

Methodology for Determining the Optimal Location of Transport Logistics Centres

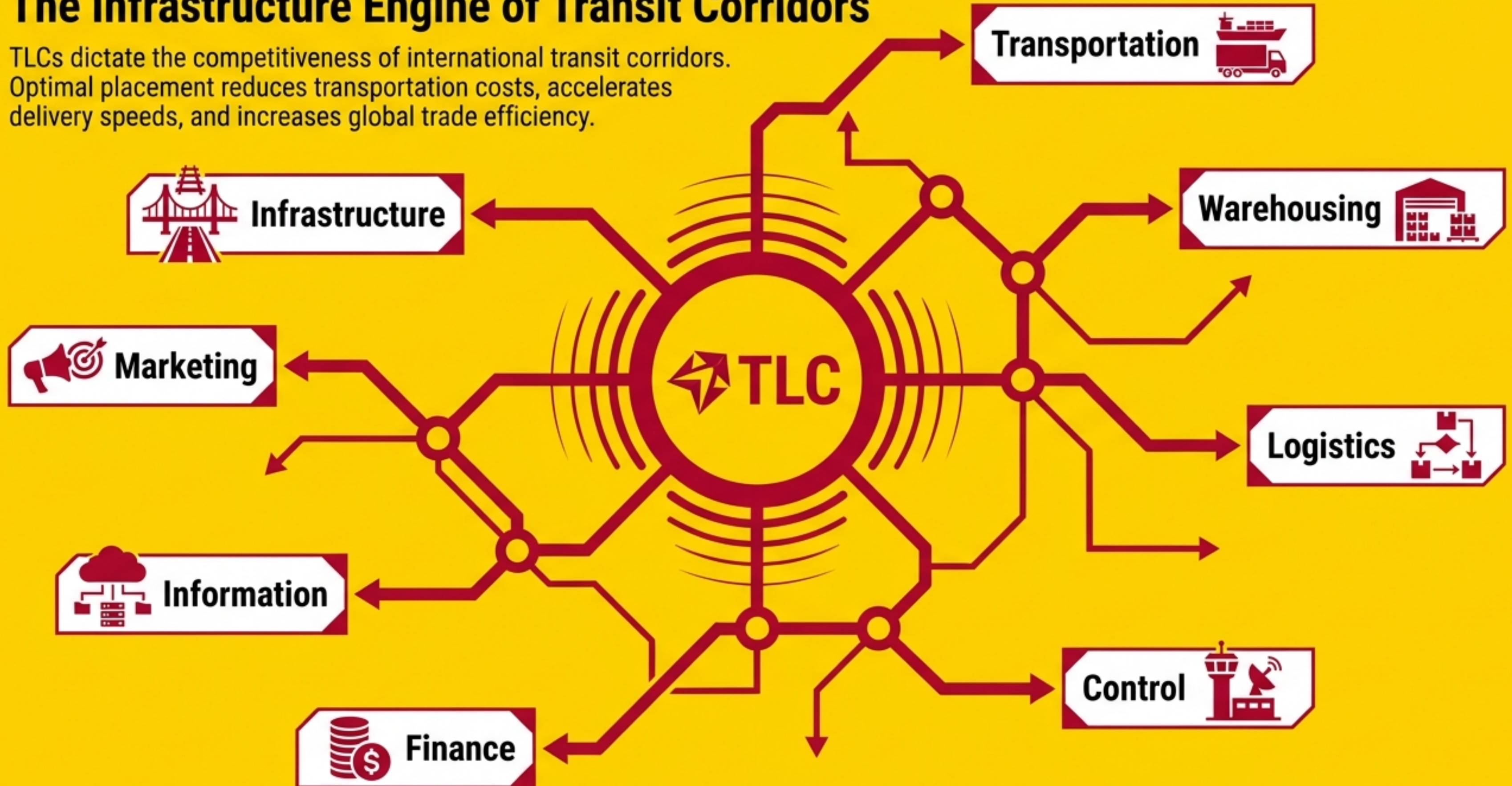
Sulkhan Khutsishvili, Mzia Kiknadze, Zurab Gasitashvili,
Taliko Zhvania, Lily Petriashvili

