

Chapter 1: Introduction

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What is Scheduling?

Allocation of (scarce) *resources* to *tasks* over time



Manufacturing

- Resources: Machines
- Tasks: Operations



Healthcare

- Resources: Doctors
- Tasks: Operations



Transportation

- Resources: Fleet
- Tasks: Deliveries



Education

- Resources: Classrooms
- Tasks: Different courses

What is Scheduling?

Allocation of (scarce) *resources* to *tasks* over time



Airport

- Resources: Runways
- Tasks: Takeoffs & Landings



Print

- Resources: Printer
- Tasks: Print Jobs



Call Center

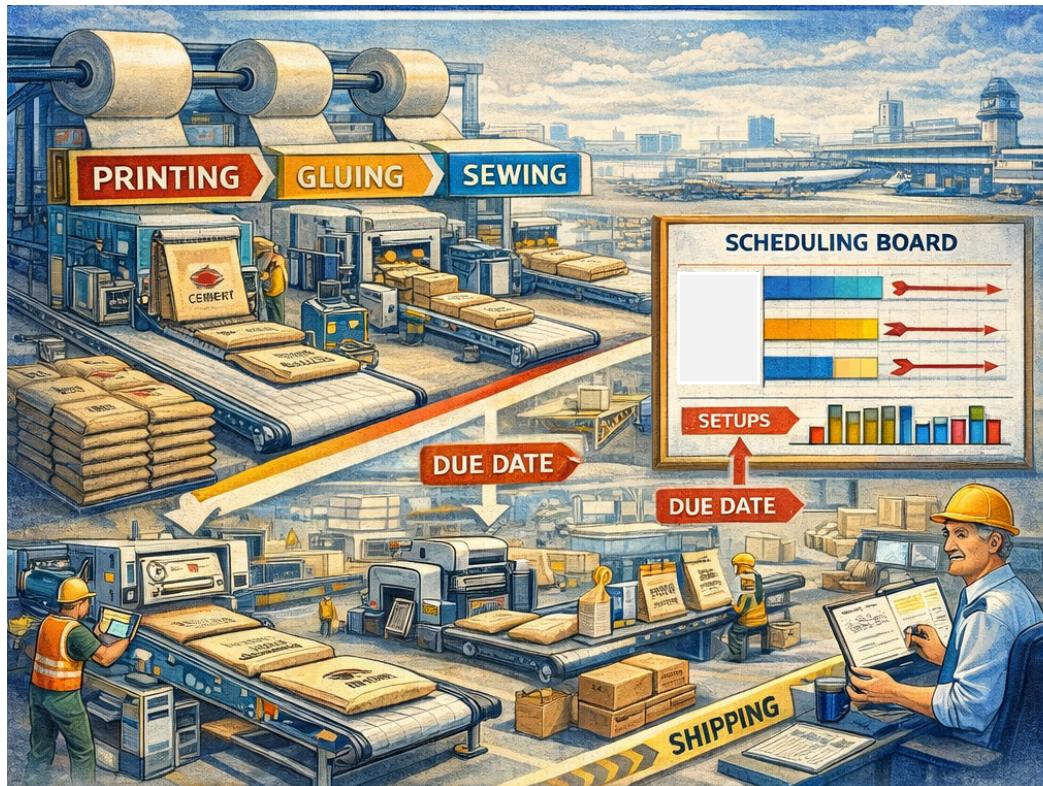
- Resources: Operators
- Tasks: Customer Inquiries

What is Scheduling?

- Decision making process with one or more *objectives*
 - Each task may have
 - A preferred start and end time
 - Priority
 - ...
 - Objectives
 - Minimize the completion time of the last task
 - Minimize number of tardy tasks
 - ...

