

TECHNICAL PERSPECTIVE 001 / LOGISTICS DECISION MEASUREMENT

How do you measure logistics behavior? And do you trust it?

A deterministic method for materializing every provably valid option for every row, ranking each option across N declared decision poles, and locating the factual decision inside the resulting counterfactual field.

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ABSTRACT

Logistics outcomes do not identify decision behavior. Behavior becomes computable only after every provably valid option is materialized for each row, ranked across declared decision poles, and compared with the factual choice. This paper defines the row-level Decision Space, multi-pole rank field, factual behavior vector, population fingerprint, and trust conditions required to assess a logistics network without turning an outcome metric into a behavioral verdict.

KEYWORDS / DECISION BEHAVIOR / DECISION SPACE / DENSE RANK / COUNTERFACTUAL ANALYSIS

01 / THE ASSESSMENT PROBLEM

Outcomes do not identify behavior

Logistics measures outcomes with precision. It does not follow that logistics measures the behavior of the decisions that produced them.

Spend, cost per shipment, cost per unit, service, utilization, transit, claims, and carrier mix describe the realized network. Executives need those measures. The error begins when an outcome is asked to establish whether the network chose well.

$$\text{CPU}(G) = \frac{\sum_{r \in G} \text{Spend}_r}{\sum_{r \in G} \text{Units}_r} \quad (1)$$

Equation 1. A correct realized ratio that does not preserve the alternatives surrounding each factual choice.

The ratio is not defective. It is incomplete for a behavioral claim. It collapses the freight entering the network, the economics attached to that freight, the valid options, and the selections made inside those options into one realized scalar.

PROPOSITION 1

An observed network outcome does not uniquely identify the decision behavior that produced it.

$$\exists G_1, G_2 : Y(G_1) = Y(G_2) \wedge B(G_1) \neq B(G_2)$$

Two populations can report the same cost per unit while selecting materially different options. Two periods can report different cost per unit while selecting at nearly the same position inside their available choices. A cheaper network can choose worse. A more expensive network can choose better. A flat line can conceal material drift.

Outcome movement is evidence that the realized network changed. It is not, by itself, evidence that decision behavior improved or deteriorated.

02 / THE DECISION FIELD

Every valid option. Every row.

A decision is defined by the factual option and the complete set of valid options that surrounded it. Anything less is a partial account of the decision.

Let an exact analytical population contain rows r . Each row carries its own lane, contract applicability, time, physical facts, service requirements, governed Postoverlay economics, and available Intelligence evidence. Validity is local to that row's governing facts.

$$D_r = \{ o \mid \text{Valid}(o,r) = 1 \} \quad (2)$$

Equation 2. The Decision Space is the complete option population Raindex can prove for row r from one governed source world.

$$f_r \in D_r \quad (3)$$

Equation 3. The factual choice and every counterfactual choice belong to the same provable option field.

Every valid option does not mean every imaginable carrier, service, or rate. It means every option that can be proven for the row. No invented carrier. No fabricated contract. No synthetic rate. No option admitted because it makes an optimization look better.

Completeness is not an aesthetic preference. Omit one valid option and the rank ordering can change. Omit a class of valid options and the network can appear to choose well only because the comparison field was artificially narrowed. The option field must be earned before behavior can be claimed.

FINDING 01

The row is the irreducible comparison grain. The network is the aggregate expression of those row-level decision fields.

03 / MULTI-POLE RANK

N poles, not one universal score

Materializing the option field is necessary. It is not sufficient. Every option must be ordered under every decision pole the assessment declares.

A Rank Basis defines one pole of optimality: base economics, Postoverlay landed cost, a named Intelligence measure, an Intelligence composite where valid, or the Raindex composite. Different poles answer different questions. Rank 1 under landed cost is not Rank 1 under transit performance, and neither is universally best outside its basis.

$$B = \{ b_1, b_2, \dots, b_N \} \quad (4)$$

Equation 4. The assessment declares N explicit Rank Bases instead of compressing every objective into one unexplained score.

For option o in row r , dense rank under pole b is written $\rho_b(o \mid D_r)$. Equal values receive equal ranks; the next distinct value receives the next rank. Ties remain visible because they describe the topology of the valid field.

