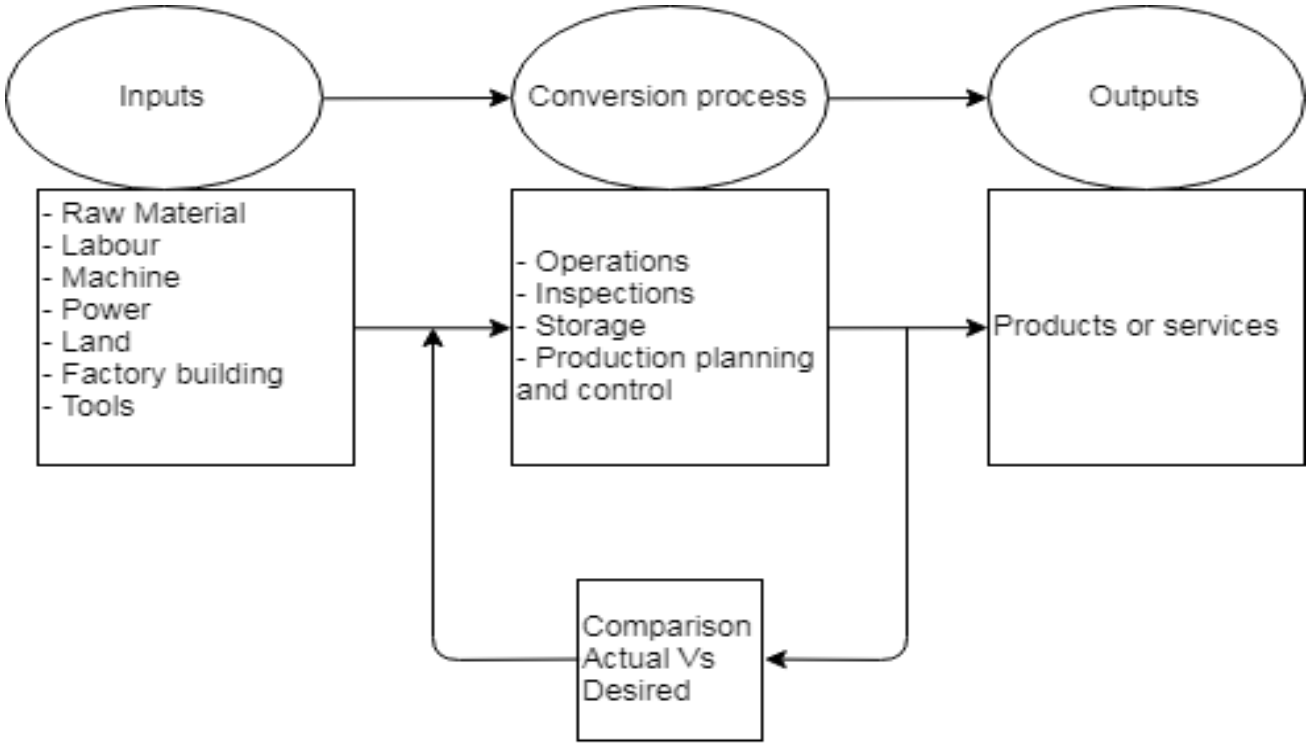
Introduction

- Welcome back, let’s recap the previous session
- The importance of understanding the conceptual framework of production systems

Lesson Outline

1. Introduction (15 minutes)
2. **Systems Approach to Production (45 minutes)**
3. Types of Production Systems (45 minutes)
4. Production Flow Diagrams (45 minutes)
5. Recap, Q&A and Homework Assignment (15 minutes)

Definition and Key Concepts



- **Production System**: A set of interconnected processes and resources that transform inputs (raw materials, labor, energy) into outputs (finished goods or services).
- **Systems Approach**: Viewing production as a system with inputs, processes, outputs, and feedback loops.

Components of a Production System

- **Inputs:** Raw materials, labor, capital, energy, and information.
- **Processes:** Transformation activities (e.g., manufacturing, assembly, testing).
- **Outputs**: Finished products or services.
- **Feedback**: Information used to monitor and control the system (e.g., quality control, customer feedback).

