

Value Creation Through Supply Chain Network Optimization To Address Dynamic Supply Chain



A Thought Paper on **“Supply Chain Network Design & Optimization Services”**
from the Business Consulting Group

Introduction

Supply chain management has become one of the crucial focus areas in many businesses. It encompasses planning and management of all activities involved in sourcing, production, warehousing and distribution of products. Many companies enjoy significant business success in lieu of unique ways in which they have designed their supply chain and how they react towards changes in internal & external factors.

Leading businesses operating in developed nations understood the importance of supply chain and there is good amount of maturity level in their processes. This is aided by the improved infrastructure and fiscal policies in those countries to a great extent. But majority of businesses in developing countries such as India need to go a long way in achieving benefits of a mature supply chain.

To clarify the above point, take the example of logistics cost. Logistics cost as a percentage of GDP in countries like US & UK is less than 8% of GDP, while in India example, it is 14 to 15% of GDP.

Taking India as an example, we highlight the dynamic and evolving nature of supply chains. In India, the high logistics costs can be attributed to poor transport infrastructure and to a great extent the complex fiscal structure currently existing in India. The freight

movement by rail is less and it needs further expansions. Tax benefits rules over the operational efficiency resulting in increasing number of stocking points. This, added to highly fragmented demands, nullifies the benefits of economies of scale. Indian economy is growing at a rate of 8% & is supposed to grow in the same pace till 2020. By 2025 it is expected to be the world's fifth largest economy. There will be a major population shift to cities and it is expected that many new growing geographies will come in existence. So the pattern and geography of demand picture is expected to undergo major shift.

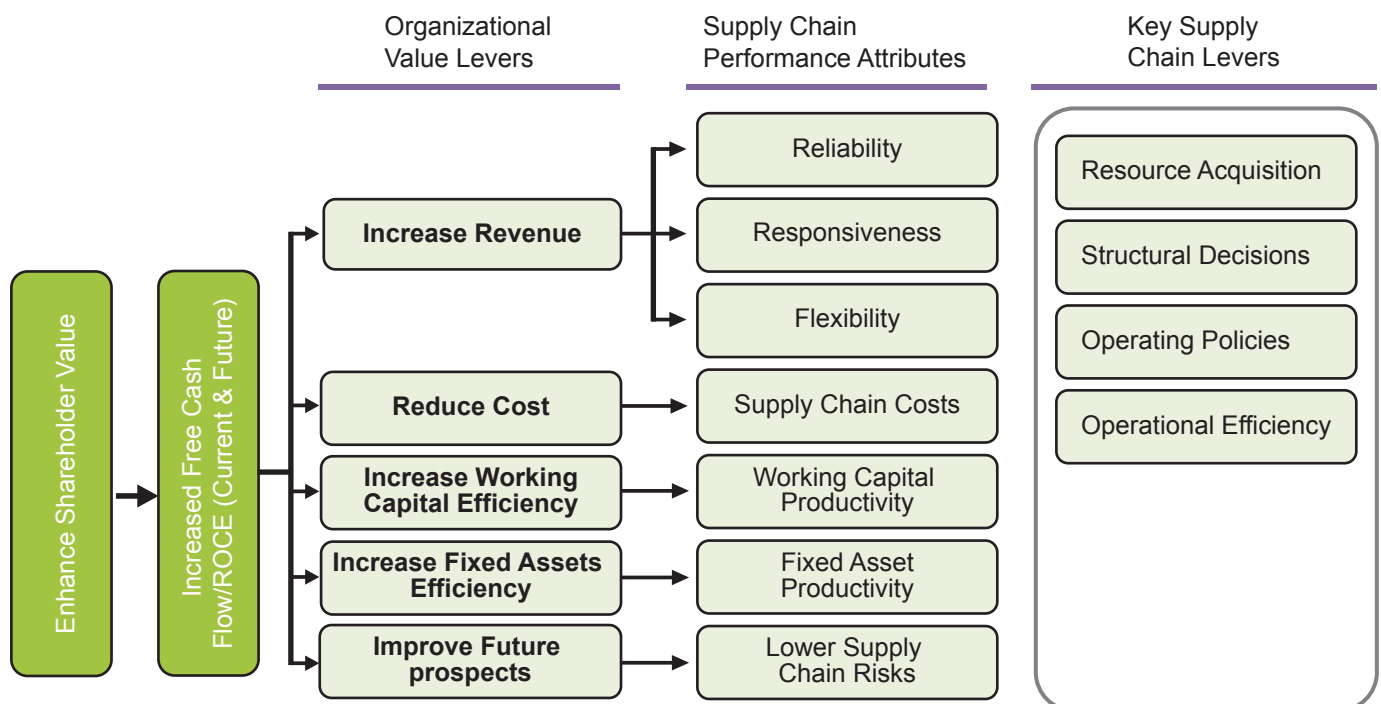
As discussed there are macro & micro economic factors that may lead to sub optimality in supply chain, and this needs to be addressed. Many companies are working in this direction and undertaking supply chain network redesign exercise to reap benefits in the short and long term.

