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Generating maximum value from your supply chain

ABSTRACT

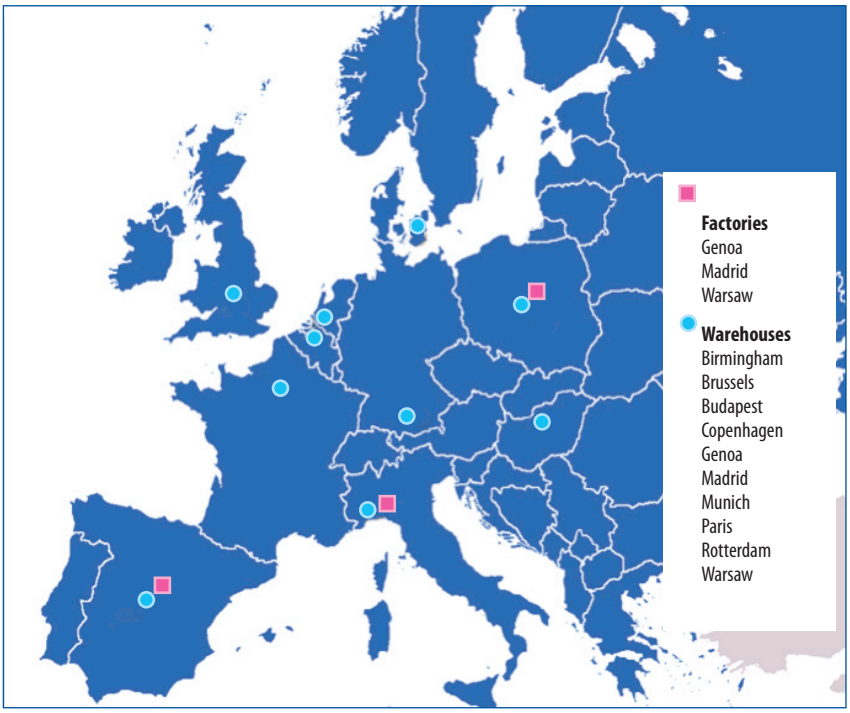
Powerful new optimisation methods mean it is now possible to optimise complex multi-leg supply chains simultaneously while taking into account user defined business constraints. When used in conjunction with online tendering it can result in dramatic cost reductions, improved service levels and truly optimised supply chains.

Introduction

Every supply chain is unique and even organisations in similar industries will have very different challenges. 'Optimising' supply chains has long been a goal for businesses and today, there are many solutions that offer tools to model supply chains with various degrees of complexity. Unfortunately most solutions have a very narrow scope and they tend to focus mainly on costs rather than considering the 'total value' that can be derived from the supply chain. However, there are a new set of solutions that use 'optimisation' – a branch of mathematics that uses complex algorithms to analyse data and identify the best available solution taking into account chosen constraints – to analyse simultaneously the vast amounts of data involved in each leg of the supply chain. What this means in reality is that it is now possible to optimise the supply chain as one entity as opposed to attempting to optimise each leg in isolation. To understand how optimisation can add value, let us consider a simple supply chain case. This example simulates a real-life situation and uses tangible data to demonstrate how optimisation can help you.

The Supply Chain Example

The example considers three different products A, B and C, each produced at a single factory located in three different European cities – Genoa, Madrid, Warsaw. The supply chain includes ten potential warehouse/distribution centres and 20 market locations. In this example we only consider the costs of transport and warehousing however in reality it is possible to include any number of additional scenarios e.g. to allow all products to be made in all factories, to include manufacturing costs in the analysis or to find the optimum allocation of products to factories.



Transportation from factory to the warehouse is constrained to one product per lane whereas co-transportation of products (any combination of A, B and C) is possible during transportation from warehouse to the market location. For simplicity, we use fixed prices per pallet in this example. But prices could easily be provided from a transport tender, potentially providing a powerful combination of network and price optimisation.

