MASTERING INTERMODAL TRANSPORT NETWORKS: LESSONS LEARNED AND STRATEGIES FOR OPTIMIZATION

[ALICE] Strategies and tools for sustainable and resilient intermodal transport networks webinar – 4/Jul/2024

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Postal
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Road Freight

✓ FLEET
- Fleet planning
- Route optimization
- Maintenance

✓ CREW
- Resource plan, shifts, roster, vacations
- Process-Task scheduling, skills & preferences
- Labor regulations

✓ FACILITIES & ASSETS
- Optimize processing throughput
- Schedule resource, assets & areas
- Design, Test, Simulate
- Ergonomics study

Rail Freight	Sea Freight & Intermodal	Road Freight & Logistics Service Providers	Air Cargo	Postal & Express
				
				
				
Rail Yard & Terminal	Port & Terminals	Warehousing, X-Dock	Air cargo hub	Sorting facilities

✓ SERVICE PLAN
- Service level & Price
- Demand Plan / Forecast
- Service/Vendor Network

- ✓ Cost control
- ✓ Customer Care & visibility
- ✓ Emissions targets & Reporting
- ✓ Safety
- ✓ Collaboration, Ideation, Innovation

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TO THE NEXT LEVEL

Intermodal bulk logistics (Road, Rail, Sea)

Trucks,
Trailers,
Chassis,
Containers

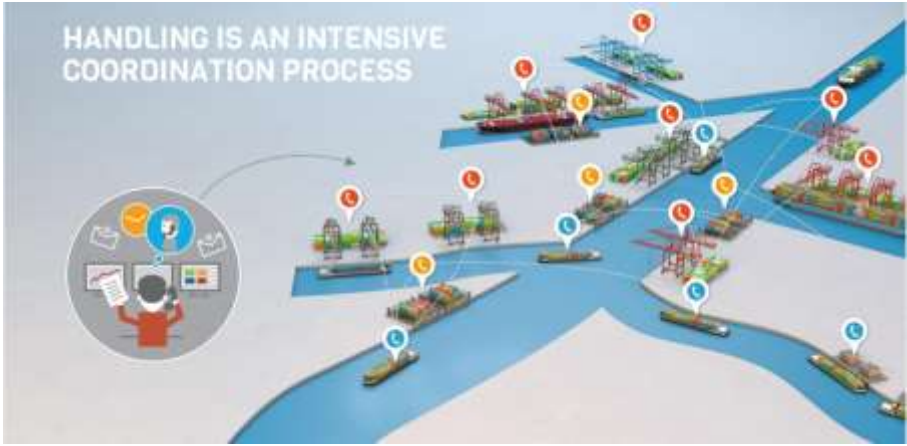
Challenge

- Route planning: allocation of containers on trailers and trucks/drivers
- Container planning: allocation of orders to containers, and allocation of containers to intermodal transport
- Assigning the right equipment (trailer, containers) to customer orders, taking into account customer (equipment) requirements
- The application includes specific rules for bulk logistics, such as resource availability, cargo type characteristics, product type characteristics, cleaning, and contamination rules

Insight into sustainability

These days, customer conversations are more and more about sustainability and reducing carbon footprints. "Everyone instinctively wants the most sustainable solution, but only if it is also the most cost-effective. We carefully map the possibilities and alternatives, so that our client gets a good picture of the total playing field. Costs, time, emissions, performance: by accurately predicting all elements in advance, our customers can make an informed choice", Franssen concludes.