Dynamic Supply Chain & Value Levers

Many companies are investing in processes, tools and resources to achieve operational efficiency in supply chain planning. They are going for integrated planning with the objective of increased customer service level, responsiveness, on time in full delivery and so on. There are many questions which still remain unanswered and which are related to company's ultimate objective:

- Is the cost factor considered for planning and is it the end-to-end supply chain cost which is considered?
- What is the basis of Cost to Serve models; is it profit maximization/cost minimization?
- Is there any consideration of working capital productivity and fixed asset efficiency in planning?
- Is the current network the most suitable one or needs some changes considering current & future scenarios?
- What are the action plans on tactical & strategic level and whether they are aligned?

The figure below shows the linkage between the main organizational value levers and different supply chain performance attributes. The supply chain performance attributes described boils down to four main key supply chain levers.

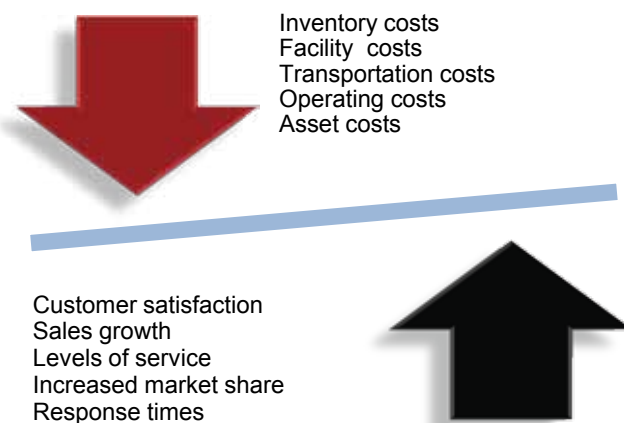


- **Resource Acquisition:** Acquiring and divesting right resources at right quantum at right place at right time. Resources can be production units, warehouses etc
- **Structural Decision:** Realignment of capacity, reduction in echelons in network etc
- **Operating Policies:** Policy decisions basis cost to company view. E.g. production strategy to react to seasonality in demand
- **Operational Efficiency:** Efficient execution & control of day to day operations

One of the most important considerations in supply chain and operations is cost. The supply chain network optimization model also focuses in optimizing “cost to serve” considering end to end supply chain cost, while maintaining necessary service level. Hence identifying end-to-end supply chain cost and cost drivers becomes one of the important considerations in network design exercise.

