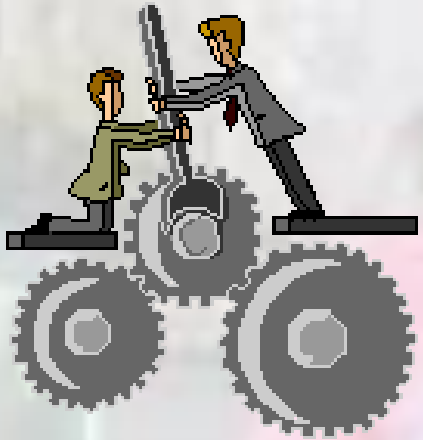
# MENG 445

## Production and Inventory Control

## Introduction



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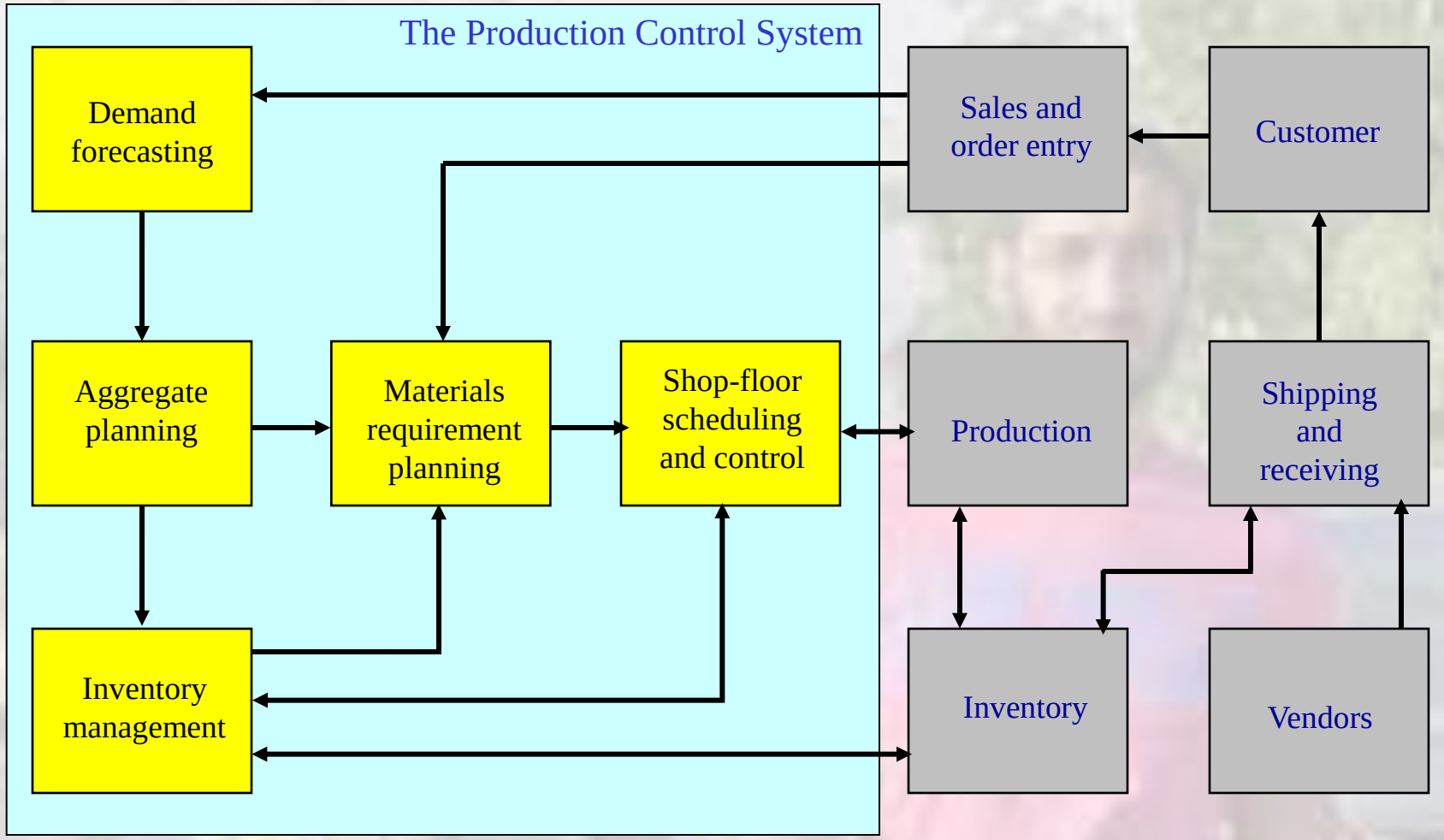
# Production Planning and Control



# Production Planning and Control

## Main Functions

***Forecasting*** to predict customer demand on various products over a given horizon.

***Aggregate Planning*** to determine overall resources needed.

***Materials Requirement Planning*** to determine all required components and timing.

***Inventory Management*** to decide production or purchase quantities and timing.

***Scheduling*** to determine shop-floor schedule of various components.

# Production Planning and Control

## Purpose

Effectively utilize limited resources in the production of goods so as to satisfy customer demands and create a profit for investors.

