

Anylogic Conference 2026



One Model, Multiple Decisions:

An End-to-End Simulation for Last-Mile Service Centers at Mercado Libre

Agenda

01. Introduction

- Speakers presentation
- About Mercado Libre

02. Problem Description

- Mercado Libre operation key figures
- Geographic scope
- Future vision

03. Solution

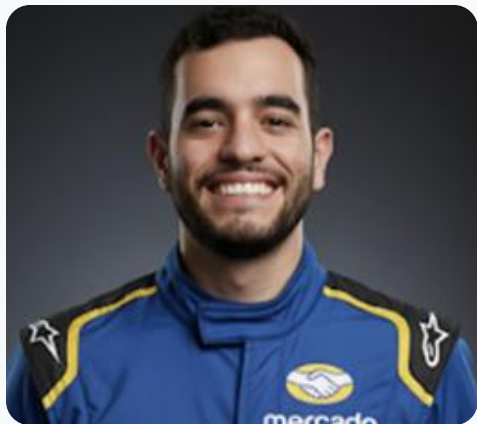
- AnyLogic
- Modeling
- Use cases
- Deployment to end users

04. Results & Next Steps

- Results
- Future
- Q&A



Speakers



Gabriel Gnemmi

Regional Capacity & Labor Planning
Manager



Luiz Vieira

Software Technical Leader in
Shipping Operations Research



Taís Diniz

Data Science Engineer in Shipping
Operations Research



About Mercado Libre

A connected technology ecosystem that brings commerce, logistics, financial services and advertising together across Latin America.

A regional technology platform

Founded in 1999, Mercado Libre operates in 18 countries and develops digital infrastructure for commerce and financial services. Its solutions help individuals and businesses buy, sell, advertise, ship, collect, save, pay and access credit ,online and offline.

Rather than operating as a single marketplace, the company connects complementary capabilities around one experience. More engagement in one part of the ecosystem strengthens the others.

Democratize access to commerce and financial services in Latin America.

HOW THE ECOSYSTEM WORKS



Commerce

Marketplace and retail technology for buyers, sellers and brands.



Mercado Pago

Accounts, payments, acquiring, credit, savings and insurance.



Logistics

Fulfillment, transportation and delivery of physical orders.



Advertising

Media and data solutions for sellers and brands.

PUBLIC SCALE AT A GLANCE

The ecosystem serves a large, highly connected base of consumers and businesses.

**18**

Countries

Operations across Latin America.

**131M**

Unique buyers

Last twelve months as of Q2'26.

**2.9B**

Items delivered

Last twelve months as of Q2'26.

**88M**

Fintech MAUs

Monthly active users as of Q2'26.



WHY THE INTEGRATED MODEL MATTERS

Commerce creates demand; logistics builds trust; payments reduce friction; advertising improves relevance. Together, these capabilities reinforce engagement and scale.



mercado
libre

Problem we solve





Geographic Scope



300+

Service Centers

A highly complex and strategically distributed capillary network to ensure maximum efficiency for regional deliveries.

