

Real-Life Case Studies in Operations Research

FedEx: Route Optimization and Package Delivery

Problem: Efficiently routing thousands of delivery trucks daily.

OR Application: Used vehicle routing problem (VRP) algorithms, linear programming, and real-time traffic data.

Impact: Reduced fuel usage, improved delivery times, and significant cost savings.

Walmart: Inventory Management and Supply Chain Optimization

Problem: Managing inventory across thousands of stores and distribution centers.

OR Application: Demand forecasting, network flow models, dynamic programming, and simulation.

Impact: Minimization of stockouts, lower holding costs, and improved customer satisfaction.

Delta Airlines: Crew Scheduling

Problem: Creating schedules for thousands of pilots and flight attendants while complying with labor laws and minimizing costs.

OR Application: Integer programming, column generation, constraint satisfaction.

Impact: Millions of dollars saved annually, reduced delays, and better crew utilization.

Massachusetts General Hospital (MGH), USA: Operating Room Scheduling

Problem: Inefficient use of surgical operating rooms.

OR Application: Simulation, queuing theory, and optimization algorithms to plan surgery schedules.

Impact: Reduced patient wait times, increased surgeries per day, and improved patient care.

Tata Steel: Production Planning

Problem: How to optimally allocate resources and plan production across different steel plants.

OR Application: Linear programming, supply chain optimization, and simulation modeling.

Impact: Better throughput, lower production cost, and optimized raw material use.

Amazon: Warehouse Layout and Order Fulfillment

Problem: Efficient picking and packing in fulfillment centers.

OR Application: Stochastic models, assignment problems, heuristics for bin packing, robotics path planning.

Impact: Fast and cost-efficient delivery with minimal human errors.

Bank of America: ATM Cash Replenishment

Problem: Reduce ATM downtime while minimizing cash holding costs.

OR Application: Queuing models, forecasting, optimization.

Impact: Reduced replenishment costs and improved ATM uptime and customer satisfaction.

Maersk Line: Container Fleet Scheduling

Problem: Planning shipping routes for a global container fleet with uncertain demands and port constraints.

OR Application: Mixed-integer programming, stochastic optimization, network design.

Impact: More efficient vessel utilization, reduced fuel costs, better on-time performance.

Netflix: Content Delivery Optimization

Problem: Streaming content to millions with minimum buffering.

OR Application: Network optimization, demand forecasting, server placement modeling.

Impact: Seamless video playback and cost-efficient use of content delivery networks (CDNs).

Apollo Hospitals, India: Bed Allocation and Patient Flow

Problem: Managing patient flow in crowded emergency and ICU departments.

OR Application: Simulation modeling, queuing theory, resource allocation models.

Impact: Improved patient throughput, reduced ER congestion, and optimized staff deployment.

Cargill: Agricultural Supply Chain Optimization

Problem: Transporting perishable goods across countries at the lowest cost.

OR Application: Linear programming, transportation problem, weather simulation models.

Impact: Better routing decisions, less spoilage, and increased profitability.

L&T Construction: Project Scheduling

Problem: Coordinating hundreds of construction tasks on tight deadlines.

OR Application: PERT/CPM, resource leveling, multi-project optimization.

Impact: Reduced project delays and improved cost control.