*Resources* include the production facilities, labor and materials.

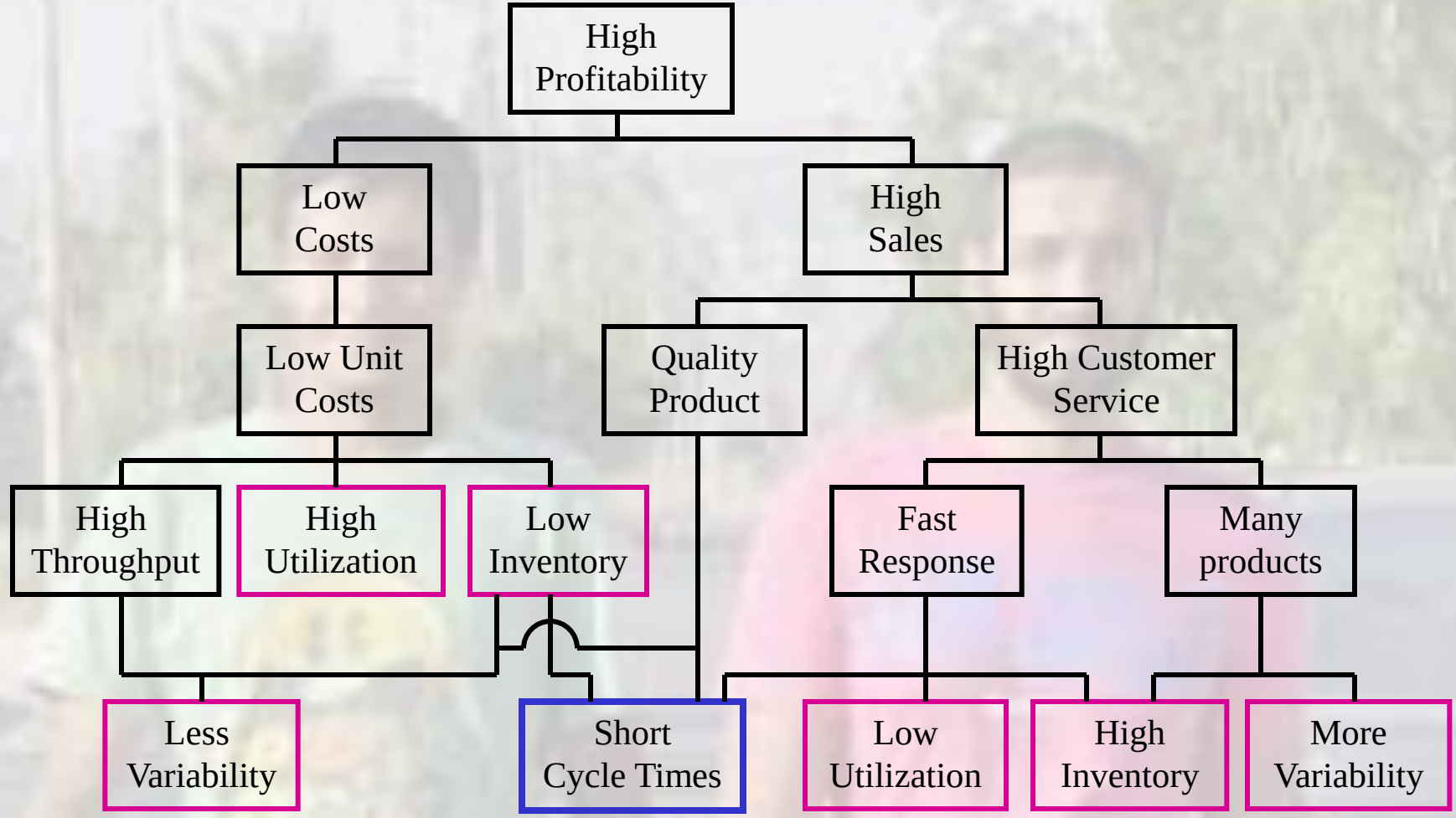
*Constraints* include the availability of resources, delivery times for the products, and management policies.

# Production Planning and Control

## Summary

The production control activity is a chain of interrelated events that functions as a system. The decisions are made for different horizons in time and with different degrees of accuracy. Yet they must all occur if the ultimate objective is to be met: that is, to use limited resources effectively to produce goods that satisfy customer demands and create a profit for investors.

