

S u p p l y C h a i n R e s e a r c h · C o r n e r s t o n e R e f e r e n c e

Supply Chain

Network Design

What Is Network Design, and When Do You Need It?

Network design decides the structure a supply chain operates inside: how many sites, where they sit, what each one does, and how product flows between them. Planning and execution systems optimize within that structure. Neither can recover a structural disadvantage the design created.

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01 The short answer

Supply chain network design is the structural decision about how many facilities a company operates, where they are located, what role each one plays, how product flows between them, and where inventory is held. It is normally carried out as a modeling study rather than run as a continuous system, because the decisions involve capital, take years to implement, and are costly to reverse. Planning and execution systems then optimize within whatever structure the design produced, which is why a planning implementation cannot recover a cost or service disadvantage that the network itself created.

Years	3	0
the horizon a network decision commits you to	structural questions: how many, where, and what flows	credible public benchmarks for the savings a redesign delivers

Key takeaways

- **Network design is a study, not a system.** Most organizations model it periodically rather than running it continuously, and buy the capability as a project or a tool used by a small team.
- **It sets the ceiling on what planning can achieve.** A planning system optimizes flow through a fixed network; it does not ask whether the network is right.
- **The output is a comparison, not an answer.** Credible studies produce a ranked set of scenarios with the trade-offs made explicit, not a single optimal configuration.
- **The binding constraint is data, not mathematics.** The optimization is well understood in the academic literature; the cost-to-serve data most companies hold is not accurate enough to feed it.
- **Treat published savings claims with caution.** Figures such as fifteen percent lower cost and fifty percent less inventory circulate without attribution and originate with parties selling the software.

02 What is supply chain network design?

Network design answers three structural questions. How many facilities should exist, of what type and capacity. Where should each be located. And which products, customers, and volumes flow through each path connecting them. Sourcing footprint and inventory positioning are decided alongside these, because moving a facility changes which suppliers are economic and where stock should sit.

The underlying problem is a facility location problem, among the older and better studied areas of operations research. A review in the European Journal of Operational Research argues that location models must capture the other structural decisions around them to be useful for strategic supply chain planning, and later surveys extend the same problem class to reverse logistics, resilience, and omnichannel distribution.

Within the SCOR Digital Standard, network design sits in Orchestrate, the process that establishes structure, technology, and governance for everything else. That placement is the useful part: network design is not a step in the operating cycle, it is a decision about the shape of the cycle.

03 How is network design different from supply chain planning?

The distinction is between deciding the structure and deciding the flow through it. Planning takes the network as given and decides how much to make, buy, hold, and move. Network design questions the network itself. The two therefore require different data, different horizons, and usually different people, and are rarely served well by the same software.

Network design decides the structure that planning and execution then work inside



Figure 1. Each tier is bounded by the one above it. A planning system optimizes flow through a fixed network without questioning whether the network is correct, which is why network problems present as persistent planning frustration rather than as an obvious structural fault.

The signal is diagnostic. When a planning team repeatedly cannot meet a service target without carrying excess inventory, and successive planning improvements move the number only marginally, the constraint is often structural rather than tactical. No amount of forecast accuracy compensates for a distribution center in the wrong place.

	Network design	Planning	Execution
Decides	Structure: how many sites, where, what flows between them	Volume: how much to make, buy, hold, and move	Transactions: this order, this load, this pallet
Horizon	Multiple years	Weeks to months	Hours to days
Reversibility	Low. Capital committed, leases signed, sites staffed	Moderate. Revised each cycle	High. Corrected continuously
Typical cadence	Every three to five years, or on a trigger event	Monthly or weekly cycle	Continuous
Bought as	A study, or a modeling tool for a small team	A planning system used by a planning function	WMS, TMS, and other execution systems

Table 1. Network design, planning, and execution compared. The row that matters most in scoping is reversibility, because it explains why network work is modeled before it is committed rather than iterated in production.

04 What does a network design study actually decide?

Four decisions recur. Facility count and location, including whether to consolidate into fewer larger sites or distribute into more smaller ones. Flow path assignment: which customers and products are served from which site, and whether goods move through a hub or ship direct. Inventory positioning: which stock is centralized and which is forward-deployed. And sourcing allocation: which plants or suppliers feed which parts of the network.

The output that distinguishes a credible study from a weak one is the treatment of scenarios. A network model can always produce a single lowest-cost configuration, and that configuration is almost always wrong, because it is optimized against one demand forecast, one cost structure, and one set of service assumptions. Useful studies compare a small number of structurally different options and state what each one costs, what service it supports, and how it behaves when the assumptions move. The deliverable is a defensible comparison, not a computed answer.

The fair case for the single-answer approach is that optimization exists to search a space too large for judgment, and offering decision makers too many options invites paralysis or reversion to the status quo. That is a real risk. Most practitioners resolve it by optimizing freely during analysis, then reducing the findings to three or four candidate structures for the decision itself.

05 What data does the model need, and where does it break?

A network model requires demand by product and ship-to location, facility fixed and variable costs, transportation rates by lane and mode, production or handling capacity, and service requirements expressed as time or distance. The mathematics is mature and the software is capable. The constraint in practice is almost always the cost data.