90+

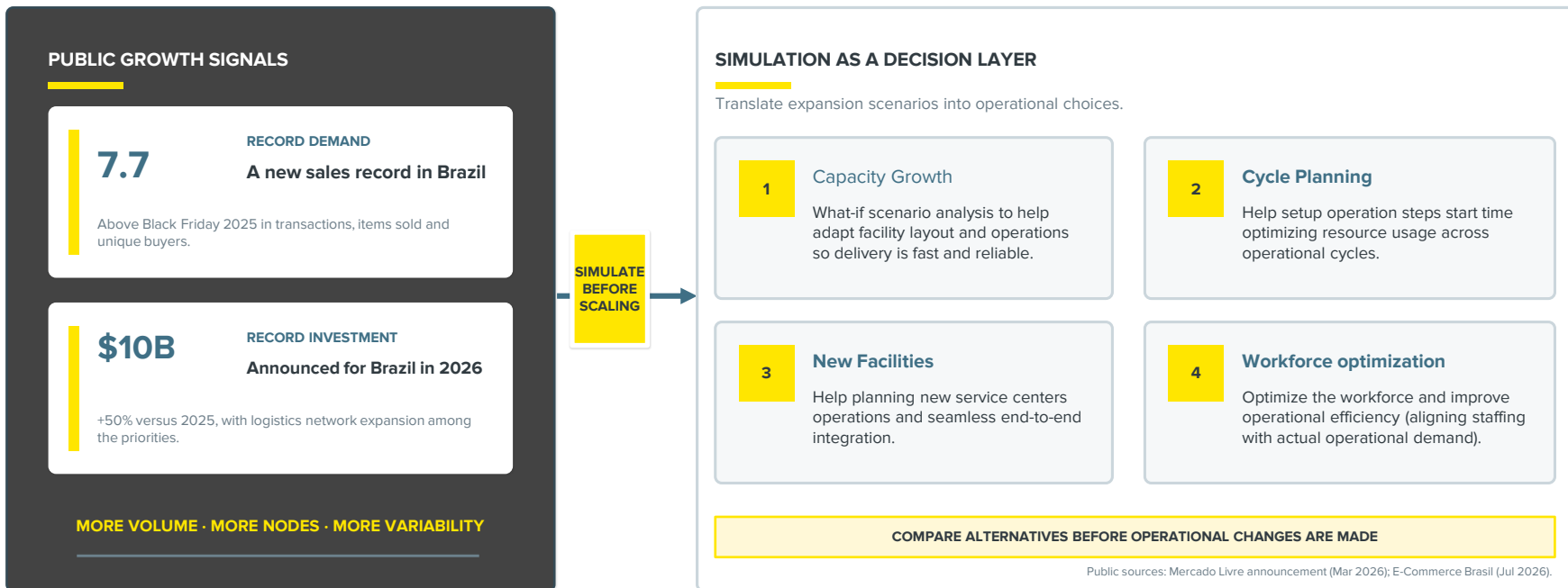
Items Delivered **per Second**

Massive volume of items processed and distributed with precision and end-to-end control across the logistics network.



Scaling Ahead: From Growth to Operational Readiness

Growth signals raise the value of testing operational choices before implementation



Use scenarios to reveal trade-offs and prioritize the configuration that best supports growth



The Growth Is Already Committed

Announced for Brazil in 2026 alone, and the operation absorbs all of it without losing the clock

PUBLIC GROWTH SIGNAL



An increase in sales volume is projected for the coming years

New logistics jobs in Brazil

The planning problem compounds ahead of the network, not with it.

WHAT GROWTH CHANGES

01



A larger network

More capacity creates more operating contexts and more combinations to coordinate.

02



More configurations

Sites, cycles, schedules, demand profiles and resources do not scale in the same way.

03



More decisions

Trade-offs must be evaluated before resources and operating plans are committed.



Simulation turns growth into testable decisions

Compare alternatives before implementation — without exposing internal plans or committing real resources.

Capacity

Cycles

Schedules

Staffing



Why This Became a Simulation Problem

Planning choices multiply faster than sites—and must be made before demand arrives

THE PLANNING SPACE MULTIPLIES

Each factor compounds the next

SITES

×

CYCLES
PER DAY

×

OPERATING
DAYS

×

SHIFT
PATTERNS

×

ROUTE &
VEHICLE MIX

×

VOLUME
SCENARIOS

Each combination becomes a different operating configuration to test—before demand arrives.

01



Design before history exists

Layout and staffing must be configured before a new site has its own operational baseline.

PHYSICAL CAPACITY DECISIONS

02



Schedules move with the day

Start times and staffing change with daily demand.

CYCLE-LEVEL DECISIONS

03



Decisions interact across the network

A change at one node can reshape neighboring inbound profiles. Isolated spreadsheets cannot reproduce that feedback.