Importance of the Systems Approach

- Helps identify interdependencies and interactions between components.
- Enables optimization of production processes and resource allocation.
- Facilitates continuous improvement through feedback loops.

Activity:

- **Group Discussion**: identify the inputs, processes, outputs, and feedback loops Brewing Beer plant https://www.youtube.com/watch?v=MJ7Uj4Q9GRs

- **Group Sharing:** presents your findings to the class.

Answer

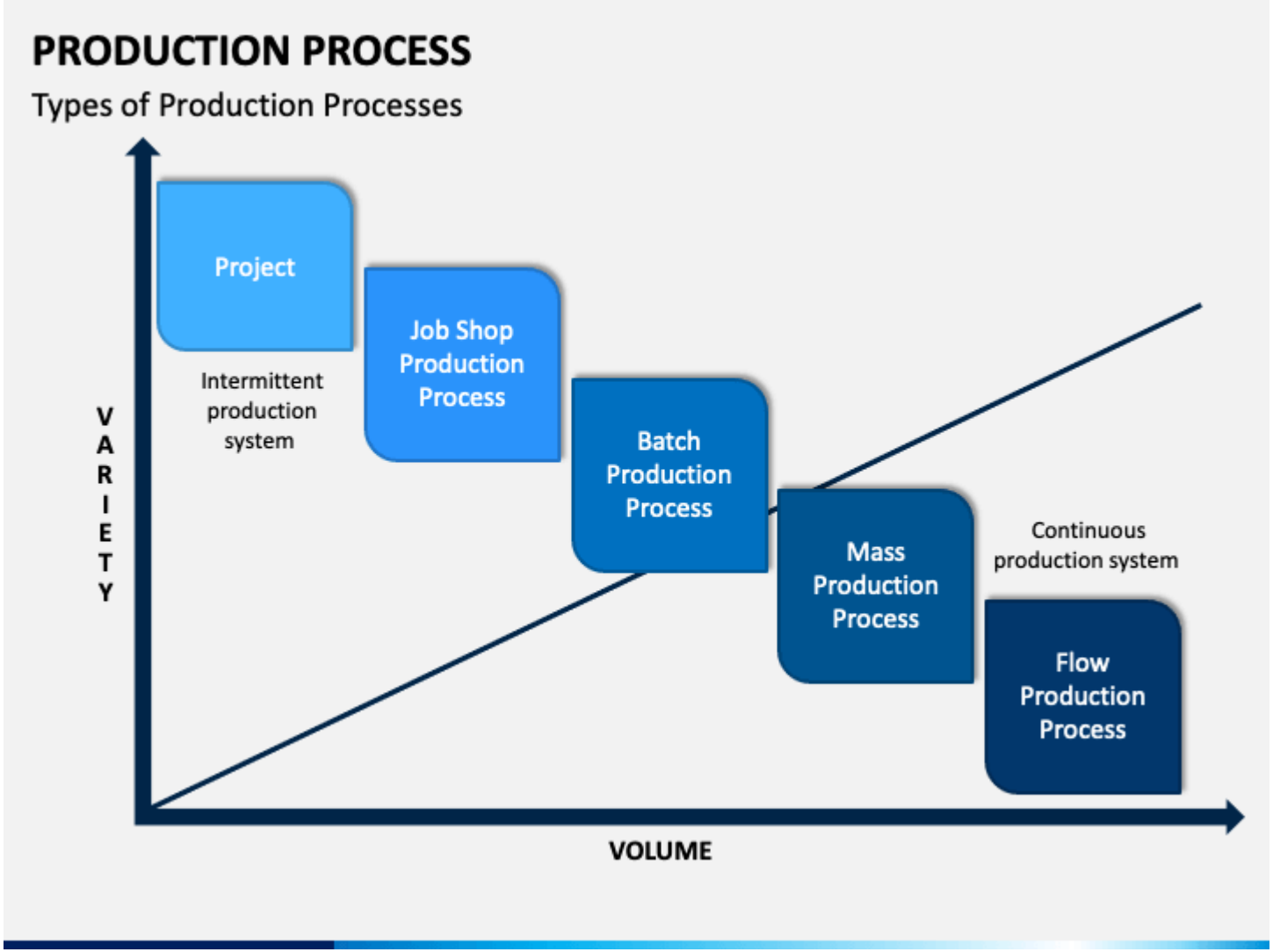
In a beer brewery, several production process types are applicable depending on the scale, variety, and methods used.