OPTION	STATE	BASE	POSTOVERLAY	TRANSIT	RELIABILITY
Option A	Factual	R2	R1	R3	R2
Option B	Counterfactual	R1	R3	R2	R1
Option C	Counterfactual	R2	R2	R1	R3
Option D	Counterfactual	R3	R4	R3	R2

Figure 1. Illustrative rank field, not customer data. The factual option is located across four poles; no column defines universal quality.

$$C_r = \{ [\rho_{b1}(o), \dots, \rho_{bN}(o)] : o \in D_r \} \quad (5)$$

Equation 5. Every valid option receives a coordinate across all N declared poles.

04 / THE COMPUTATION

Locate the factual choice inside the field

The method is deterministic because the objects and operations are explicit. It does not infer choice quality from a trend line.

$$R_r = [\rho_{b1}(f_r), \dots, \rho_{bN}(f_r)] \quad (6)$$

Equation 6. The factual behavior vector locates the factual option across every declared pole.

DEFINITION 01

Computational behavior is the factual choice's position inside the complete, multi-pole counterfactual field.

ALGORITHM 1 ROW-TO-NETWORK BEHAVIOR COMPUTATION

```

INPUT exact row population U, declared poles B

for each row r in U:
  D_r <- materialize_every_provably_valid_option(r)
  assert factual_option(r) in D_r

  for each pole b in B:
    dense_rank every option o in D_r under b
    record factual rank rho_b(f_r | D_r)
    record field depth max_o rho_b(o | D_r)

  R_r <- factual rank vector across all poles

OUTPUT exact-population behavior fingerprint Phi(U)

```

The computation fails closed when option validity, factual membership, pole direction, or required evidence cannot be proven.

The computation fails closed. If option validity, factual membership, a pole's direction, or required evidence cannot be proven, the field is incomplete and the behavioral claim is withheld.

This order matters: materialize first, rank second, locate the factual choice third, aggregate last. Reversing the order turns a complete decision problem back into an outcome proxy.

04A / POPULATION BEHAVIOR

The row resolves behavior. The population reveals it.

The row-level vector is the atomic behavioral object. It can be inspected alone or aggregated over any governed population without changing its definition.

The complete network, one mode, one carrier population, one geography, one context intersection, or one row all resolve from the same comparison contract. The query grain changes. The meaning of the measure does not.

$$\bar{\rho}_b(G) = \frac{\sum_{r \in G} w_r \rho_b(f_r | D_r)}{\sum_{r \in G} w_r} \quad (7)$$

Equation 7. Average Rank aggregates factual position under one explicit pole and weighting contract.

Average Rank is not sufficient without the field around it. A factual Average Rank of 2.2 inside an average field depth of 20 describes a different position from 2.2 inside a depth of 3. The factual rank tells us where the network chose. Counterfactual depth tells us what that position means.

$$\Phi(G) = \{ (\bar{\rho}_b(G), \bar{m}_b(G)) : b \in B \} \quad (8)$$

Equation 8. The population fingerprint preserves every pole and its field depth rather than manufacturing one universal behavior score.

An economic pole can also yield a basis-specific Counterfactual Floor when every row has complete, comparable economics. That floor is set-derived analytical evidence. It is not realized savings, a guarantee, or permission to introduce an option absent from the field.

ORDER OF PROOF

Every valid option -> every declared pole -> factual position -> row behavior vector -> exact-population fingerprint.

05 / OUTCOME NARRATIVES

Dip, plateau, spike

Outcome charts repeatedly invite three narratives: improvement, stability, and deterioration. None is a behavioral conclusion until the decision field is computed.

EVENT	OUTCOME	ECONOMIC RANK	SERVICE RANK	FIELD	INTERPRETATION
Dip	Improves	2.7 -> 4.8	3.0 -> 5.1	Stable	Outcome improved; behavior deteriorated.
Plateau	Nearly flat	3.0 -> 4.4	3.3 -> 4.7	Stable	Mix offset material behavioral drift.
Spike	Deteriorates	3.1 -> 1.7	3.5 -> 2.1	Broader	The world cost more; choices improved.

Figure 2. Illustrative patterns, not customer data. Outcome direction does not identify behavioral direction.