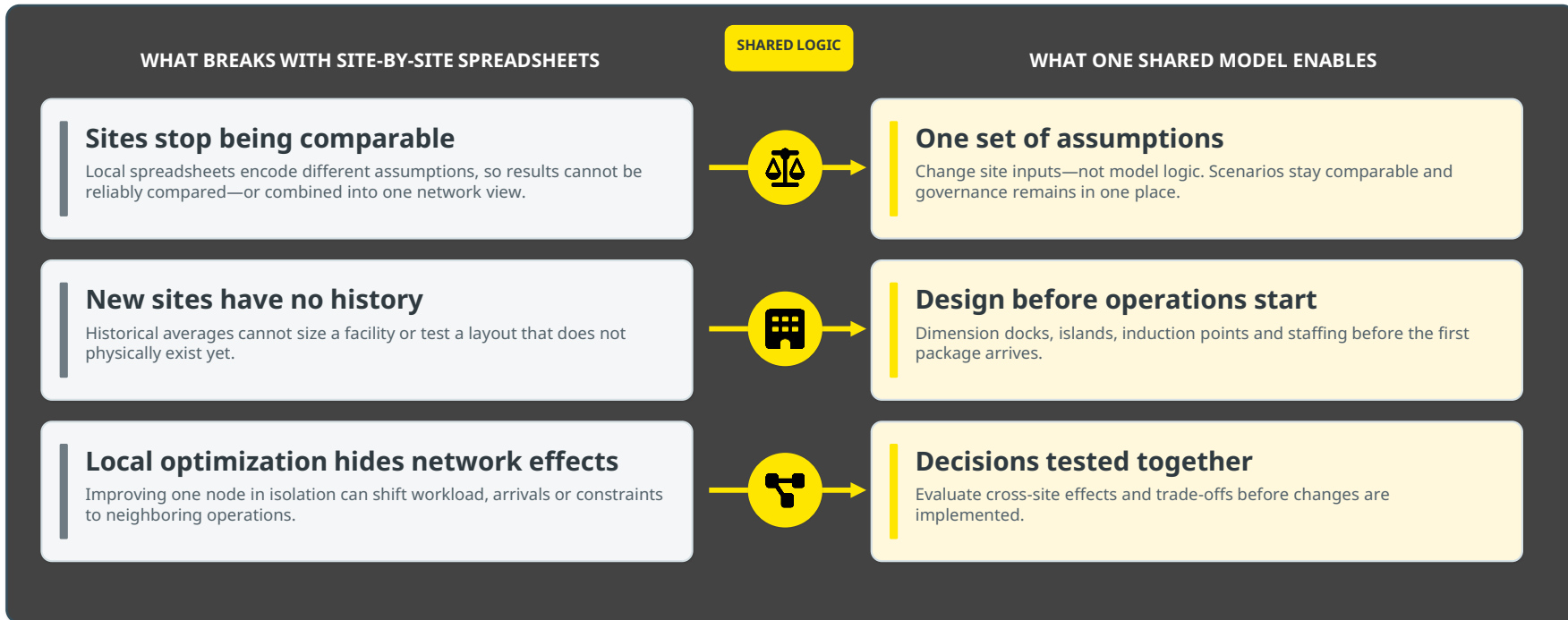
SYSTEM-LEVEL EFFECTS

A spreadsheet describes one plan. Simulation reveals how many plans behave, interact and scale



Why One Tool, Not One Spreadsheet per Site

Different sites need different inputs—not different decision logic



ONE MODEL, MANY OPERATING REALITIES. Standardize the decision logic—not the operation.