BRAIN. Broad Research in Artificial Intelligence and
Neuroscience (2025, Vol 16, Issue 3)



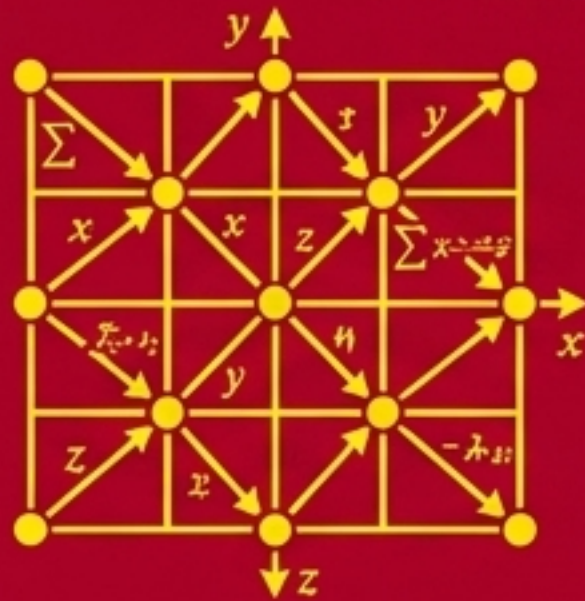
The Infrastructure Engine of Transit Corridors

TLCs dictate the competitiveness of international transit corridors. Optimal placement reduces transportation costs, accelerates delivery speeds, and increases global trade efficiency.



The Methodological Gap

Analytical Methods



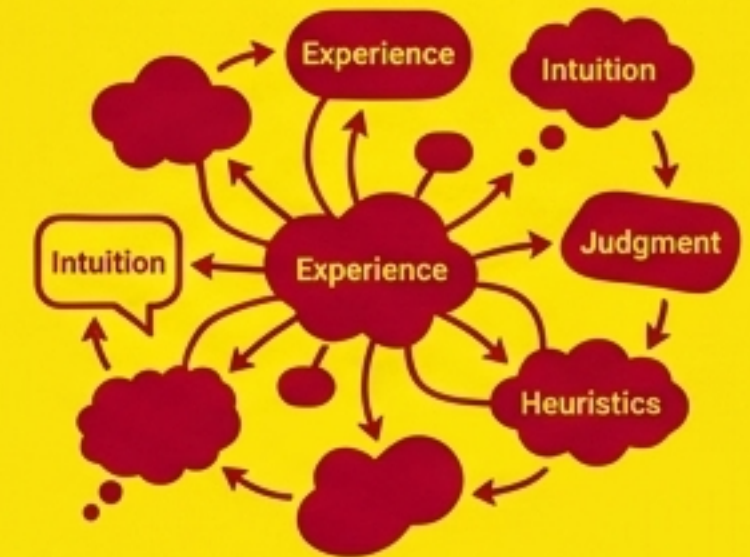
Examples: Center of Gravity, Mathematical Programming, Full Selection.

The Flaw: Overly rigid. Fails to capture complex, real-world qualitative nuances and unquantifiable operational factors.

Synthesis: A Multi-Criteria Expert System

Using fuzzy set theory to bridge qualitative human opinions and quantitative data.