DIP	Cheaper does not prove better. A favorable mix can reduce cost while the factual choice moves backward across the same decision poles.
PLATEAU	Flat does not prove stable. Opposing movements can cancel inside the aggregate while row-level choice behavior drifts materially.
SPIKE	More expensive does not prove worse. The counterfactual field can become more expensive while the factual choice improves inside it.
COROLLARY 1	
The derivative of an outcome series does not identify the derivative of decision behavior.	
$\Delta Y_t \neq \Delta B_t$	

The dip, plateau, and spike are real observations. The false step is treating their visual direction as proof that the network chose better, stayed stable, or chose worse.

06 / TRUST

Earn the right to call the field real

The difficult part is not drawing a counterfactual chart. The difficult part is earning the right to call the counterfactual field real.

A behavior measure is trustworthy only when the source world, option population, ordering contract, and analytical identity are inspectable. A polished score does not repair an incomplete field.

01	Complete option materialization. Every provably valid option is present; missing options can change the rank field.
02	One governed source world. Factual and counterfactual options resolve from the same contracts, context, time, and evidence.
03	Stable option identity. Carrier, contract, matrix identity, economics, evidence, and lineage remain attached.
04	Explicit poles and direction. Every ordering names its Rank Basis and preferred direction.
05	Preserved ties. Dense rank keeps equal values equal; ties describe the topology of the field.
06	Exact population and version. The calculation never substitutes remembered or latest state.

07 Visible weighting and coverage. Weighting and missing evidence remain part of the result.

08 Fail-closed semantics. Unproved validity or comparability withholds the behavioral claim.

TRUST PREDICATE

Complete field AND factual membership AND explicit poles AND exact version AND preserved ties AND declared weighting AND visible coverage.

07 / EXECUTIVE READOUT

Assess the network one level deeper

The assessment changes when outcomes and decision behavior are treated as separate, equally inspectable objects.

OUTCOME	What happened? Observed cost, service, utilization, transit, claims, and mix.
DECISION FIELD	What was valid? Every option that can be proven for the exact row from governed source truth.
FACTUAL POSITION	What was selected? The factual option located under every declared decision pole.
BEHAVIOR	How did the network choose? The aggregate pattern of factual rank positions across an exact population.

The executive question is no longer only, What happened to cost? It becomes: What was possible for each row? Where did the factual choice sit across every relevant pole? Which populations changed position? Was the world harder, were the decisions worse, or did both move?

If an assessment cannot show the complete valid option field, the factual choice, the declared decision poles, and the exact population being compared, it is not measuring logistics behavior. It is interpreting outcomes.

An outcome is observed.
Decision behavior is computed.
Trust begins with the complete decision field.

METHOD APPENDIX

Notation, boundaries, and interpretation

The notation describes the analytical contract, not a claim that every logistics field or economic method is universally available.

G	Declared analytical population.
r	One scoped factual row in G.
D_r	Complete set of options provably valid for row r.
f_r	Factual option for row r; f _r must belong to D _r .
B	Set of N declared Rank Bases or decision poles.
p_b	Dense rank under Rank Basis b.
C_r	Complete multi-pole counterfactual rank field for row r.
R_r	Factual rank vector across every declared pole.
Φ(G)	Exact-population behavioral fingerprint.

METHOD BOUNDARY

A valid readout requires an exact population and version, a complete provable Decision Space, explicit Rank Bases and direction, preserved ties, declared weighting, and sufficient evidence coverage. Economic floors additionally require complete and comparable economics at the relevant grain and currency.

Probabilistic methods remain appropriate for uncertain phenomena such as future demand, capacity, weather, service risk, and arrival time. They may contribute governed evidence to a decision pole. They do not replace deterministic measurement of a factual choice against a choice set that can already be proven.

Counterfactual evidence is analytical evidence. It is not realized savings, a guarantee of future execution, or permission to synthesize options absent from the governed Decision Space.

FURTHER READING

Decision Space - how Raindex preserves valid choices and explicit Rank Bases.

Methodology - the deterministic method behind source, option, and outcome separation.

Product foundation - the decision foundation beneath the Raindex work surfaces.

Raindex Perspectives publishes reviewed technical points of view on logistics economics, decision infrastructure, and governed operations. Perspectives are explanatory publications, not product release notes or capability guarantees.