How we did

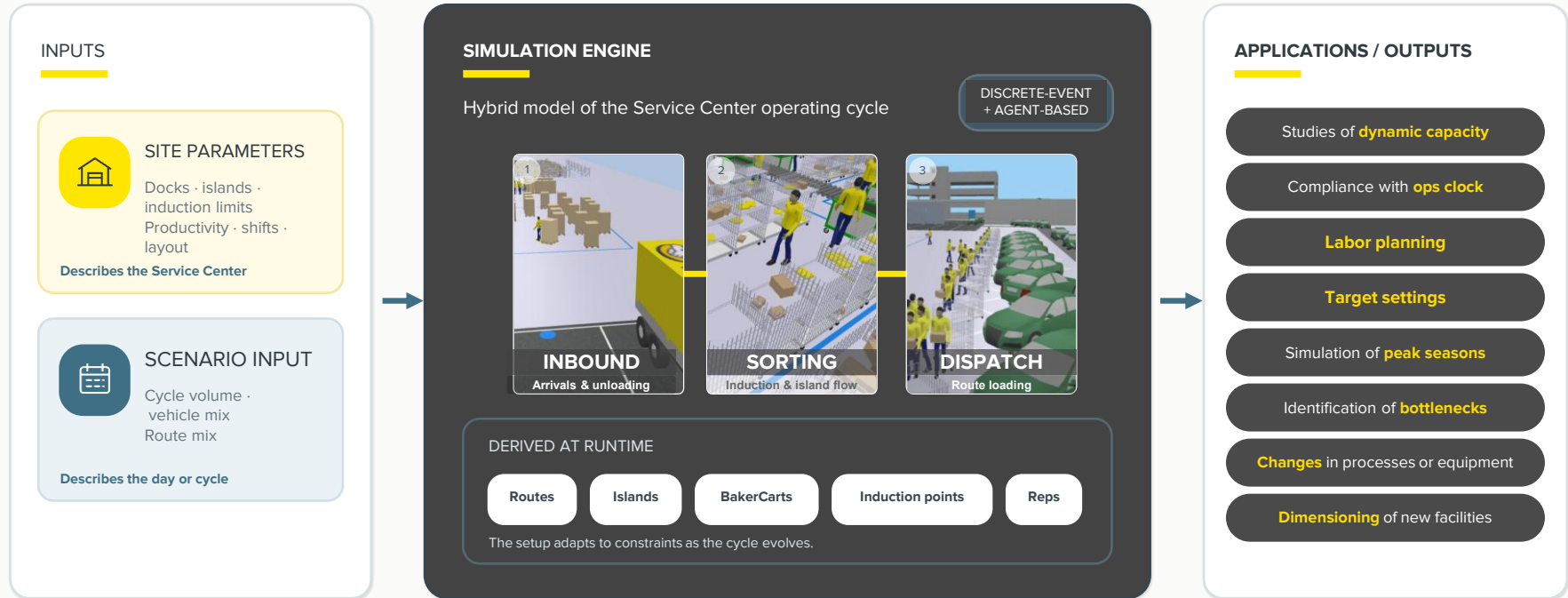


mercado
libre



What the Model Represents

How site constraints and daily demand become an executable operating cycle



SITE CONSTRAINTS

+

DAILY DEMAND



EXECUTABLE OPERATING SCENARIO

with measurable staffing, timing, utilization and bottlenecks



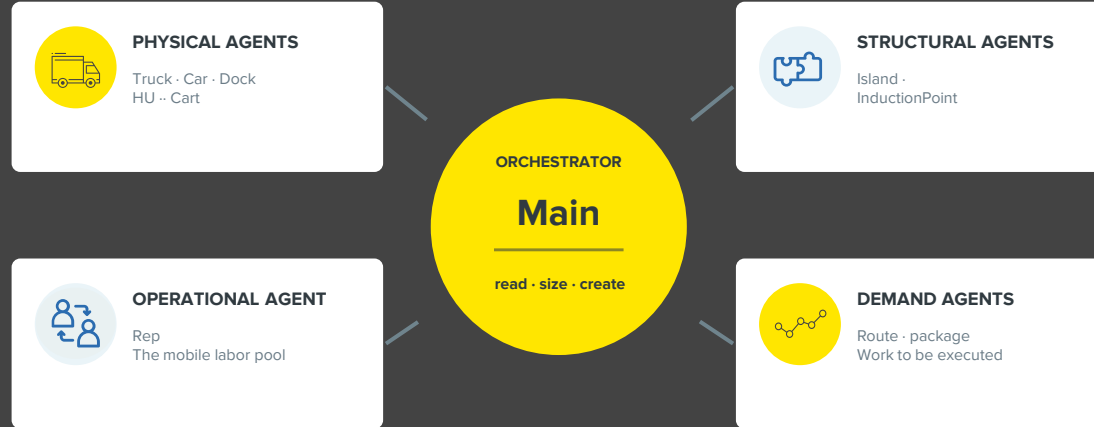
An Agent Society, Not a Fixed Flowchart

The model assembles interacting populations from data at the start of every cycle

AGENT SOCIETY

Interacting populations coordinated by Main

NO SINGLE FIXED FLOW



CYCLE INITIALIZATION

At the beginning of every cycle, Main:

01



READS INPUTS

Site parameters + cycle scenario

02



CREATES & SIZES

The populations required for that cycle

03



ORCHESTRATES

Interactions across inbound, sorting and dispatch

STRUCTURE GROWS FROM DATA

No site-specific flowchart has to be redrawn.