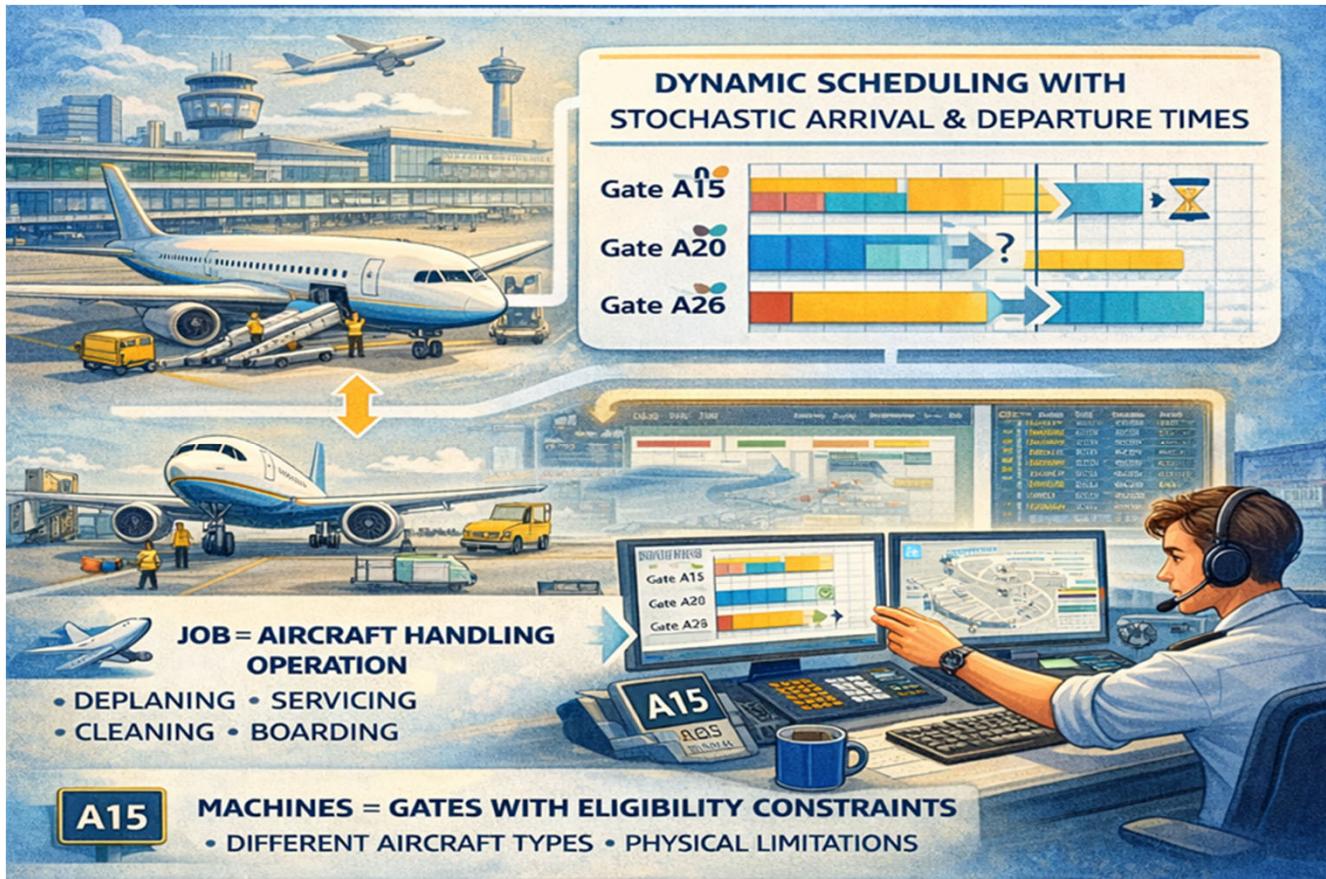
PAPER BAG FACTORY SCHEDULING

A MACHINE SCHEDULING PROBLEM



AIRPORT GATE ASSIGNMENT

A MACHINE SCHEDULING PROBLEM



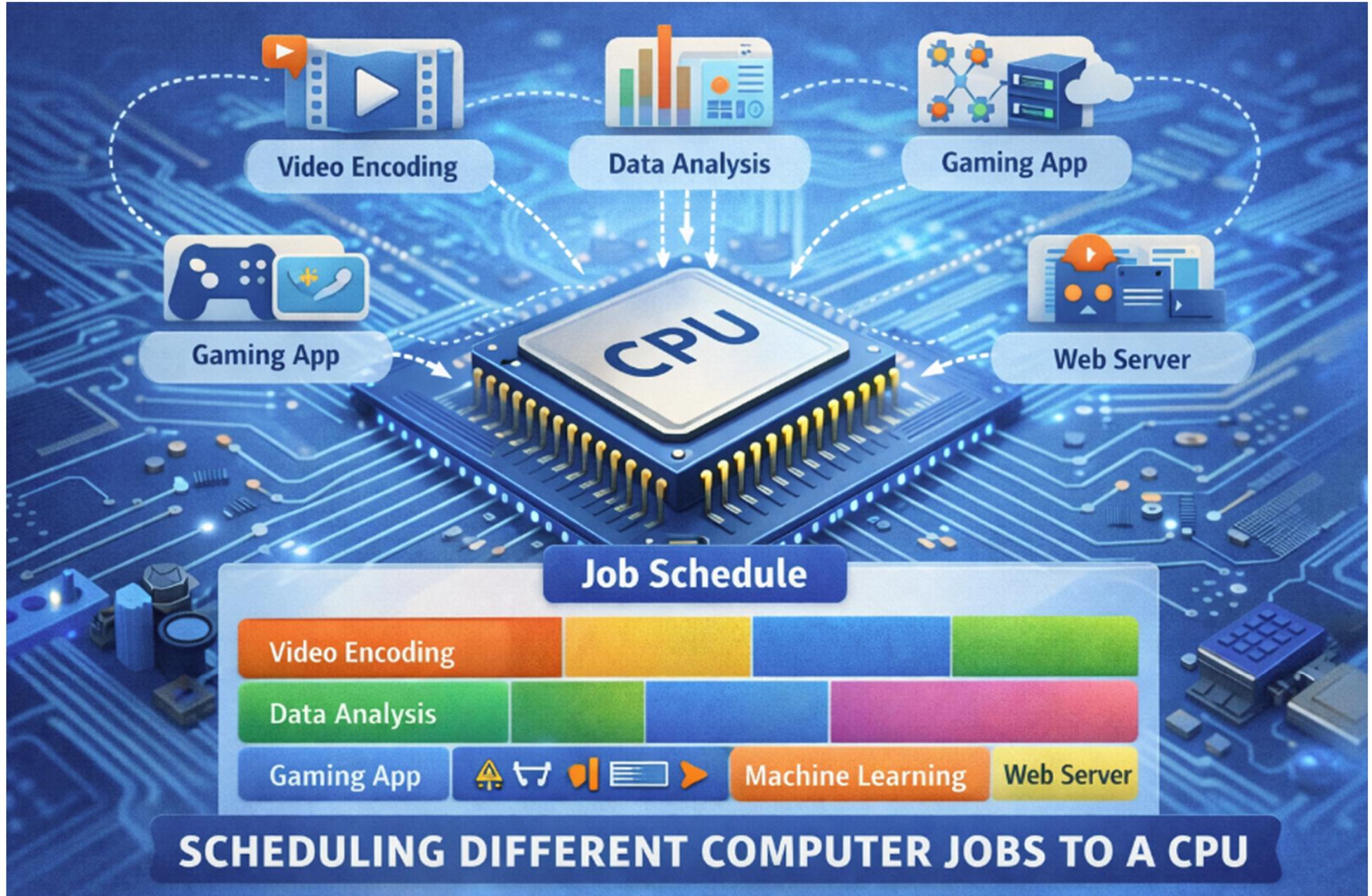
MULTI-OBJECTIVE

- MINIMIZE TARDINESS
- WORKLOAD • CONGESTION



COMPLEX CONSTRAINTS

- UNCERTAINTY • BLOCKING
- DYNAMIC DECISIONS







Notification Alerts



A blue clipboard icon with a white checklist on it.