INLAND CONTAINER SHIPPING – KEY FOR ROTTERDAM HINTERLAND

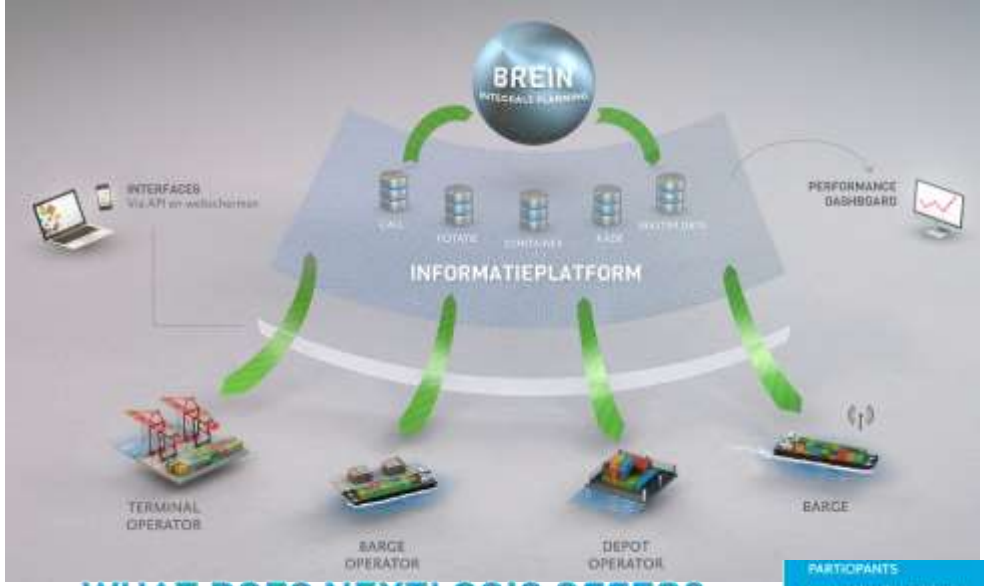


NEXTLOGIC

CURRENT SITUATION IS SUB-OPTIMAL

- Sea port terminals
- Empty depots
- Barge operators/inland terminals

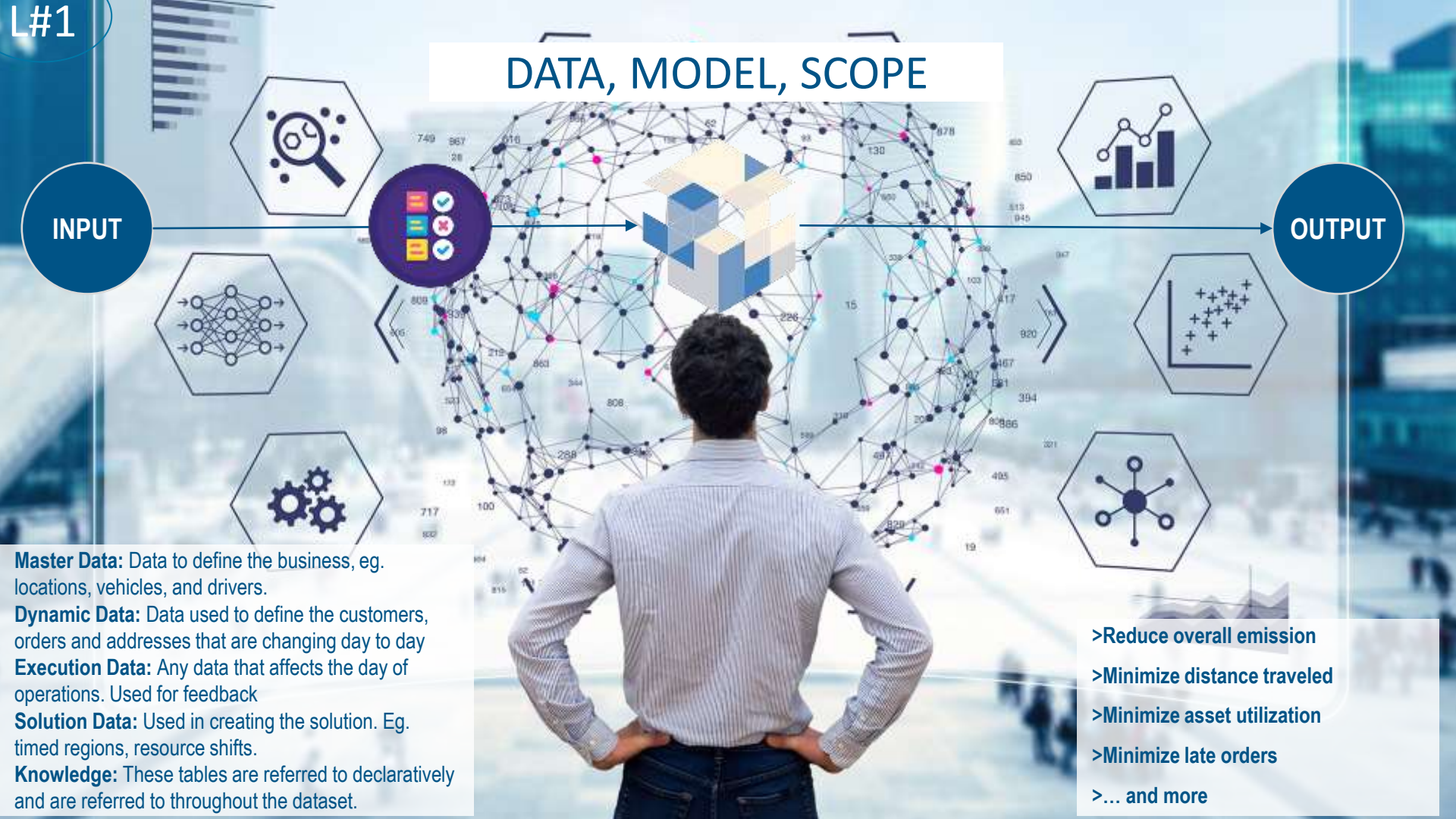
DASSAULT SYSTEMES



PORT OF ROTTERDAM / NEXTLOGIC

L#1

DATA, MODEL, SCOPE



Master Data: Data to define the business, eg. locations, vehicles, and drivers.
Dynamic Data: Data used to define the customers, orders and addresses that are changing day to day
Execution Data: Any data that affects the day of operations. Used for feedback
Solution Data: Used in creating the solution. Eg. timed regions, resource shifts.
Knowledge: These tables are referred to declaratively and are referred to throughout the dataset.

>Reduce overall emission
>Minimize distance traveled
>Minimize asset utilization
>Minimize late orders
>… and more

FOCUS ON THE RIGHT KPIS & CONSTRAINTS DEF.