Supply chain summary

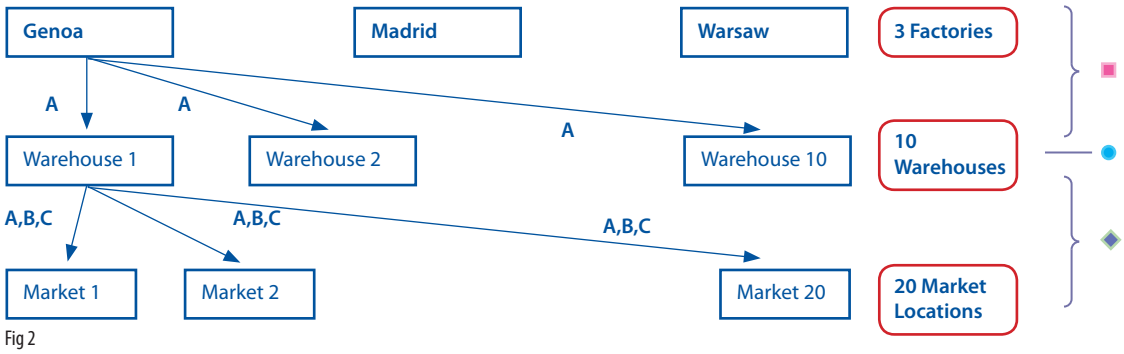


Fig 2

FACTORIES

Factory	Product	Annual Volume	Unit
Genoa	A	400,000	pallets
Madrid	B	600,000	pallets
Warsaw	C	800,000	pallets

TRANSPORT

Warehouse	Maximum Annual Troughput	Cost per Pallet (EUR)	Annual Fixed Costs (EUR)
Birmingham	640,000	10.52	100,000
Brussels	480,000	6.71	100,000
Budapest	320,000	10.90	80,000
Copenhagen	320,000	7.01	100,000
Genoa	220,000	5.26	70,000
Madrid	240,000	7.15	30,000
Munich	480,000	6.81	80,000
Paris	480,000	6.68	80,000
Rotterdam	640,000	8.47	30,000
Warsaw	320,000	9.34	100,000

WAREHOUSES

TRANSPORT

MARKETS

Country	Annual Demand (Pallets)		
	Product A	Product B	Product C
Austria	8,000	12,000	16,000
Belgium	16,000	24,000	32,000
Czech Republic	16,000	24,000	32,000
Denmark	8,000	12,000	16,000
Finland	4,000	6,000	8,000
France	48,000	72,000	96,000
Germany	56,000	84,000	112,000
Hungary	12,000	18,000	24,000
Ireland	4,000	6,000	8,000
Italy	40,000	60,000	80,000
Netherlands	20,000	30,000	40,000
Norway	8,000	12,000	16,000
Poland	28,000	42,000	56,000
Portugal	4,000	6,000	8,000
Slovakia	12,000	18,000	24,000
Slovenia	8,000	12,000	16,000
Spain	36,000	54,000	72,000
Sweden	16,000	24,000	32,000
Switzerland	8,000	12,000	16,000
UK	48,000	72,000	96,000
Total	400,000	600,000	800,000

Fig 3 Supply Chain Summary

Costs

There are three main costs in this simple supply chain model: transport costs from factory to warehouse; cost of warehousing (fixed and variable costs) and transport costs from warehouse to market location

Transport Cost to Warehouse per Pallet (EUR)			
To Warehouse	From Factory		
	Genoa	Madrid	Warsaw
Birmingham	71.60	75.95	103.00
Brussels	23.88	42.59	38.35
Budapest	25.80	62.58	17.84
Copenhagen	40.80	64.34	30.74
Genoa	3.25	37.51	37.61
Madrid	30.48	2.88	59.77
Munich	16.21	42.50	25.73
Paris	20.88	14.11	43.57
Rotterdam	28.24	46.62	29.50
Warsaw	33.76	74.46	2.92

Warehouse	Maximum Annual Throughput	Cost per Pallet (EUR)	Annual Fixed Cost (EUR)
Birmingham	640,000	10.52	100,000
Brussels	480,000	6.71	100,000
Budapest	320,000	10.90	80,000
Copenhagen	320,000	7.01	100,000
Genoa	220,000	5.26	70,000
Madrid	240,000	7.15	30,000
Munich	480,000	6.81	80,000
Paris	480,000	6.68	80,000
Rotterdam	640,000	8.47	30,000
Warsaw	320,000	9.34	100,000

