

What is the difference between optimisation and simulation models?

Optimisation produces only one solution and it can do so, if:

- There is one variable over which an optimisation can be done (like cost)
- It is linear
- All other output variables are fixed (like assets)
- The problem is not too complex (true supply chains often are)

Optimisation tends to be applied to solve tactical/operational issues when simulation can resolve more complex and realistic supply chain issues.

Uses of Optimisation

- Used in situations where strong constraints apply
 - Budgeting - minimising costs or maximising utility.

Uses of Simulation

- Allows companies to ask many “what if” questions about changes in their systems without actually changing the systems themselves
- Used in situations where no tractable mathematical model exists
 - Supermarket queues where customers can move freely between lanes
 - Which of several possible investments to choose (risk analysis) in the face of possible future governmental regulation scenarios.
 - Inventory decisions in the face of unknown demand
 - Competitive bidding situations

What is the benefit of using simulation over optimisation?

The benefits are numerous and generally include:

- Longer supply chain scope
- Stronger analysis
- False input becomes obvious during simulations whereas in optimisation, it remains hidden in the optimisation algorithms

Simulation can handle:

- Conditional inputs (exceptions like stock-outs, shortages, etc.)
- Real-world realities: like departure frequencies, inventory policies, variation of transport times
- Logistics control policies: like inventory, consolidation and production policies
- Wide number of true variables
- Time related issues: like delivery times distribution and cash flows

Simulation analysis enables to:

- Drill down and explain the results, as results are an aggregate of individual events and not a result of some complex mathematical function
- Break down results by products, facilities, etc.

Advantages and Disadvantages of Simulation

Advantages

- Easy to build the model
- Can handle otherwise intractable problems
- Not subject to so many assumptions
- Easy for decision maker to understand
- Cheap and safe
- Good for comparisons

Disadvantages

- Hard to debug (randomness)
- No guarantee of optimality
- Hard to establish validity
- Costly to build and maintain complex models
- Can't produce absolute numbers

BOTTOM LINE: *USE SIMULATION ONLY WHEN ADVANTAGES OUTWEIGH DISADVANTAGES*