1. **Batch Production:** Breweries typically produce beer in batches. Each batch involves a specific recipe, fermentation process, and packaging run. This allows for flexibility in producing different types of beer (e.g., lagers, ales, stouts) in the same facility. **Example: Brewing a batch of IPA, followed by a batch of stout.**
2. **Continuous Production:** Large-scale breweries (e.g., macrobreweries) may use continuous production for high-volume, standardized beers. This involves a non-stop process where raw materials are continuously fed into the system, and beer is continuously packaged. **Example: Mass-produced beers like Budweiser or Heineken.**
3. **Flow Production:** Breweries often use a flow production system where the beer moves through stages (mashing, boiling, fermenting, conditioning, and packaging) in a sequential manner. This is common in both small and large breweries **Example: Automated systems in large breweries where beer flows from one stage to the next.**
4. **Craft Production** Small, artisanal breweries (microbreweries or craft breweries) often focus on craftsmanship and small-batch production.**. Example: Craft breweries producing small batches of unique or seasonal beers.**

Lesson Outline

1. Introduction (15 minutes)
2. Systems Approach to Production (45 minutes)
3. **Types of Production Systems (45 minutes)**
4. Production Flow Diagrams (45 minutes)
5. Recap, Q&A and Homework Assignment (15 minutes)

Tupes of Production process



Project

Project or job-based production is one-of-a-kind production in which only one type of item is manufactured at a time. This type of production is often used for very large projects or for individual customers.

Definition: Customized production of unique rpoduct.

Examples: custom home construction, haircutsyachts.

Characteristics: Very high flexibility, highly skilled labor,

Job Production

Jobbing production is characterized by the manufacture of one or few number of a single product designed and manufactured strictly to customer's specifications within the given period and within the price fixed prior to the contract.

Definition: Customized production of unique or small-batch products.

Examples: Tailored suits, custom furniture, specialized machinery.

Characteristics: High flexibility, skilled labor, low automation

Batch Production

Batch production is the manufacturing of limited number of product produced at regular intervals & stocked in warehouse as finished goods.

- **Definition:** Production of limited quantities of similar products in batches.
- **Examples:** Bakeries, pharmaceuticals, electronics**.**
- **Characteristics:** Moderate flexibility, semi-skilled labor, moderate automation

Mass Production

Mass as well as flow production are characterized by the manufacturer of several number of a std product and stocked in the warehouses as finished goods awaiting sales. The goods under mass production are manufactured either at a single operation or a series of operation on one machine.

- **Definition:** Large-scale production of standardized products**.**
- **Examples:** Automobiles, consumer electronics, household appliances.
- **Characteristics:** Low flexibility, unskilled labor, high automation**.**

Continuous Production

Continuous production is a manufacturing method that involves the continuous production of goods for sale. It aims to create non-stop operations of goods that are the same or similar. Continuous production is a highly automated process that creates large numbers of products more quickly and efficiently than other common manufacturing practices.

Definition: Non-stop production of homogeneous products.

Examples: Oil refining, chemical plants, steel manufacturing.

Characteristics: No flexibility, highly automated, 24/7 operation.

Activity:

Case Study Analysis

https://www.youtube.com/watch?v=JacrWVaMKV8

Task: Identify the type of production system used to manufacture Nutella and justify your choice.