Book Delivery



Track Packages



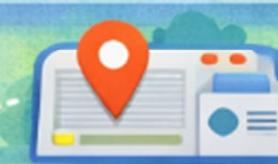
Deliveries Schedule

The figure shows a digital calendar interface with a grid layout. The columns represent the days of the week: Mon, Tue, Wed, Thu, Fri, and Fri. Each day has a corresponding row. Colored boxes indicate specific delivery times:

- Tuesday:** An orange box contains the text "Priority Delivery" above "10:00 AM".
- Wednesday:** A green box contains the text "Standard Delivery" above "1:00 PM".
- Wednesday:** A blue box contains the text "Express Delivery" above "4:30 PM".



Locate Nearby Jobs



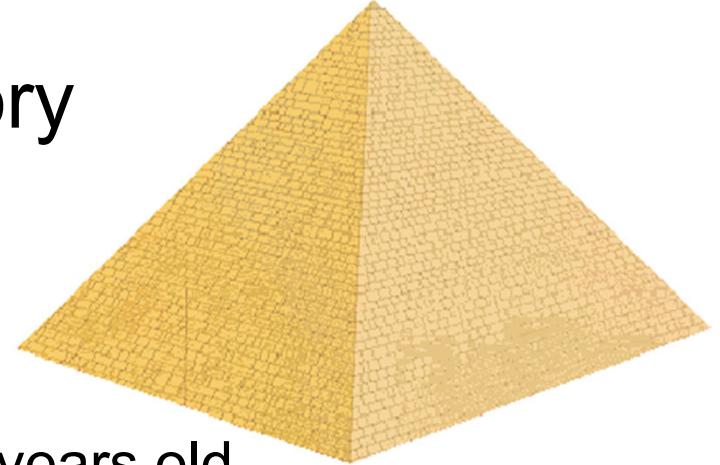
Target Delivery



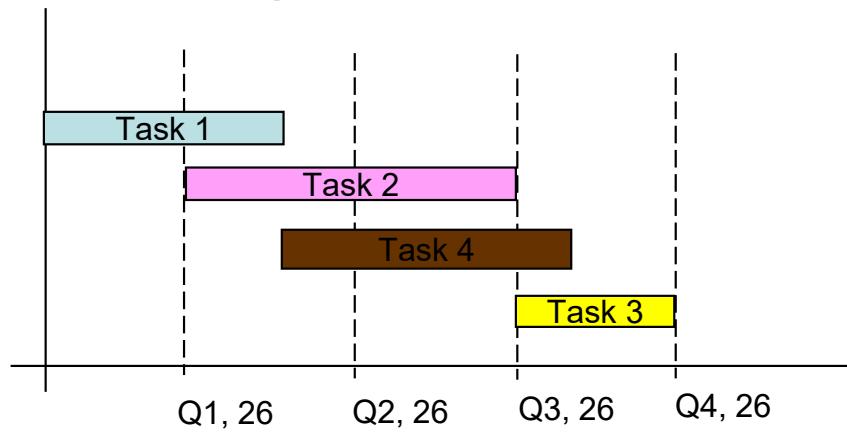
Manage Availability

SCHEDULING IN COURIER SERVICES

Scheduling History



- Scheduling is not new
 - The pyramids are over 3000 years old
 - Transcontinental railways are over 200 years old
 - Scheduling must have been an integral part in most activities
 - No evidence of formal process until early 1900's
- Henry L. Gantt in 1917
 - Introduced Gantt chart for production control



