CONCEPT

Discrete Event Simulation for Supply Chain and Operations: Warehouse, Port and Production Models

7 – 11 June 2027
Dubai - Five-star CBD venue



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Introduction:

Warehouses, production lines, ports and distribution networks are often sized with averages in spreadsheets, so queues, idle docks and missed cut-offs appear only after capital is committed. Discrete event simulation lets operations and supply chain teams reproduce variability, test layouts and staffing rules, and see bottlenecks before they happen. This Core Concept course equips analysts and engineers to frame a simulation question, fit input distributions, build and validate models, and run statistically sound experiments. Participants finish with a Distribution Centre Simulation Study Report built from a case model they construct and analyse.

Course Objectives:

- Decide when a question calls for simulation, optimisation or a spreadsheet model and frame its scope, KPIs and level of detail
- Construct discrete event simulation models of warehouses, production lines, ports and distribution networks using entities, resources, queues and events
- Fit probability distributions to operational input data and test the fit before using it in a model
- Verify and validate simulation models against logic traces, historical performance and operator knowledge
- Design simulation experiments with suitable warm-up, run length and replications and compare scenarios with confidence intervals
- Present capacity, bottleneck and what-if findings to decision makers in a Distribution Centre Simulation Study Report

Target Audience:

- Operations and process improvement staff who analyse capacity, throughput and staffing in plants and service facilities
- Supply chain and logistics analysts who evaluate warehouse, transport and inventory policy options
- Industrial engineers who design layouts, material flows and production line configurations
- Data and business analysts who build quantitative models to support operational investment cases
- Port, terminal and distribution centre planners who test berth, dock and resource allocation rules

Course Outline:

Day 1: Simulation Foundations and Problem Framing

- Simulate Versus Optimise Versus Spreadsheet: Decision Criteria and Model Fit
- Discrete Event Simulation Building Blocks: Entities, Resources, Queues and Events
- Simulation Clock, Future Event List and Next-Event Time Advance
- Queueing Behaviour: Utilisation, Waiting Time and Variability Effects
- Problem Framing Canvas: Decision Question, Scope, KPIs and Level of Detail

Day 2: Input Data, Distributions and Modelling Paradigms

- Input Data Collection from WMS and MES Logs and Time Studies
- Probability Distribution Fitting: Exponential, Triangular, Lognormal and Empirical
- Goodness-of-Fit Tests and Handling Sparse or Censored Data
- Agent-Based Modelling and System Dynamics at Overview: Agents, Stocks, Flows and Emergence
- Simulation Software Landscape: AnyLogic, Arena, Simio and SimPy-Type Tools

Day 3: Building Warehouse, Production, Port and Network Models

- Warehouse Model: Receiving, Put-Away, Order Picking and Dock Door Allocation
- Production Line Model: Buffers, Breakdowns, Changeovers and Shift Patterns
- Port and Terminal Model: Berth, Quay Crane and Yard Truck Interactions
- Distribution Network Model: Replenishment Policies, Transport Legs and Lead Times
- Capacity and Bottleneck Analysis with Resource Utilisation and Queue Statistics

Day 4: Verification, Validation, Experiment Design and Risk

- Verification Techniques: Trace Runs, Animation Checks and Extreme-Value Tests
- Validation Against Historical Throughput and Face Validation with Operators
- Warm-Up Period Detection, Run Length and Number of Replications
- Confidence Intervals, Common Random Numbers and Design of Experiments
- Monte Carlo Risk Simulation for Supply Disruption and Demand Uncertainty

Day 5: Capstone: Distribution Centre Simulation Study

- Case Distribution Centre Brief: Order Profile, Layout and Service Targets
- DES Model Build of Inbound, Storage and Outbound Flows
- What-If Scenarios: Added Pickers, Wave Release Rules and Peak Volumes
- Results Storyboard for Decision Makers: Throughput, Cost and Risk Trade-Offs
- Distribution Centre Simulation Study Report and Model Documentation Peer Review

Skills You Will Gain:

- Simulation Problem Framing
- Input Distribution Modelling
- Discrete Event Model Construction
- Bottleneck Diagnosis
- Model Verification and Validation
- Simulation Output Analysis
- Scenario Experiment Design
- Simulation Results Storytelling

Why Attend This Course:

- Return with a Distribution Centre Simulation Study Report and a working case model that shows how to approach your own facility
- Stop sizing docks, pickers and buffers on averages by quantifying the effect of variability on queues and service
- Challenge simulation studies from vendors and consultants by checking their input data, warm-up and replication choices
- Compare modelling practice with engineers and analysts from manufacturing, retail, ports and third-party logistics

Conclusion:

Simulation earns trust when the question is framed clearly, the inputs reflect real variability and the experiments are statistically sound. The week moves from choosing between simulation, optimisation and spreadsheets and the mechanics of events, queues and the simulation clock, through input distributions and modelling paradigms, to warehouse, production, port and network models with bottleneck analysis, then to verification, validation, experiment design and Monte Carlo risk. The final day turns this into a Distribution Centre Simulation Study Report presented for peer review.