Transport Costs to Market per Pallet (EUR)										
Country/Market	From Warehouse									
	Birming-ham	Brussels	Budapest	Copenha-gen	Genoa	Madrid	Munich	Paris	Rotterdam	Warsaw
Austria	16.43	29.44	14.65	29.75	20.28	55.02	9.69	32.07	26.33	18.46
Belgium	9.45	8.16	27.95	32.01	25.45	44.65	19.35	13.03	8.21	32.54
Czech Republic	19.00	28.21	15.99	29.07	20.37	47.83	13.13	28.36	29.14	16.25
Denmark	17.41	24.31	37.77	7.94	42.97	68.27	27.97	33.83	27.69	32.02
Finland	29.23	46.11	52.96	36.04	54.66	90.15	59.33	65.87	53.04	35.07
France	11.34	19.61	37.51	36.85	17.37	25.23	24.58	12.87	18.67	38.65
Germany	15.23	20.01	20.16	31.94	22.44	51.00	20.01	19.29	13.83	26.53
Hungary	26.42	41.11	10.01	43.64	28.28	50.52	18.67	40.87	32.29	21.14
Ireland	15.62	63.15	129.18	81.98	102.44	100.48	100.13	58.72	66.21	117.82
Italy	20.39	34.39	32.42	43.75	11.06	42.65	22.06	37.42	33.02	36.56
Netherlands	7.81	10.97	31.88	26.45	32.14	51.60	22.77	17.20	5.10	36.20
Norway	18.38	33.24	51.46	21.78	58.18	78.86	41.14	36.29	36.64	33.90
Poland	20.81	32.87	18.78	27.83	31.31	67.04	26.66	46.41	33.63	10.15
Portugal	21.36	46.66	77.73	77.36	46.21	17.35	58.80	43.63	50.87	66.42
Slovakia	24.29	34.08	7.34	32.66	35.37	55.64	18.26	40.73	32.38	11.48
Slovenia	21.87	29.08	11.40	40.82	19.60	45.46	17.82	30.27	31.03	27.80
Spain	21.41	40.32	52.62	54.19	40.31	14.10	48.41	29.70	48.04	76.27
Sweden	22.44	35.88	42.92	27.13	50.17	84.59	41.33	39.17	36.54	26.71
Switzerland	14.20	18.35	24.86	41.81	9.44	38.67	11.38	19.61	21.78	31.22
UK	12.01	39.24	89.78	59.89	73.36	77.37	74.31	40.70	34.60	93.21

Fig 4 Supply Chain Costs

Using data (price per pallet) for all the available routes, the individual transport costs incurred are calculated.

Even this simplified model generates vast levels of data and means it is very difficult, to manually calculate the 'optimum' solution that is aligned with the physical constraints of the supply chain i.e. the annual demand at the market locations must balance with the production at each factory and there must be a balanced flow through the warehouses that adheres to any transportation constraints.

What is the optimum solution?

This amount of data and number of potential combinations presents an overwhelming challenge for any buyer and traditional analysis methods will not provide the optimum solution. Faced with this situation a buyer using traditional analysis methods may choose to optimise one of the legs and be happy with the savings generated. However, with the new optimisation tools it is possible to optimise all legs simultaneously and as is shown in the table below the results are interesting – and definitely worth saving.

The following table (fig.5) shows seven scenarios - each one optimising one or more of the legs.

	OPTIMISED LEG	FAFACTORY TO WARE-HOUSE TRANSPORT COSTS ('000 EUR)	WAREHOUSING COSTS ('000 EUR)	WAREHOUSE TO MARKET TRANSPORT COST ('000 EUR)	TOTAL COSTS '000 EUR
1	Warehouse to Market	91,284	16,287	21,793	129,364
2	Factory to Warehouse	20,164	14,510	57,803	92,477
3	Warehousing	37,064	12,214	46,921	96,199
4	Warehousing AND Warehouse to Market	76,911	15,386	22,247	114,545
5	Factory to Warehouse AND Warehousing	20,164	14,510	57,803	92,477
6	Factory to Warehouse AND Warehouse to Market	25,237	14,434	45,975	85,646
7	All legs optimised	25,425	13,890	49,975	85,291

Fig 5 Optimisation results

From this analysis we can see that there is a difference of €45 million between the solution with all legs optimised (scenario 7) and the scenario where only transport costs from Warehouse to Market have been optimised (scenario 1). In reality if a buyer was faced with this situation they are more likely to optimise the Factory to Warehouse (scenario 2) leg because it is the leg with the longest combined distances. Even so, optimising this leg in isolation fails to uncover over €7 million of additional savings that could be achieved by optimising all legs simultaneously.