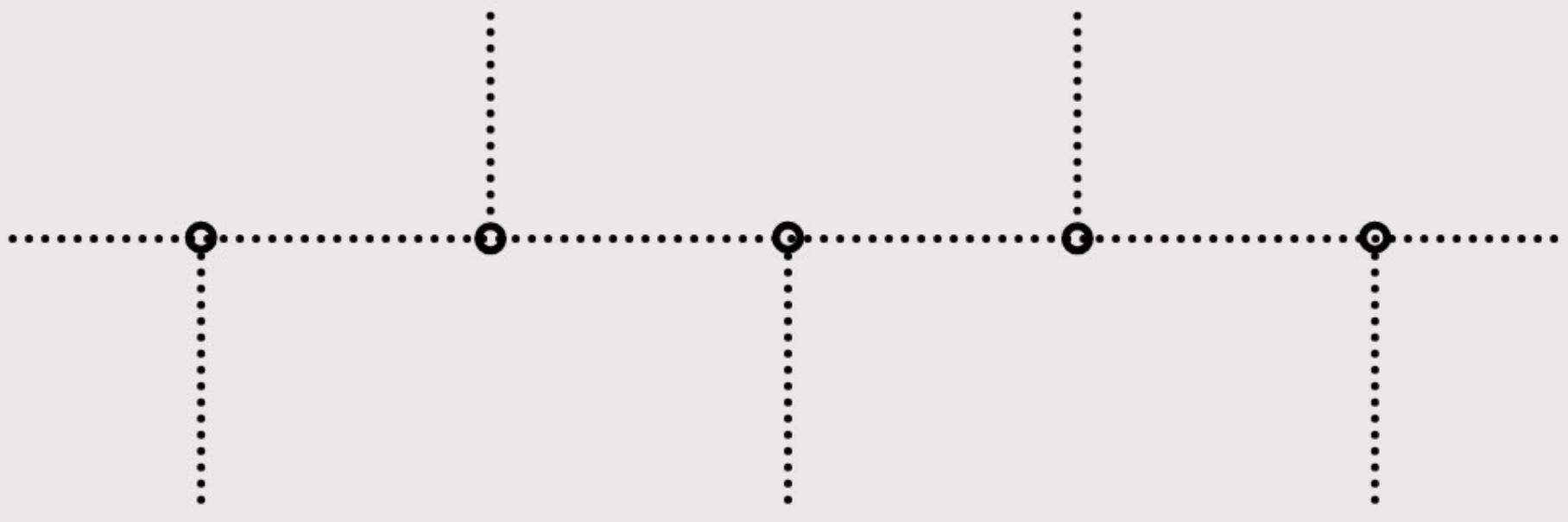
Scheduling History

1960'S

Dynamic and Linear Programming
Formulations for Scheduling
Problems

1980'S

Attention to
Stochastic Scheduling



Scheduling in Manufacturing