Answer

For Nutella, the production process is highly specialized and optimized for mass production due to its global demand and standardized recipe. Here are the most relevant types of production processes that apply to Nutella:

1. **Continuous Production:** Nutella is produced in very large volumes to meet global demand. The production process is designed to run continuously, with raw materials (e.g., hazelnuts, cocoa, sugar, palm oil) fed into the system and finished product outputted without interruption (Large-scale factories producing Nutella 24/7 to ensure consistent supply)

2. **Mass Production:** Nutella is a standardized product with a consistent recipe. Mass production allows Ferrero (the manufacturer) to produce high volumes efficiently while maintaining uniformity across all batches**.(Millions of jars of Nutella are produced annually, all with the same taste and texture)**

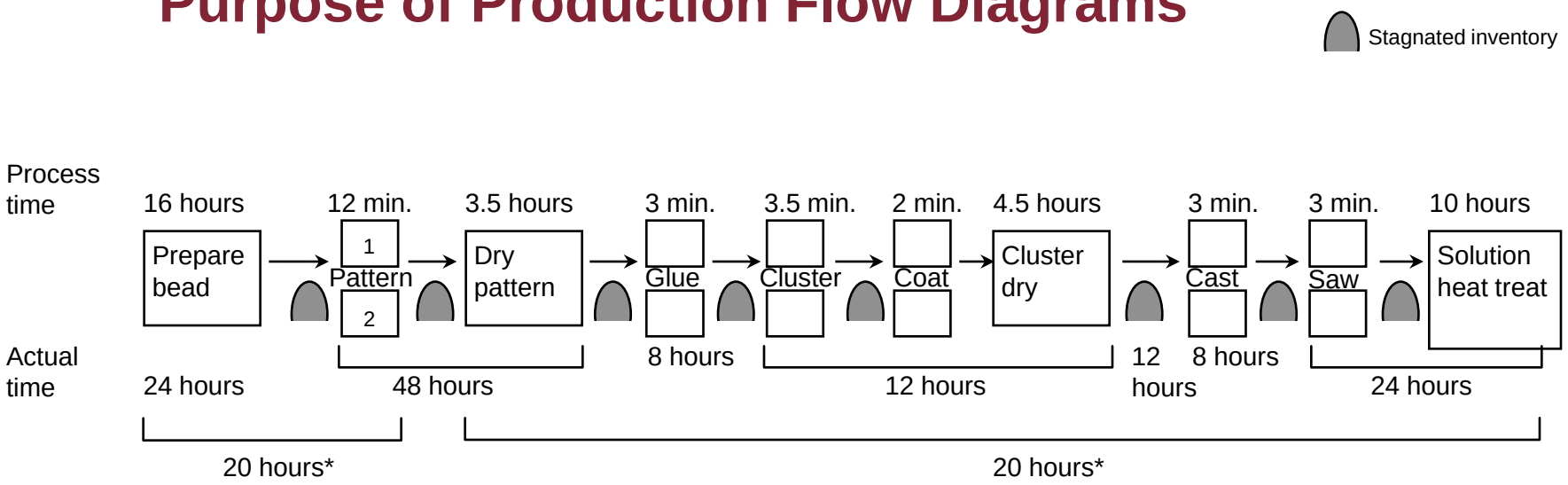
3. **Flow Production:** The production of Nutella involves a sequential flow of stages, including ingredient mixing, refining, pasteurization, and packaging. Each stage is connected, and the product moves continuously through the system. (Example: Automated production lines where hazelnuts are ground, mixed with other ingredients, and filled into jars.)

4. **Automated Production:** For consistency and speed in packaging and handling and **Repetitive Production:** For uniformity across all batches.