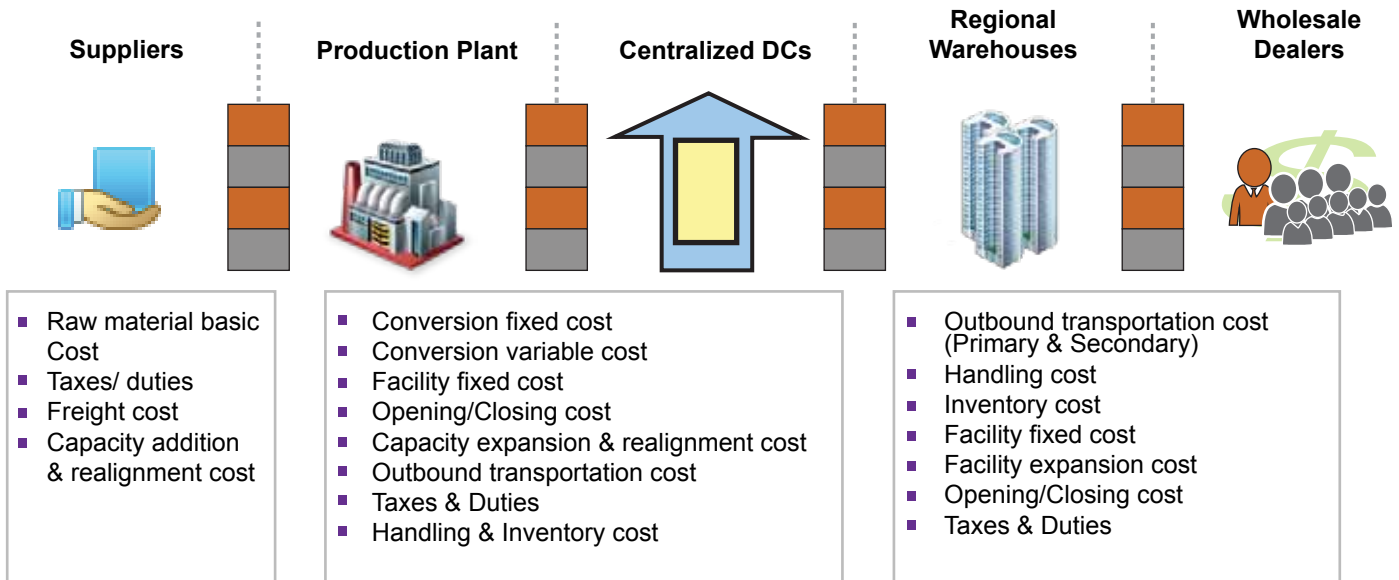
Dynamic Supply Chain Cost Structures & the need for Optimization

Companies are increasingly focusing on cost perspective along with service requirements during planning & design of supply chain network. The initiative goes in a way to find the most cost optimized way in meeting key objectives for a good supply chain as shown in figure below:



In the current scenario, where market & demand is highly fragmented, companies are coming up with different models of sourcing & distribution. The supply chain is getting complex and number of echelons are increasing to get fiscal benefits. Companies have created numerous facilities (sourcing, manufacturing, Centralized DCs/Warehouses) with tangible & intangible benefits in mind. While intangible benefits usually based on strategic intent, tangible benefits are mostly cost based.

Figure below gives the set of cost involved in different legs of multi echelon supply chain network:



For companies it becomes very important to make decisions basis end-to-end supply chain cost. The recommendations coming out of network design exercise when balanced with strategic intent gives a good picture about the roles of different facilities in supply chain. Because of the dynamic nature of supply chain, these supply chain network design decisions need to be periodically revisited.

Drivers for Supply Chain Network Design

The need for supply chain network design can be because of many internal and external factors:

Internal Factors: The supply chain operation is majorly divided into four main functions namely sourcing, production, logistics and sales/customer service. It has been observed that the alignment regarding their individual (function specific) and company objectives are not very well defined which leads to inter functional conflict in objectives. Different functions working on their individual objectives lead to local optimization and not enjoy the benefits of global optimization. The cost associated to achieve certain level of service level becomes high when compared to optimization done in keeping end-to-end cost in picture.



External Factors: The supply chain design is based on many factors and should ideally keep on changing as these factors changes. It is very important to analyze the sensitivity of supply chain network of a company against changes happening in these factors. Some of the important factors are:

- **Demand Factors:** Increase/Decrease/Shift in demand, type of demand like regional / fragmented / homogenous demand
- **Fiscal Factors:** Tax structure & policy change in due course of time
- **Infrastructural Factors:** Availability and cost of labour, transportation facilities and necessary utilities
- **Competitive Factors:** New entrant/existing competitors & competitive intensity, New product introduction, expansion into new markets, pricing strategy

Because of the impact of internal and external factors, supply chain network becomes suboptimal over a period. It becomes very important to have periodic assessments carried out to align network with supply chain strategy considering changes in factors.

Illustration:

Ferdows in his paper “*Making the most of foreign factories*” has discussed how the roles associated with manufacturing plants changes because of changes happening in internal & external factors. He devised a framework to understand the position of manufacturing plant in a given network. The two dimensions for defining roles of manufacturing plant are **reason of exploitation** and **level of strategic intent** involved.