One model adapts to many sites because the required structure is generated from data



Inbound: A Continuous, Overlapping Flow

Truck arrivals, dock constraints and Rep availability shape how quickly HUs reach sorting

INBOUND TIMELINE



ARRIVAL & QUEUE

Configured line-haul profile



DOCK OCCUPIED

Capacity controls concurrency



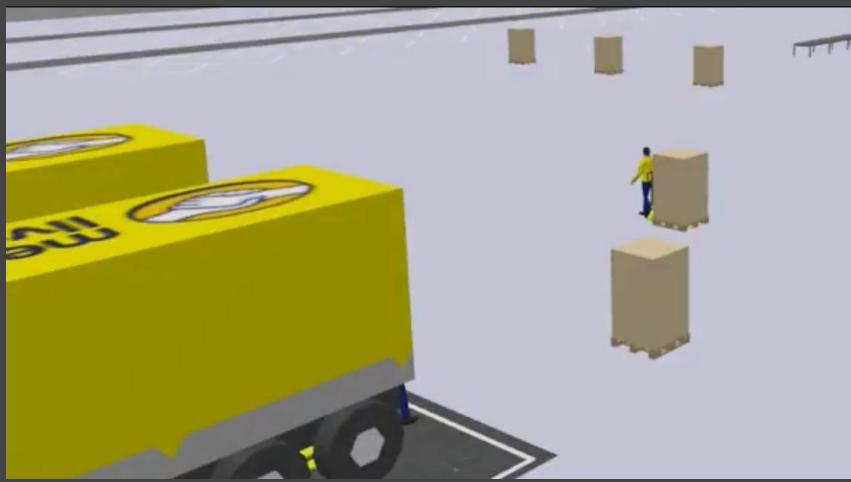
UNIT-BY-UNIT UNLOAD

Rep agents remove each HU



STAGING & INDUCTION

First HUs move toward sorting



Simulation-generated visuals using synthetic data. No real facility or operational configuration is represented

WHAT CONTROLS INBOUND

The same process adapts to every site and cycle.



ARRIVAL PROFILE

When line-haul trucks reach the site



DOCK CAPACITY

How many trucks can unload at once



REPS PER TRUCK

Maximum concurrent unloaders



NO FULL-TRUCK BARRIER

Available HUs can leave immediately.

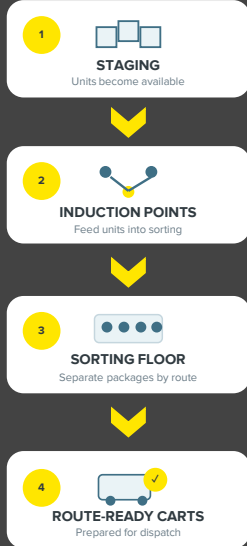
Unloading, movement and sorting overlap, one phase does not have to finish before the next starts



Sorting: An Adaptive Setup for Every Cycle

The route mix defines the layout; the layout defines the labor needed to sort the volume

PACKAGE JOURNEY



Simulation-generated visuals using synthetic data. No real facility or operational configuration is represented

TWO SETUP DECISIONS BEFORE SORTING STARTS

1 LAYOUT SETUP

What structure is needed for this cycle demand?

- 1 How many islands? 2 How many carts per island?

Generated for the cycle within the site limits.

2 STAFFING SETUP

What labor is needed to operate that structure?

- 1 Active induction points 2 Sorters per island

Induction is capped; sorter allocation follows the same capacity logic.

The same model sizes structure and labor for each cycle ,no fixed sorting flowchart



Dispatch: Dock Assignment, Loading & Release

Vehicle type, package quantity and profile determine loading time and dock availability

DISPATCH FLOW



ROUTE-READY CARTS

Sorted work awaits loading



VEHICLE QUEUE

Cars and trucks wait for service



DOCK ASSIGNED

Position rotates round-robin



LOAD & DEPART

Idle Reps load the vehicle

INBOUND IN REVERSE



Simulation-generated visuals using synthetic data. No real facility or operational configuration is represented

OPERATIONAL OUTPUTS

Each completed loading operation updates three decision metrics.



Dock utilization

Occupied versus available time



Loading time

By vehicle type and package profile



Dispatch completion

When the final vehicle departs

ONE COMPLETED LOAD → ONE DOCK RELEASED

The simulator converts each vehicle–dock interaction into capacity, timing and completion insights



What Actually Makes the Model Generic?

Volume, staffing, and layout can change cycle to cycle without changing the model

THREE VARIABLES, ALL DERIVED

NO MODEL EDITS

1



VOLUME

Shipment volume + vehicle and route-mix assumptions

DERIVED AT RUNTIME



ROUTES / CYCLE

Derived

2



STAFFING CALCULATION

Demand profile + planning horizon

DERIVED AT RUNTIME



HEADCOUNT

Staffing isn't fixed

3



PHYSICAL LAYOUT

Instantiated at runtime

DERIVED AT RUNTIME



DOCKS · ISLANDS · CARTS · INDUCTION

Sized and instantiated as runtime populations

Each cycle begins with inputs and constraints ,not fixed object counts.

