

SUPPLY CHAIN OPTIMIZATION: WAY TO IMPROVE INDIAN SMES SCENARIO.

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Abstract—In the present demand driven, Omni-channel world, it is easy to undervalue the growing complexities of global supply chains.

However the development of worldwide markets, expanding client desires, increasing expenses, and more intense & diverse competitive pressures are driving the improvement of emerging supply chain networks & complicated system structures. This increasing complexity is exactly why supply chain networks need to be frequently re-evaluated.

No matter business is well-established or just a startup. For making business successful, one has to make supply chain effective & efficient enough to deal with the market dynamics & competitors.

In India, small & medium businesses are still running on traditional models, people are still unaware of optimization processes & techniques. They are to be made aware of simple optimization tools such MS- Excel solver & other applications of MS-Excel, that are very effective in running smooth business. Also when the price of these tools is compared to costly Supply chain soft wares, it is negligible. Digitization not only means cashless society but it also focuses on making businesses hassle free & profitable with use of technologies available.

1. Introduction

This paper gives insights how a small or a medium business can be modified so as to achieve optimum level performance, which means minimum costs & maximum profit. It includes network optimization, minimizing lead time, reducing inventory levels, making supply chain agile & demand driven. Also one of the important aspects of optimization is user friendly data visualization of sales or performance in the market as compared to other competitors.

This not only helps in understanding the performance at different nodes of supply chain, but also helps management teams to take smart & informed decisions. It also helps in removing bull whip effect which is one of the major reasons of supply chain failures in India. One of the most user friendly & easily available software for optimization & visual representation of database is MS – Excel.

MS Excel enables clients to characterize and make their own User Interface and to work the manner in which they need to

work as opposed to complying with a pre-fabricated and fixed methodology.

- **It's very convenient:** One can utilize it all over the place, and offer it effectively with others. Wherever there's a PC — at work, home, school, library — there's feasible a copy of Excel on it. Export information from your undertaking application to Excel and you can chip away at it anyplace. Also if you need to share the spreadsheet to somebody, simply attach it to an email. Certainly, the cloud and versatile advance technologies are making undertaking applications increasingly convenient today.
- **It's ubiquitous:** Almost everyone has it and realizes how to utilize it. You can email a spreadsheet to a provider, client, accomplice, associate, or any other individual, and it's nearly ensured they will be able to open it and utilize it as well. Conversely, on the other hand you request that providers and clients utilize a Web or online application to give you data; you would need to prepare them first on your framework or teach them specific software, If 100 organizations ask your trading accomplices to utilize their applications, that is 100 distinct frameworks or soft wares they would need to learn. Excel in any case, is the common denominator of programming applications — everyone has it, everyone realizes how to utilize it.
- **It's inexpensive.** Sure, software-as-a-service and cloud based applications are more reasonably priced than traditional enterprise applications (at least the upfront costs are lower), but Excel is still at least an order of magnitude less expensive than most business applications & Supply chain soft wares provided by SaaS & other software agencies [1][2].

2. Basic components to a world class supply chain network.

- **Strategy or policy framework before Network.** With complex and contending industry objectives, for example, Minimizing investment, improving working edges, bringing down the carbon footprints or minimizing environmental degradation caused industries &

businesses, and upgrading the client experience, a clear-cut, concise & transparent supply chain must be completely lined up with the business methodology. Shockingly, numerous organizations start diminishing system costs before they characterize how the system can be completely utilized to help the business strategy.

Uncertainties in product mix designs and volumes, growing marketplaces, edge objectives, dynamic client administration methodologies, value added opportunities, and product returns and obsolescence are only a portion of the contemplations that are often given minimal consideration or overlooked entirely.

- **Emphasis on Aggregate Profit Optimization.** An expanding number of organizations are making the inquiry: "By what means can my supply chain network & processes be utilized to maximize profits?" It is a difficult objective as markets are volatile in nature. One cannot achieve total profit optimization just by using traditional methods of business. New business models are to be implemented or making a customized business model according to your own business strategy & objectives.

Presently, amalgamations of functional scenarios are critical that drive available network models. After that sensitivity analysis is executed to estimate impacts, in what way a corporation is functioning to improve the critical parameters it practices to drive stockholder value. Certain examples include: EBIDTA, tax effectiveness, wealth engaged, operating expenses, profit margins, working capital and cash to cash conversion.

- **Scheme versus On-going Procedures.** World class business networks are developing as sourcing regulates according to variations or fluctuations. A network joins an on-going procedure that cores around the adaptability or flexibility of the business and safeguards that objectives are fulfilled consistently and over a range of dynamic market conditions while improving the main drivers of stockholder value [3].