Two failures are common enough to plan for. Transportation rates are often held as negotiated tariffs rather than actual paid cost, so the model optimizes against prices the company does not pay. And facility costs are often allocated rather than measured, spreading overhead evenly so the model cannot see the marginal cost of opening or closing a site. Both produce results that are internally consistent and externally wrong, and neither is visible in the output. Validating against actual freight invoices and site-level financials is usually the highest-value work in the study.

06 When do you need a network design study?

Trigger events are more reliable than calendars. A merger creating overlapping footprints. A lease expiry or capacity decision forcing a commitment. A shift in demand geography, including channel shifts moving volume from bulk delivery into parcel. A change in sourcing origin driven by tariffs, trade policy, or supplier risk. Or a service promise the current structure cannot support.

A negative test also applies. If no structural decision is available in the next twenty-four months, because leases are long and capital committed, a study will produce a recommendation nobody can act on. The useful work is then flow path and inventory positioning within the existing footprint, a smaller exercise with faster payback.

On the question of expected benefit, SCR does not publish a figure. Claims such as fifteen percent lower supply chain cost and more than fifty percent less inventory circulate widely, but the instances we can trace appear on the sites of companies that sell network design software and are published without study, sample, or method. That does not make them false. It makes them unverifiable, and a number that cannot be checked should not be used to justify a capital decision.

07 Frequently asked questions

Is network design a software category or a consulting service?

Both, and the split matters commercially. Specialist modeling tools exist and some planning suites include a design module, but a large share of network work is delivered as consulting studies using those tools. Buyers should decide whether they intend to build a permanent internal modeling capability or commission periodic studies, because that determines whether licensing makes sense.

How long does a network design study take?

The modeling is rarely the long pole. Assembling and validating cost and demand data typically dominates the timeline, and studies stall there rather than in optimization. Organizations with clean freight and facility cost data move considerably faster than those reconstructing it, which is the main driver of variance.

Can our planning system do this?

Some planning suites include network modeling, but the questions differ enough that coverage is uneven. The test is whether the tool can open and close facilities as decision variables rather than treating the network as fixed input. If it cannot, it is optimizing flow, not designing structure.

How often should we redesign the network?

Most organizations revisit every three to five years, but the interval matters less than the triggers. An acquisition, a lease decision, a tariff change, or a service commitment can each justify work well inside that window, and a calendar-driven study with no pending decision usually produces analysis nobody acts on.

Does network design cover reverse logistics?

It can, and increasingly does. The academic literature has extended facility location models to recovery and return networks, and where return volumes are material the placement of processing sites is a structural decision of the same kind. If returns are a significant cost, they belong in the model rather than in a separate exercise.

Who should own the study internally?

It needs a sponsor with authority over capital, because the recommendation implies spending. Analytical work often sits with a supply chain or operations team, but studies that report only into supply chain frequently produce recommendations that finance and real estate never adopt. Involving those functions early is the difference between a study and decision.

08 Method, sources, and where to go deeper

Method

- The framing of network design as a facility location problem, and its integration with wider structural decisions, follows the peer-reviewed operations research literature cited below rather than vendor definitions.
- Process placement follows the SCOR Digital Standard, which locates network design within Orchestrate, the process establishing structure and governance across the supply chain.
- Supply Chain Research is independent and vendor-neutral. We accept no payment from the vendors or categories covered, and we name no single best product in this category.

Caveats

- No credible public benchmark exists for the savings a network redesign delivers. Widely circulated figures on cost and inventory reduction appear on the sites of companies selling network design software, without study, sample size, or method. They are cited here only as an example of an unverifiable claim, and should not be used in a business case.
- The academic literature reviewed here is methodological rather than empirical. It establishes how these problems are formulated and solved; it does not measure what typical organizations achieve.
- Table 1 and Figure 1 are structural distinctions rather than measured data. The cadence figures reflect common practice, not a survey.

Where to go deeper

Network design sets the structure that three SCR guides then operate inside. The supply chain planning guide covers how volume decisions are made within a fixed network. The transportation management guide covers the lane and mode execution that a flow path decision commits you to. The warehouse management guide covers what happens inside the facilities a design study opens or closes. Readers scoping a wider program should start with the SCR supply chain software category map.

Sources

- [1] Melo, Nickel and Saldanha-da-Gama. [Facility location and supply chain management: a review. European Journal of Operational Research.](#) Peer reviewed.
- [2] Springer. [Facility location modeling in supply chain network design: current state and emerging trends.](#) Peer reviewed; extends the problem class to resilience, circularity, and omnichannel.
- [3] Association for Supply Chain Management. [SCOR DS model reference, Orchestrate process.](#)
- [4] Association for Supply Chain Management. [SCOR Digital Standard overview.](#)
- [5] Sophus. [What is supply chain network design.](#) Interested source: sells network design software. Cited as the origin of unattributed cost and inventory reduction claims, not as evidence for them.
- [6] ICRON. [Supply chain network design: key strategic decisions and trade-offs.](#) Interested source: sells planning and optimization software.

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