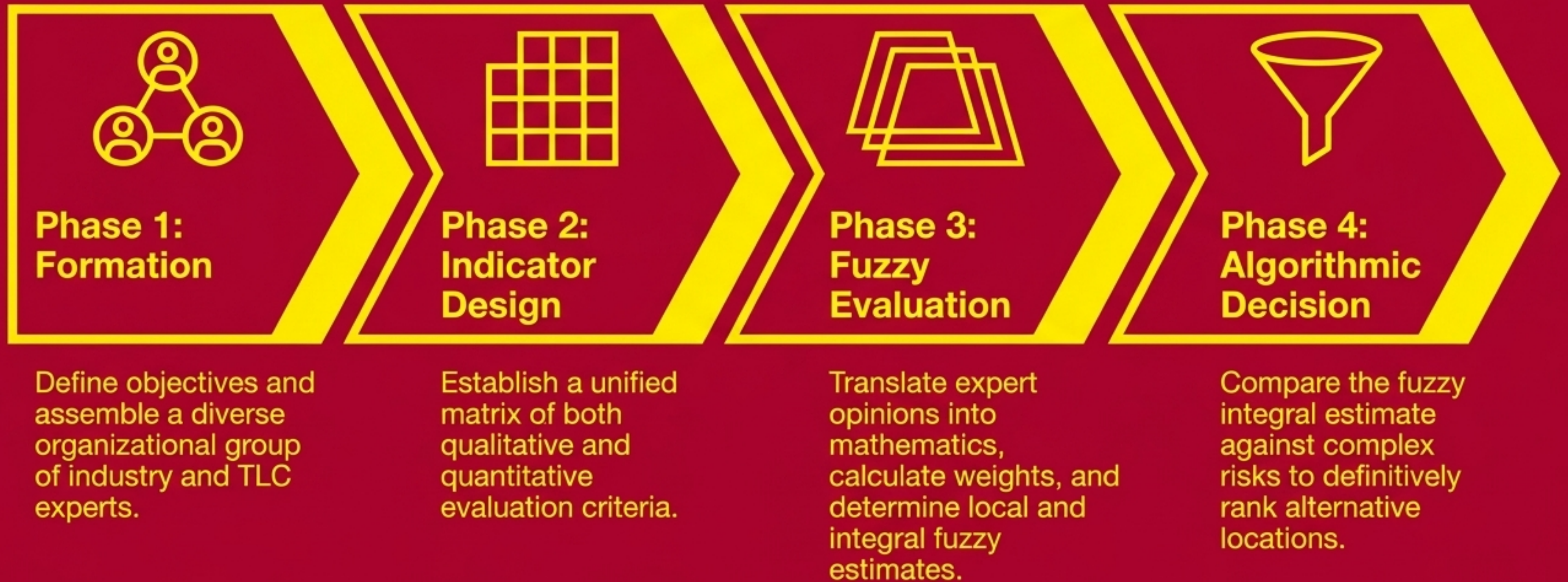
Expert Methods



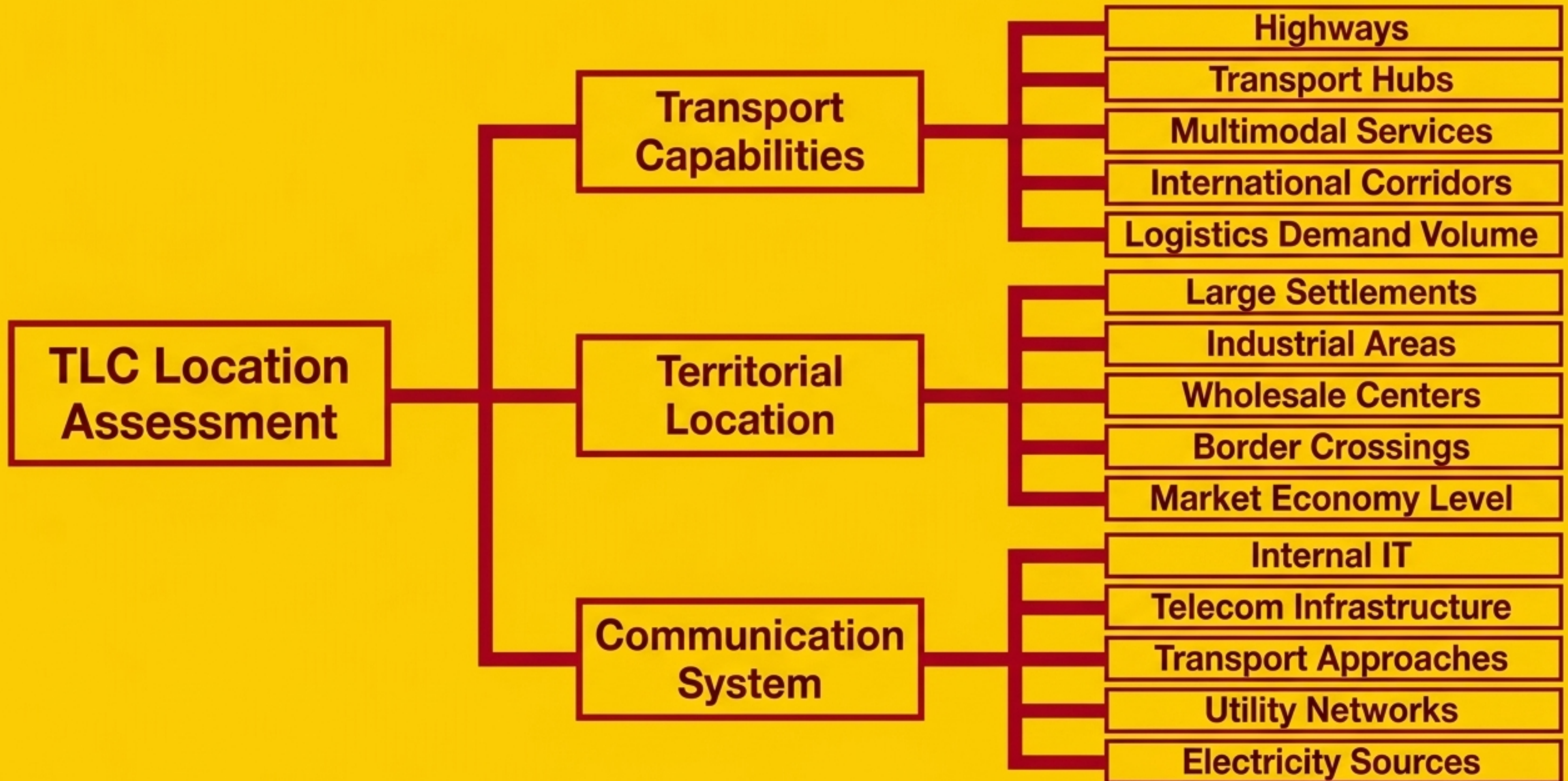
The Approach: Relies on human intuition and experience.

The Flaw: Subjective and notoriously difficult to mathematically formalize or verify.