$$\begin{aligned}&\text{Maximize} && P = p_1x_1 + p_2x_2 + \cdots + p_kx_k\\ &\text{Subject to:} && a_{11}x_1 + a_{12}x_2 + \cdots + a_{1k}x_k \le q_1\\ & && a_{21}x_1 + a_{22}x_2 + \cdots + a_{2k}x_k \le q_2\\ & && \vdots\\ & && a_{n1}x_1 + a_{n2}x_2 + \cdots + a_{nk}x_k \le q_n\\ & && x_1, x_2, \cdots x_k \ge 0\end{aligned}$$

Key Business Goals → KPIs

Costs & efficiency

- Reduce costs with efficient inventory and logistics routes
- Optimize resources, minimize transportation costs and cut inventory levels

Customer service

- Optimally match customer demands and capacity availability to increase service delivery capabilities

Safety

- Match employee skills to qualification requirements
- Ensure compliance with driver rules/regulations
- Provide solution for safe, secure and compliant transport of goods

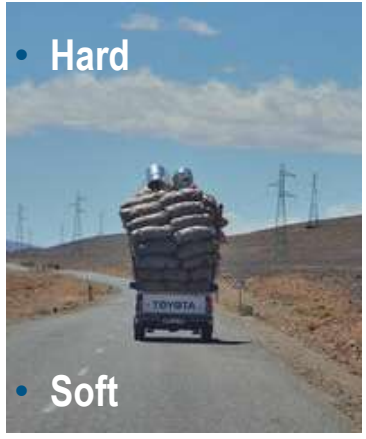
Asset utilization

- Inventory optimization resulting in reduced working capital and improved service times
- Site and fleet management
- Align resources to meet critical business performance targets