ONE MODEL, MANY CONFIGURATIONS

The Presentation canvas stays generic; Java creates what each cycle needs.

SCENARIO + SITE INPUTS



JAVA
SIZING

compute → size → instantiate

ROUTES × n

REPS × n

LAYOUT × n



The model decides how many objects exist before the cycle starts.

Structure is computed in Java and instantiated at runtime ,not redrawn for every site



Why AnyLogic, and Java, Made This Possible

Java owns the decisions; AnyLogic provides the simulation framework and visualizes the result

ONE MODEL, CLEAR RESPONSIBILITIES

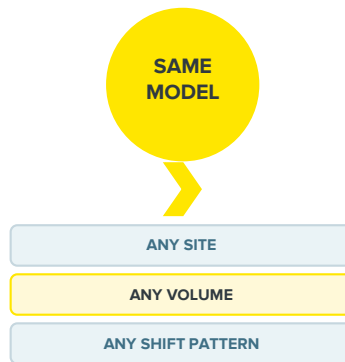
Plain Java decides what the model needs; AnyLogic executes it; the canvas shows the result.



Customize” means changing inputs ,not rebuilding the model.

THE PRACTICAL RESULT

One codebase, many operating realities.



One model, driven entirely by data, representing every service center we operate

Where we use



mercado
libre



One Model, Many Use Cases

The same simulation supports decisions from the next cycle to the next year.

PLAN THE WORKFORCE

01 Labor Planning

Headcount by day and cycle

02 Target Setting

Annual hiring targets and operating cost

03 Peak Seasons

Readiness for demand surges

DESIGN CAPACITY

01 Dynamic Capacity

Process limits, bottlenecks, and resource thresholds

02 Layout & Equipment

Islands, carts, induction points, and machinery

03 New Facilities

Site design and sizing before launch

RUN THE OPERATION

01 Ops Clock

On-time cycle completion and dispatch performance

02 Line-Haul Timing

Truck arrival schedules and downstream impact

03 Scenario Validation

Throughput and staffing for a new configuration

Different questions, same model, only the inputs change

How we scale





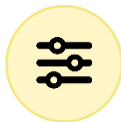
Deployment to end users

Simulation Suite allows to generate simulation scenarios and visualize the results

ONE END-TO-END WORKFLOW

Configure • Simulate • Compare

01



Scenario Interface

Define the operating assumptions to be tested.

- Time horizon, cycles and calendars
- Demand, vehicle and route assumptions
- Operational and cost parameters



02



Simulation Engine

Run the configured end-to-end operating cycle.

- Inbound → Sorting → Dispatch
- Resources, queues and operating rules
- Variability and selected replications



03



Results & Decisions

Explore outcomes and compare alternatives.

- Staffing, capacity and cycle time
- Utilization, bottlenecks and deferrals
- Side-by-side scenario comparison

A single workflow designed around the decisions operational users need to make.



Tool usage since January 2025

Simulation Suite allows to generate simulation scenarios and visualize the results

play_circl
e

5,584

simulator executions

schedule

2,055

cumulative runtime hours

Results





Early Results: Better Decisions, Faster

Aggregated pilot evidence from analyzed operating days ,presented without site volumes, cost values or rollout details

What changed in planning

The pilot moved the team from a static, manually rebuilt estimate to a repeatable scenario-based planning process.

01

One end-to-end view

Inbound, sorting and dispatch are evaluated on the same operating timeline.

02

Comparable scenarios

Capacity, cycles, schedules and staffing can change without rebuilding the analysis.

03

Earlier trade-offs

Teams see the operational effect of each configuration before implementation.

04

Reusable decision logic

Local parameters vary by site; the planning framework remains consistent.



Model accuracy

Observed in the analyzed pilot sample.

Compared with manual baseline



Modeled headcount

Potential reduction in evaluated configurations.

While preserving the planning objective



Faster analysis

More scenarios can be compared before a decision.

Turnaround improved



Planning accuracy

Aggregated result from the pilot validation.

Calculated excluding Sundays

Less time preparing calculations. More time discussing the best operating configuration



QA

Shipping Operations Research

Statistics and Simulation Team



Thank You!

Mercado Libre