Lesson Outline

1. Introduction (15 minutes)
2. Systems Approach to Production (45 minutes)
3. Types of Production Systems (45 minutes)
4. **Production Flow Diagrams (45 minutes)**
5. Recap, Q&A and Homework Assignment (15 minutes)

Purpose of Production Flow Diagrams

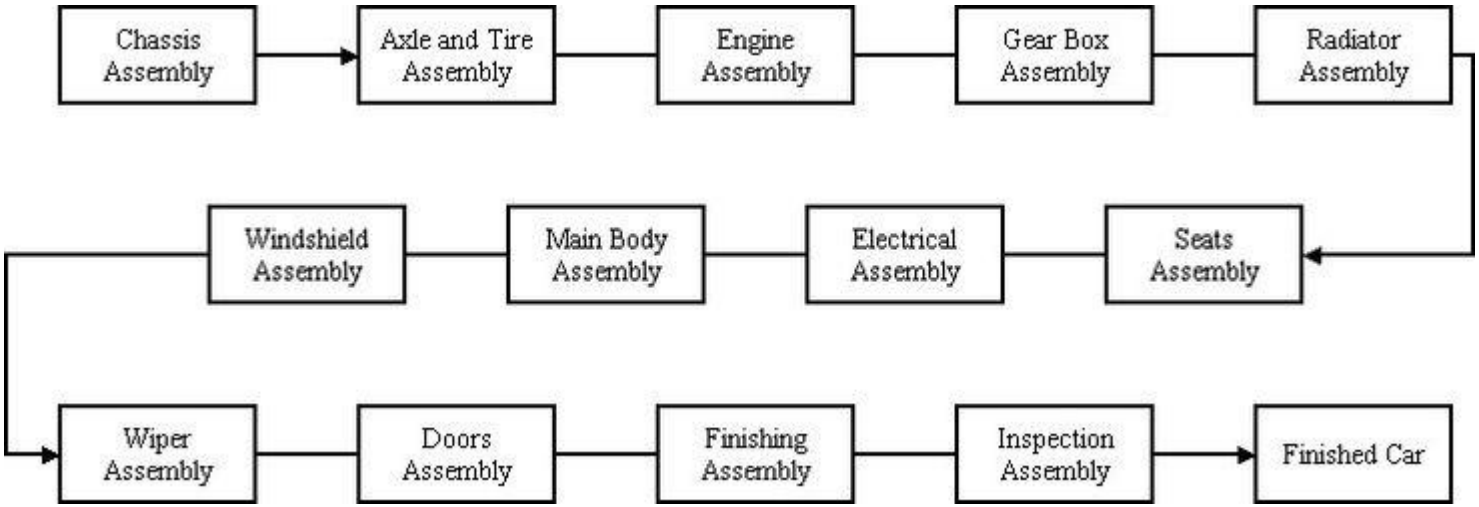


- Visual representation of the production process.
- Helps identify bottlenecks, inefficiencies, and opportunities for improvement

Key Elements of a Production Flow Diagram

- **Inputs:** Raw materials, labor, energy.
- **Processes:** Transformation steps (e.g., cutting, welding, assembly).
- **Outputs:** Finished products.
- **Flow Lines:** Arrows indicating the direction of material and information flow.

Example: Production Flow Diagram for a Car Factory



- **Input:** Steel, rubber, labor, energy.
- **Processes:** Cutting, welding, painting, assembly.
- **Output:** Finished cars.
- **Feedback:** Quality control, customer feedback.

Activity:

- **Task: Create a production flow diagram for the Jewellery Manufacturing Process**
- **https://www.youtube.com/watch?v=hCtujezhMl0**

- **Presents your diagram to the class.**

Lesson Outline

1. Introduction (15 minutes)
2. Systems Approach to Production (45 minutes)
3. Types of Production Systems (45 minutes)
4. Production Flow Diagrams (45 minutes)
5. **Recap, Q&A and Homework Assignment (15 minutes)**

Recap and Q&A

Key points covered in the lesson:

- Systems approach to production.
- Types of production systems.
- Production flow diagrams.

Questions and clarifications

Homework Assignment

- **Task:** Research a real-world production system (e.g., a local factory or an industry of interest or go to How it's Made video https://www.youtube.com/playlist?list=PLygLgY8-7XTboBwiuIL_ntd63YbWZXCAz)
-
- **Deliverable:** Write a 1-page report describing the system, its type, and its production flow. Include a simple flow diagram**.**