The effectiveness of the optimisation is shown again in scenario 7 in that none of the individual elements have the lowest possible cost when compared to the other scenarios. However, the combined cost of all elements is €7 million less than the next best. Based on the data we have seen this is the optimum solution but to identify this result requires an extremely powerful optimiser. And because the new methods of analysis are so fast, it is possible to run numerous optimisation scenarios so you can be sure you have the best solution for your needs.

Further improvements from tendering

Optimisation is only one component of an efficient supply chain modelling solution. The other component that ties into this process is tendering. Solutions that readily handle complex tenders and can also make use of optimisation techniques make the task of supply chain modelling significantly less cumbersome. The initial results (fig.5) can then be re-optimised quickly and easily with the tender results, perhaps leading to very different supply chain solutions.

In the above example when all the flows were put out to tender and the results were optimised the lowest cost solution fell to €78 million or €7 million less than a solution that relied on optimisation alone.

While a €7 million saving looks attractive, in reality it will probably not be possible – or desirable – to implement the lowest cost scenario as there will be other criteria to consider. This is a vital part of the analysis when considering 'total value' and when choosing a solution provider it is imperative that it allows you to incorporate your own business constraints into any analysis. In the example above when the optimised tender results were reanalysed to reflect business constraints the total optimised cost was €82.5 million.

Conclusion

The example showcased is a relatively simple supply chain where transport was the major cost component to be optimised. The modelling of similar supply chains where raw materials and services are major cost components (with transportation accounting for a lower percentage of total costs) can easily be visualised. Furthermore, a complex supply chain comprising several distribution channels, markets involving numerous routes and exponentially growing network possibilities can be modelled and optimised. In one example, the Trade Extensions platform was used by a financial services firm to tender all the components of a US$ 1 billion direct mail project with 65,000 items and 400,000 bids from over 100 suppliers. In this case there were five legs in the chain from design to delivery and the supply chain was optimised as a whole.

The supply chain example and the experience of the financial institution mentioned above shows combining competitive tendering with optimisation can result in significantly lower costs. However, identifying the best available 'total value' solution is only possible with tools that also allow companies to apply their own business constraints and this is the way to ultimately generate maximum value from a supply chain.

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E-tools for sourcing logistics services

Logistics networks are ideally suited to the efficiencies that can be achieved through e-sourcing yet for the uninitiated running an e-sourcing event can seem a daunting task. In this article, Joe Critchley, Trade Extensions VP Sales and Business Development, demystifies the subject and describes what e-tools are available to buyers of logistics services.

Before discussing the available tools it is worth defining 'sourcing' and 'sourcing event' as they are used in this paper. In simple terms, 'sourcing' is the act of contracting goods or services and this is achieved through a 'sourcing event'. Often sourcing events are referred to as auctions or tenders but the variety of sourcing methods and analytical processes now available to buyers means these classifications are less informative than they have been in the past. 'Sourcing event' is a term that encompasses all methods and processes available. Looking at the main components of a sourcing event these include lots (the items or services a buyer is looking to source); suppliers; rules and specifications; a process for suppliers to make offers; analysis of the offers collected and finally a decision making phase that ends with business awards.

As mentioned above, lots are the items which suppliers make offers to provide. In FTL or FCL events 'lots' could be routes (or lanes) from point A to point B, in LTL events they could be deliveries from a warehouse or factory to a geographical area. The flexibility of e-sourcing tools today means that lots are not limited to physical objects and can be defined to meet the needs of the situation - such as buying space or other warehousing services.

Now sourcing and sourcing events have been defined we can look at what objectives buyers have and how e-tools can help. Irrespective of whether e-tools are used or not, effective sourcing means allocating business to the right supplier, at the right price, for the right period of time and with the right payment terms. 'Right' in this context means different things to different buyers depending on their precise requirements but good buyers will always want to ensure the capacity and quality of their suppliers.

Effective sourcing also allows buyers to behave more strategically and achieve broader objectives. This could be a desire to find new suppliers in order to strengthen the supplier base. In transport events shippers can use sourcing to manage their dependence on carriers in terms of total number of carriers used or the distribution of the workload between carriers. Equally it could be something not so easy to measure such as reducing environmental impact. The transport sector has been making great strides in reducing empty running and making transport flows more efficient and with new e-sourcing tools it is possible to reduce environmental impact further by collecting information that means sourcing decisions can take environmental factors into account.