The 4-Phase Location Assessment Architecture

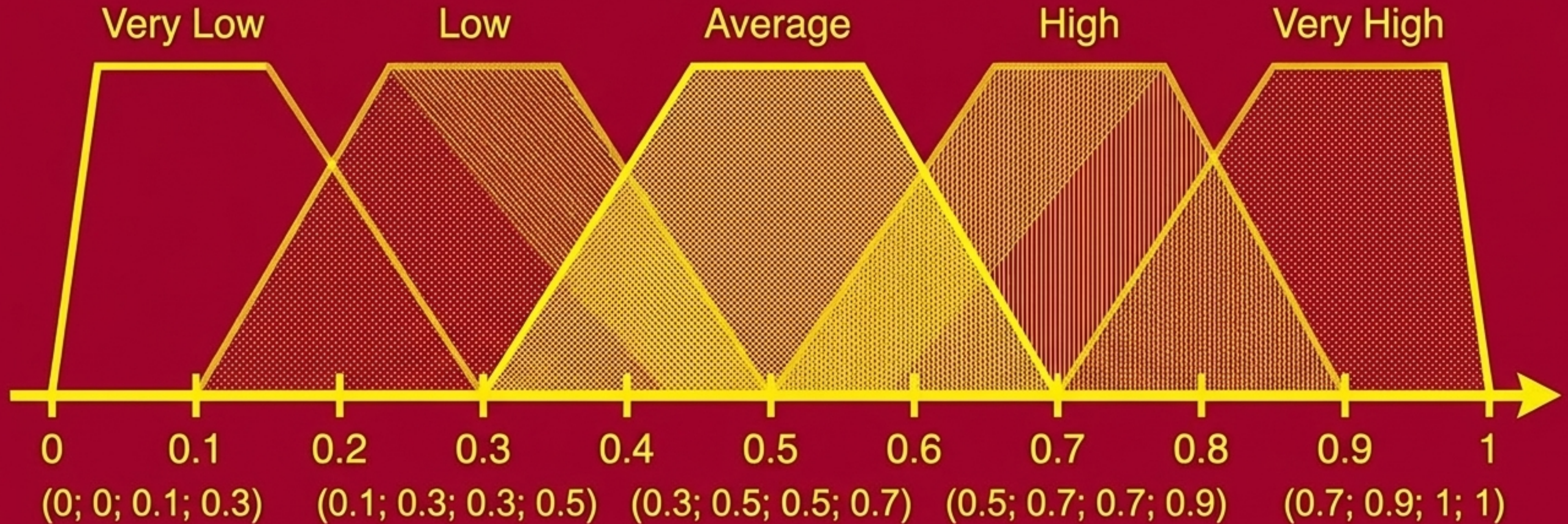


Structuring the Decision: The Indicator Taxonomy



Quantifying the Subjective: The Fuzzy Interval Scale

Linguistic assessments are translated into trapezoidal fuzzy numbers, allowing qualitative opinions to be processed mathematically.



The Normalization Engine

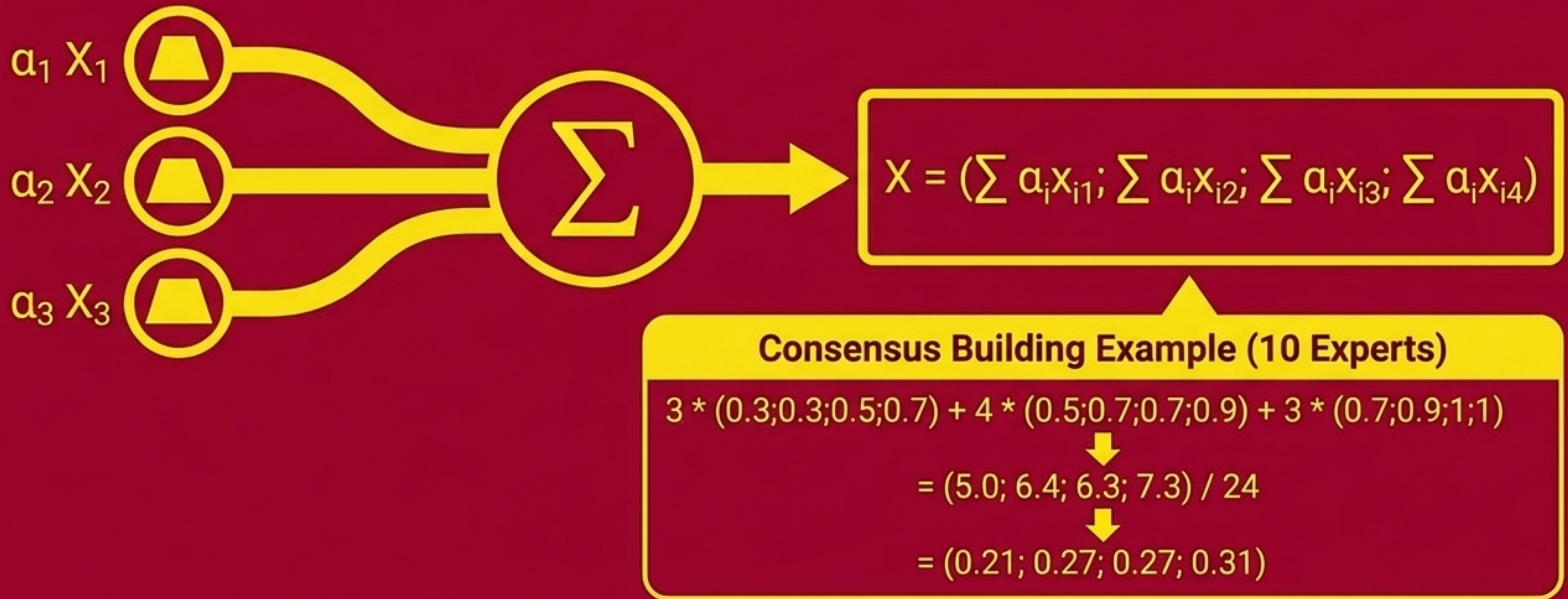
Quantitative indicators have vastly different dimensions.