Sustainable operations

- Reduce negative impact of greenhouse gas emissions
- Reduce carbon tax if applicable
- Carbon footprint monitoring and reporting
- End-to-end transparency of emissions

And Constraints…



PLANNING MODELS & OPTIMIZATION REQUIRES TUNING

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Avoid:

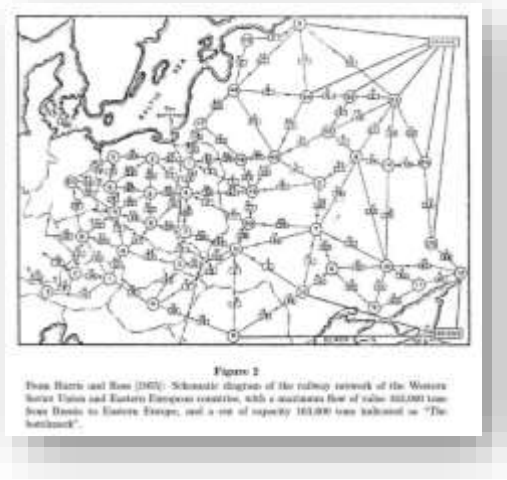
- Wrong KPI
- Insufficient Detail
- Not accurate
- Ignored

Example	Result
Constraint is ignored	Plan is not executable
Approximate KPI definition	Optimize the wrong KPI
Degrees of freedom are ignored	Money is left on the table
Wrong KPI	Model does not bring value
And more	

S#1?

ONE SOLUTION TO SOLVE EVERYTHING?…

- Evaluate inter-relation of the network model. What are interdependencies?
- Propagation effects in large networks is a real headache if not decoupling puzzles
  - What if a train is late? What happens to the schedule in a single track infrastructure?
  - What if a truck is late? With a load to a cross dock where other truck collects?
  - What if a plane is late? And misses their slot?



S#2?

OPERATIONAL HORIZONS

DESIGN, MODEL, SIMULATE	PLAN	SCHEDULE, OPERATE	EXPERIENCE, VALUE	ADVOCATE
Long term: Strategic	Mid term: Tactical/Seasonal	Pre-Operational	Ops	Post Op
INVESTMENTS	CAPACITY ALLOCATION	OPERATIONAL PLANNING	EXECUTION	REPORTING & EVALUATION
				
1 – 10 years	2 weeks – 12 months	7 days – Hrs.	Now - Execution	History
• What would happen if…? - We open a new Hub, consider more order volume, more resources, different cost structure, different employee contracts, etc. And how to optimally solve it.	• Considering a forecast, what could we do with what we have today? Can we plan for the right capacity, at the right place and time? and what if we get additional temporary capacity?	• How will we process these customer orders? What we will do with what we have • Plan each customer order to an optimal route • Who is doing what and where?	• How are we doing now? • What to do with this unexpected disruption? What are the alternative courses of action? • Will we be there on time?	• How did we perform? • Daily, weekly, monthly, YTD KPI • How is our trend? • Wil we meet our targets?

We usually start around Here

DASSAULT SYSTEMES

S#2?

THINKING STRATEGICALLY FIRST?

How a Network Virtual Twin helps

Have the capacity to:

- Integrate data from different sources in context.
- Model locations, facilities, costs, performance, and more
- Simulate volume flows, disruptions, changes in policy, adoption or changes in technology or infrastructure, ...
- Run scenarios (closing / delays at a hub, opening a new hub, increasing capacity, ...)
- Test virtually technology and run simulations

In Order to:

- Assess impact in the environment
- Better prepare for future scenarios and gain resilience
- Validate capacity assumptions, identify potential bottlenecks and make more sound decisions on CAPEX investments
- Anticipate and mitigate impact on processing performance, changes of policy, etc.
- Validate business case for adoption/changes of technology and infrastructure

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