Alongside the strategic options available to buyers, one major objective is nearly always a good ROI taking into account the total cost of running the event and the savings achieved. Modern e-tools available make this objective more achievable as buyers can minimise costs without compromising quality.

In achieving their objectives, buyers have another desire which is to create an efficient sourcing process. This process needs to be manageable and not use too much of the buyer's resources. It has to be fast in order to deliver the benefits quickly – an annual saving of £2m delayed by one month costs the buyer more than £150k. The process needs to be transparent - both internally and externally, fair to suppliers and well documented so any disputes can be resolved quickly. Ideally the process will be repeatable and common across regions, sectors and business units as this will make better use of buyers' resources and enable the best balance between central and local decisions.

With so many objectives and considerations sourcing has become incredibly complex which is why many buyers are using e-tools to help manage this complexity. So let's look at these e-tools in more detail.

Today's e-tools give buyers more flexibility and allow them to manage projects that would have been impossible a few years ago. To highlight the benefits e-sourcing can provide we will look at four stages of a sourcing event in detail – spend analysis, RFx, optimisation and contract management.

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Spend Analysis

Spend analysis allows buyers to look at transactional data and identify opportunities for goods and services to be sourced more effectively. This sounds simple but in many organisations this data is stored in numerous databases in varying formats. To get the data in a format where it can be used can take weeks or months if done manually. E-tools are now available that automatically clean and collate the data so it can be viewed in multiple ways giving organisations greater insight into what they actually spend and which items could be sourced more effectively.

RFx

RFx is a term used to cover RFIs, RFPs, RFQs and other requests made to suppliers. Traditionally this process can be very time consuming but e-tools make it much more efficient. RFIs of any size can be run and it is possible to tailor them to any situation and collect information that can be used to pre-qualify suppliers or used in the analysis phase following bid collection. For example a transport buyer may want to know what proportion of each carrier's work is carried out using their own equipment, who their main reference customers are and what discounts they can offer for shorter payment terms.

Electronic RFQs have developed as well and whereas a few years ago they were only used for FTL, they are now used in numerous formats for just about anything. Along with FTL, electronic RFQs can be used for LTL, deep-sea, air freight, parcels, warehousing or even entire supply chains. It is also possible to have multiple bidding rounds with different types of feedback. For example if you are running a warehousing or deep-sea event you might want to run it under sealed bid conditions whereas if you are a running a FTL event you may want to give carriers an indication of where their bids stand compared to the bids of other carriers. 'Collaborative' bidding where suppliers can make offers for packages of lots and volume discounts is frequently used and enables suppliers to highlight the opportunities of which the buyer may otherwise be unaware.

Optimisation

Optimisation helps identify the best combination of lots and suppliers that meets the buyer's requirements and suppliers' strengths. The number of lots, suppliers and offers mean the number of potential combinations runs into millions and this type of analysis is simply impossible without e-tools.

Sophisticated scenario builders can produce optimised results in a few seconds even for extremely large projects with hundreds of suppliers and thousands of bids. The analysis can take into account supplier data (from the RFI and other sources – for example the buyer's own supplier quality scores), lot data, bid data and constraints and rules set by the buyer - for example limiting the number of suppliers or the amount of change. In addition elements other than price (for example lead time, payment terms, quality scores, incumbency) can be factored into the decision process.

Contract Management

Using e-tools for contract management allows users to access the essential elements of contracts from one location. It is also possible to allocate business directly from the e-sourcing platform and once contracts are in place they can be updated, for example, by contracting new routes during the tender term.

What E-tools Cannot Do

While technology does bring numerous benefits like the ones described it is worth recognising that it does have its limitations. E-tools will not create competition where it doesn't exist. Luckily this is less of an issue for transport buyers than it can be in other sectors. In addition, e-tools will not magically make all suppliers entirely reliable and equally will not make every buyer an expert.

Conclusion

Ultimately, when well used, e-tools help to bring buyers and suppliers together in a very efficient and effective way. Buyers still need to know their industry; what they want to achieve and what questions to ask but using e-tools means it is possible to manage projects and achieve results which previously would have been impossible.

If you would like to discuss how you can use e-tools for logistics sourcing please contact
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