To evaluate them alongside qualitative fuzzy numbers, they must be **converted** into **dimensionless quantities** within the (0,1) interval.



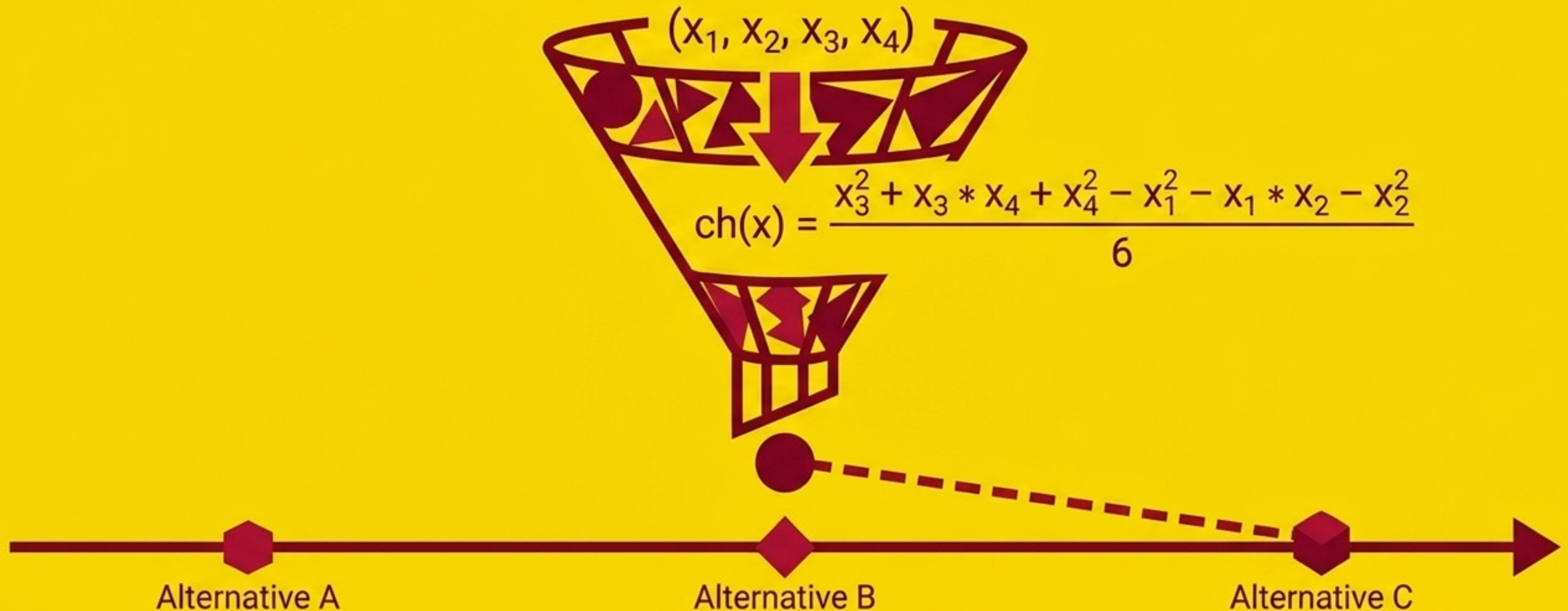
The Aggregation Algorithm

The algorithm mathematically bridges disparate expert assessments by applying priority weights (α) and calculating the arithmetic mean to forge a unified fuzzy coordinate.



Decisive Ranking: Chang's Method

To rank alternative TLC locations, the integral fuzzy number must be converted into a clear, actionable real number. A larger final number mathematically dictates a superior location.



Strategic Clarity & Resource Optimization

Objective Justification

Planners can mathematically defend location choices, completely independent of unverified human intuition.

Risk Mitigation

Ineffective alternatives are rejected at the earliest stage, preserving massive human and material resources.

Stakeholder Alignment

Harmonizes the complex, competing interests of state entities, logistics organizations, and consumers into a single optimized transit reality.