Reason of exploitation includes low cost input factors, technological knowhow & market proximity. **Level of strategic intent** means degree of contribution of plants to the company strategy. It means plant contribution related to other processes next to production (like product & process improvement, procurement planning, logistics planning), acting as an innovation partner with head office and becoming knowledge hub for other plants.

For example, plants which have been established in areas like Baddi (H.P) in India are mainly because of the tax exemptions provided by the Indian government. The period of exemption is likely to finish in near future. Most of the companies are revisiting the future role to be played by these manufacturing units. There are three options left with them:

- To increase their strategic role
- To run plant only to satisfy local demands
- To shut them or shift the facilities to other region which are profitable to the company

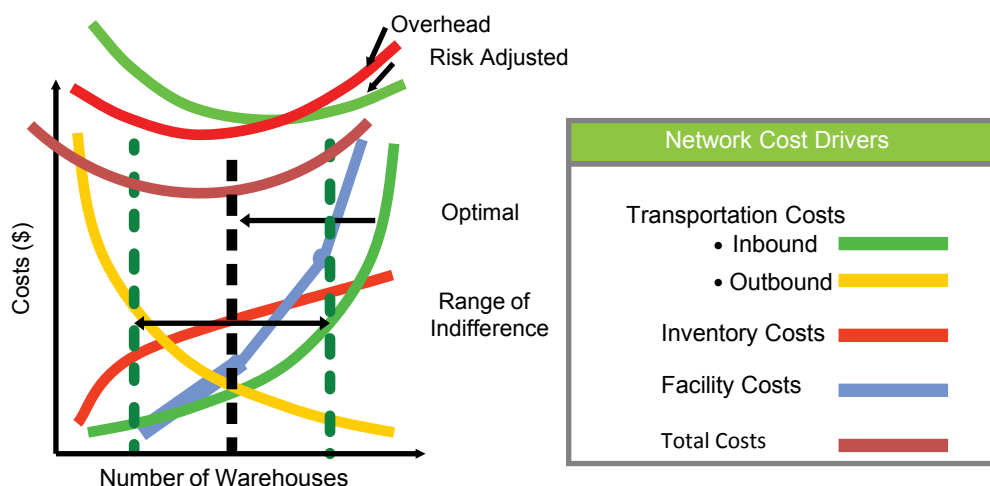
Any of the three options requires a clear definition in time phase basis on how to manage the required shift.

Our approach to Supply Chain Network Design

Supply Chain Network Design requires a powerful modeling approach to deliver significant improvements in supply chain cost structures and service levels. It needs to incorporate modeling of fixed and variable costs for all the main activities and cost drivers in a supply chain network: purchasing, production, warehousing, inventory, and transportation. ITC Infotech has devised a unique approach to model & design supply chain network services – the same is described further in this paper.

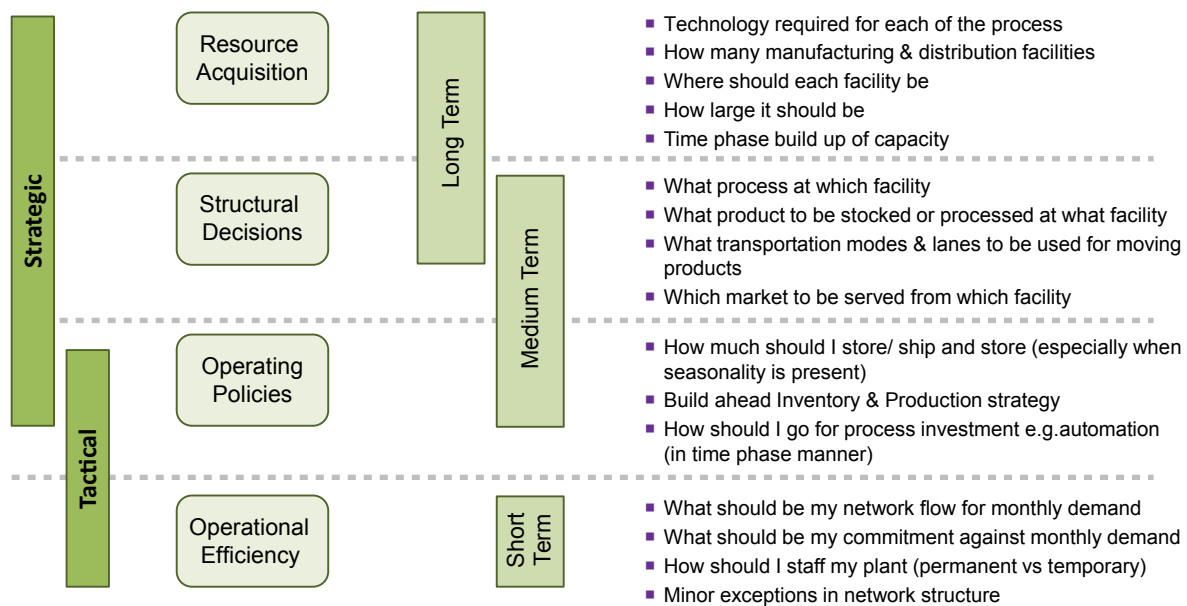
I. Network Design & Optimization Models Overview:

Network Design is a process to determine the unique network configuration for the supply chain that offers the lowest total cost/ highest total profit considering operational and financial risk while achieving targeted Service Levels. The figure below gives an illustration of how Network design exercise helps in finalizing **Zone of indifference / Range of indifference** where supply chain cost is minimal basis various tradeoffs involved. In network design exercise performance simulation is also done to validate the feasibility of supply chain strategies.



Network design exercise involves many decision variables like location and capacity of facilities, product – location combination decisions, decisions on transportation lanes etc subject to real world constraints of capacity, manufacturing, sourcing and serviceability requirements. Thus supply chain network design provides answers to some of the key questions in supply chain network.

II. Questions answered by Supply Chain Network Design & Optimization Models:



The four key supply chain levers explained earlier poses many questions which needs to be answered. Most of the questions that will be answered by Network design exercise are detailed in the figure. The strategic & tactical decisions can further be seen as long term, medium term & short term decisions basis the lead time to finalize and implement the changes.

The table below is basis a leading CPG company in India. It explains the planning horizon, frequency and bucket for Network design exercise carried out for Short term/Medium Term & Long term decisions.

Parameters	Short term	Medium Term	Long Term
Horizon	1-3 Months	1-24 Months	1-5 Years
Frequency	Monthly	Quarterly	Semi annually/Yearly
Planning Bucket	Weekly/Monthly	Monthly	Quarterly/Yearly

Because of the number of decision variables and constraints involved, it is very difficult to perform this exercise manually or with excel tools. There are some best in class tools available which can aid the process of network design

III. Supply Chain Network Optimization tools:

Supply chain network optimization tools provide end-to-end supply chain modeling which includes sourcing, manufacturing and distribution. These tools provide options to incorporate large number of constraints with lot of decision variables. The best in class tools in this category are i2 Strategist, supply chain guru, IBM network optimization workbench etc

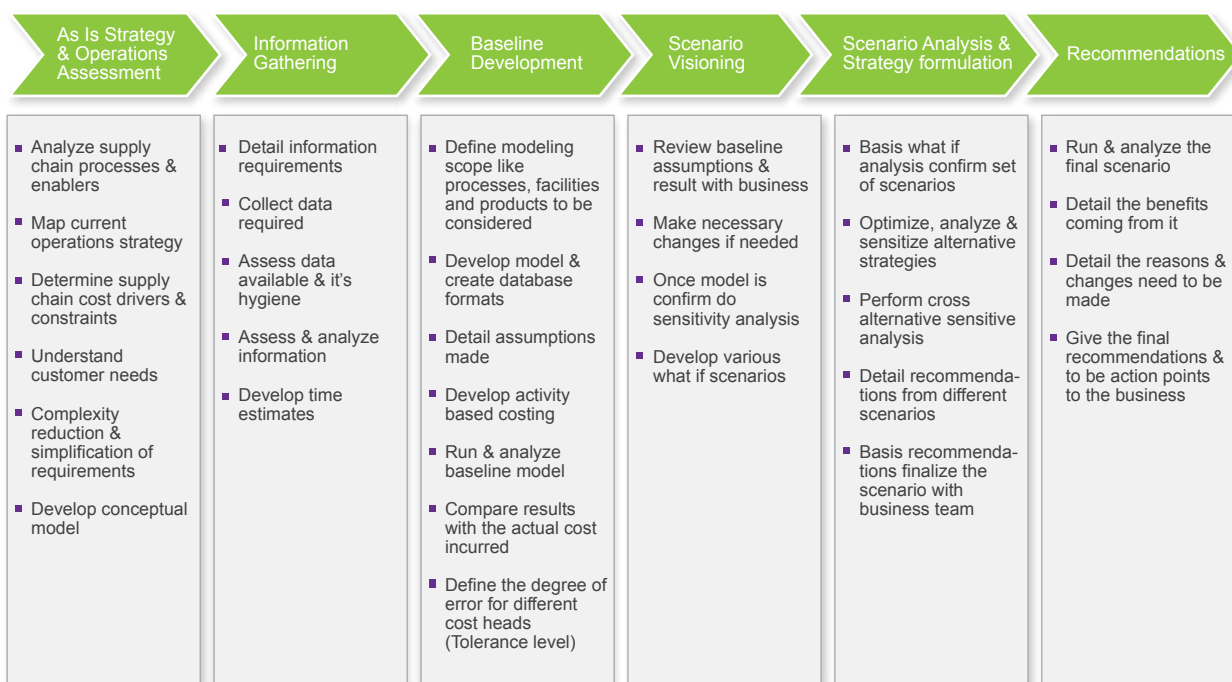
Key aspects include its ability to:

- ✓ Model the entire supply chain from raw materials to finished products to delivery
- ✓ Improve strategic and tactical decision making with visibility into network design, sourcing and capacity
- ✓ Plan for uncertainties with what-if scenario generation and analysis
- ✓ Understand and project the inventory costs of network design decisions based on stochastic parameters

Network design projects are usually carried out in multiple logically sequenced steps.

IV. ITC Infotech’s Supply Chain Network Optimization Approach:

Our approach for Network design exercise is a six step approach as given below



Putting Supply Chain Network Design & Optimization to Work

This is a case study of one of India's leading CPG companies.

Objective: Recommend "To-Be" supply chain network in short term, medium term & long term basis minimum overall cost (end-to-end cost involving Vendor-Production Unit-Centralized DCs-Regional Warehouses)

Background: Our client has a high growth business, with a mature planning process. The business wanted to incorporate holistic cost perspective in planning.

Description:

- Our Objective was to design a time based supply chain network, which works on minimum cost to serve model.
 - Costs involved - RM/PM landed cost + Conversion cost + Transportation cost + Fiscal cost + Inventory handling/carrying cost. Different fixed costs and facility opening/closing costs are also involved
- Decision Variables – Vendor - Factory mapping, Factory - DC/Warehouse mapping, DC-Warehouse mapping, Factory-Product mapping
 - Subject to – Customer service constraints, Factory Minimum/Maximum Capacity constraints, changeover constraints, packing constraints & transportation capacity constraints

Model Outcome:

- Finalization of sourcing strategy
- Product planning (Where to produce & how much to produce)
- Finished goods network from production unit till warehouses – Via centralized DCs vs.direct to serve to regional warehouses
- Capability realignment
- Opening/Closing of facilities in time phase manner

Summary

Supply Chain Network Design is a powerful modeling approach which has been proven to deliver significant reduction in supply chain cost and improvements in service levels. It incorporates end-to-end supply chain cost: purchasing, production, warehousing, inventory, and transportation. Companies can revisit their network periodically considering changes in business scenarios like new product introduction, changes in demand pattern and new supply sources so as to align supply chain network. Also companies can reap cost and competitive advantage by undertaking supply chain network optimization exercise in response to big ticket changes in fiscal policy like change in taxes, tax rebates etc.

References

- Paper by *Kasra Ferdows* "Making the most of foreign factories"

About the Author(s)

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About the ITC Infotech Business Consulting group

ITC Infotech's Business Consulting Group provides rich business consulting capabilities across key business functions such as product design & development, manufacturing & supply chain management, sales & service, loyalty & customer relationship management, etc. The group has expert practices around Enterprise Performance Management, CRM and Loyalty, SCM and Operational Excellence, Auto ID Solutions and Corporate Sustainability. Our domain experts and management consultants bring in expertise of addressing customer needs and problem statements in these areas across verticals such as CPG, Retail, Process & Discrete Manufacturing, Travel & Hospitality, Banking & Financial Services and Logistics & Transportation.

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