# Production Objectives



# Performance Measures

Throughput

WIP

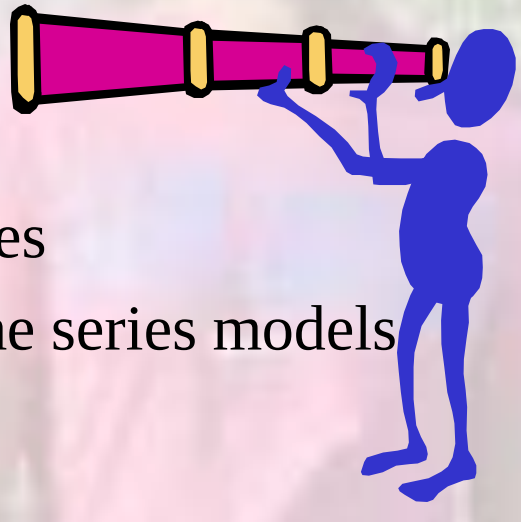
Cycle time

Service quality

Profit

# Forecasting

- Objective: **predict demand for planning purposes.**
- Laws of Forecasting:
  1. ***Forecasts are always wrong!***
  2. ***Forecasts always change!***
  3. ***The further into the future, the less reliable the forecast will be!***
- Forecasting Tools:
  - ***Qualitative***: Delphi, Analogies
  - ***Quantitative***: Causal and time series models



# Aggregate Planning

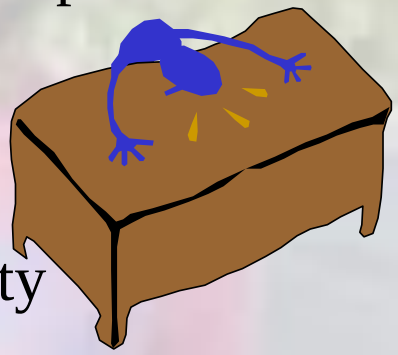
- Objective: **generate a long-term production plan that establishes a rough product mix, anticipates bottlenecks, and is consistent with capacity and workforce plans.**
- Issues:
  - ***Aggregation***: product families and time periods must be set appropriately for the environment.
  - ***Coordination***: AP is the link between the high level functions of forecasting/capacity planning and intermediate level functions of MRP, inventory control, and scheduling.
  - ***Anticipating Execution***: AP is virtually always done deterministically, while production is carried out in a stochastic environment.

# Workforce Planning

- **How much and what kind of labor is needed to support production goals?**
- Issues:
  - ***Basic Staffing Calculations***: standard labor hours adjusted for worker availability.
  - ***Working Environment***: stability, morale, learning.
  - ***Flexibility/Agility***: ability of workforce to support plant's ability to respond to short and long term shifts.
  - ***Quality***: procedures are only as good as the people who carry them out.

# Capacity Planning

- **How much and what kind of physical equipment is needed to support production goals?**
- Issues:
  - ***Basic Capacity Calculations***: stand-alone capacities and congestion effects (e.g., blocking)
  - ***Capacity Strategy***: lead or follow demand
  - ***Make-or-Buy***: vendoring, long-term identity
  - ***Flexibility***: with regard to product, volume, mix
  - ***Speed***: scalability, learning curves



# Demand Management

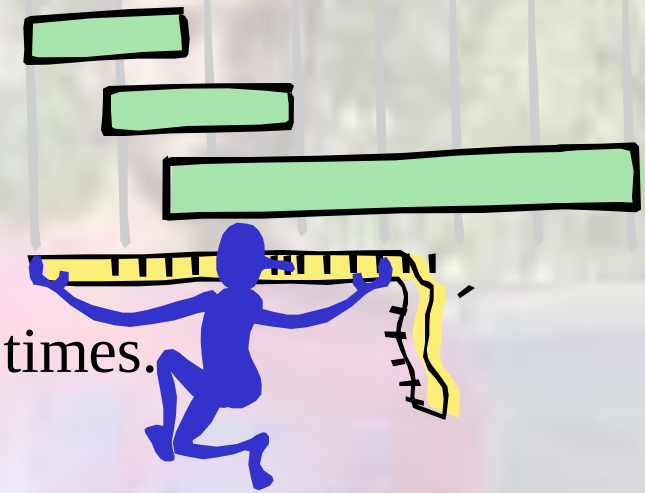
- Objective: **establish an interface between the customer and the plant floor, that supports both competitive customer service and workable production schedules.**
- Issues:
  - ***Customer Lead Times***: shorter is more competitive.
  - ***Customer Service***: on-time delivery.
  - ***Batching***: grouping like product families can reduce lost capacity due to setups.
  - ***Interface with Scheduling***: customer due dates are are an enormously important control in the overall scheduling process.

# Material Requirement Planning

- Objective: **Determine all purchase and production components needed to satisfy the aggregate/disaggregate plan.**
- Issues:
  - ***Bill of Materials***: Determines components, quantities and lead times.
  - ***Inventory Management***: Must be coordinated with inventory.

# Sequencing and Scheduling

- Objective: **develop a plan to guide the release of work into the system and coordination with needed resources (e.g., machines, staffing, materials).**



- Methods:
  - ***Sequencing***:
    - Gives order of releases but not times.
  - ***Scheduling***:
    - Gives detailed release times.

# Shop Floor Control

- Objective: **control flow of work through plant and coordinate with other activities (e.g., quality control, preventive maintenance, etc.)**
- Issues:
  - ***Customization***: SFC is often the most highly customized activity in a plant.
  - ***Information Collection***: SFC represents the interface with the actual production processes and is therefore a good place to collect data.
  - ***Simplicity***: departures from simple mechanisms must be carefully justified.