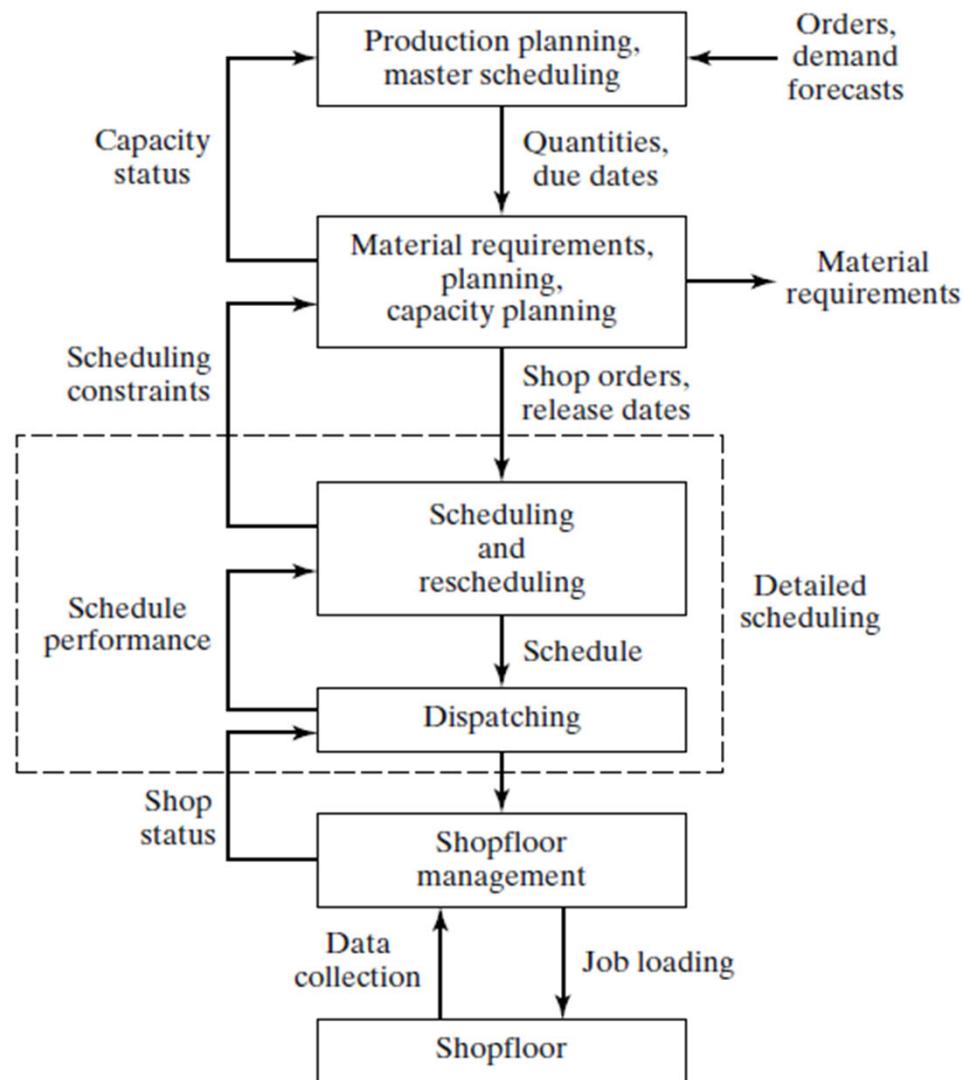


Fig. 1.1 Information flow diagram in a manufacturing system

Scheduling in Services

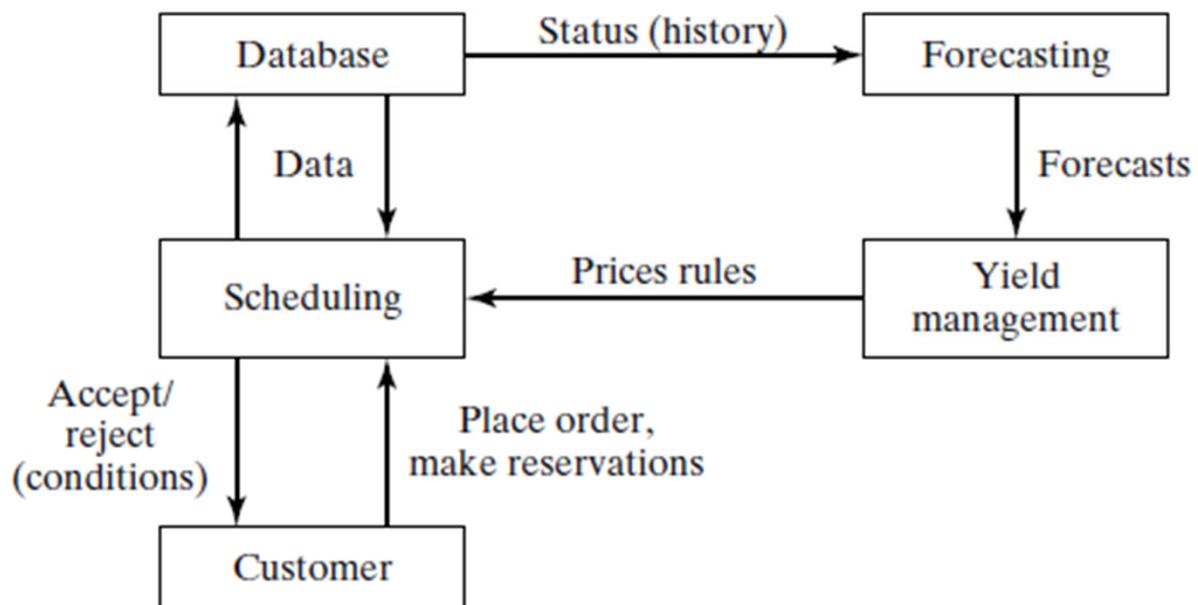


Fig. 1.2 Information flow diagram in a service system