3. What is Optimization?

Optimization is utilization of available resources in most effective & efficient manner so as to achieve maximum profit with minimum input cost or investment. It includes:

- Optimal network design: Selecting / formulating a logistics model.
- Lowest cost structure and smooth flow of information among different nodes of supply chain network.
- Assigning demand to manufacturing facilities.

- Locating production facilities and assigning capacity & resources.
- Which plants & warehouse to be setup? How to arrange or organize the network?
- Proper allocation of resources.
- Understanding market dynamics
- Market penetration & smart marketing.

4. Business case studies:

Let us now consider few business problems for instance.

A Marketing manager has to visit top ten business cities in India to create awareness & advertise its products. These cities are Mumbai, Delhi, Kolkata, Bengaluru, Chennai, Hyderabad, Pune, Ahmedabad, Surat and Vishakhapatnam. Distances between these 10 cities are framed in the given table. Find the most optimized route for the manager?

		Mumbai	Delhi	Kolkata	Bengaluru	Chennai	Hyderabad	Pune	Ahmedabad	Surat	Vishakhapatnam
1	Mumbai	0	1447	2056	845	1033	618	120	530	289	1103
2	Delhi	1447	0	1304	1742	1757	1257	1451	946	1156	1376
3	Kolkata	2056	1304	0	1878	1672	1183	2063	2092	2015	764
4	Bengaluru	845	1742	1878	0	290	290	837	1489	1248	1005
5	Chennai	1033	1757	1672	290	0	627	915	1843	1601	798
6	Hyderabad	618	1257	1183	290	627	0	562	1219	973	503
7	Pune	120	1451	2063	837	915	562	0	659	412	1189
8	Ahmedabad	530	946	2092	1489	1843	1219	659	0	266	1259
9	Surat	289	1156	2015	1248	1601	973	412	266	0	1601
10	Vishakhapatnam	1103	1376	764	1005	798	503	1189	1259	1601	0

Solution

- Objective function is to minimize the total distance covered.
- Constraint is that we have to visit one city only once.
- Variable is the sequence or order in which the manager has to move.

Frame the table in MS Excel.

Create another table that would give us the order or sequence of movement between the cities.

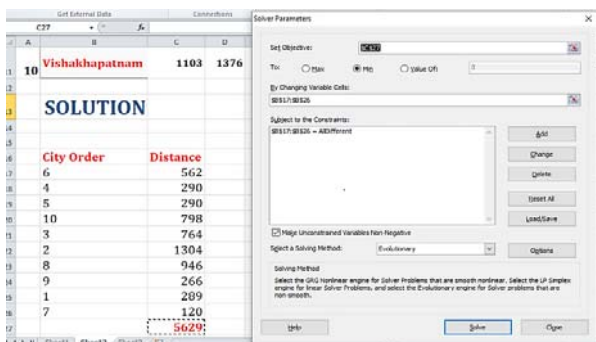
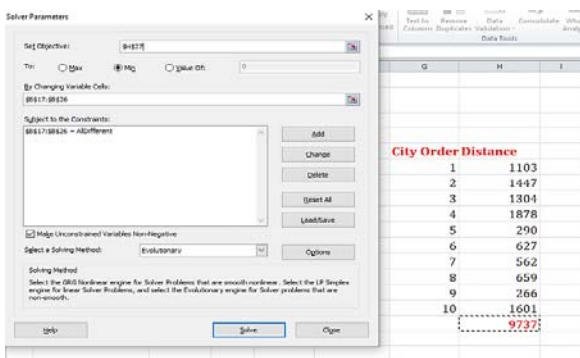
Using INDEX function of Excel- **INDEX (table, row number, column number)**, to create an algorithm to take distance between two cities automatically.

Also using SUM function – **SUM (cell_1:cell_2, [cell_3:cell_4] ...)** to find the total distance manager has to travel.

This cell would be **objective cell** and it has to be minimized.

Open solver tool box from the data tab.

Finally, selecting variable cells, creating a constraint in the solver tool box using **diff**(All different) as manager has to visit one city only once & using evolutionary solver to minimize the objective function.



Before optimization there was no clear rote for the manager, he might move randomly that would lead to useless wastage of time, efforts & money. But after optimization using MS Excel solver, the most optimized distance was **5629 km**.

Using this simple tool- Solver, various business problems can be solved that in turn can save a lot of money & time along with a clear path of movement & effective decision making.

This problem can also be converted into logistics movement or freight movement problem. All you need is to frame the problem in terms of objective function, decision variables & constraints available for that problem. This technique can be applied to different business problems without any specialized costly soft wares.

Let us consider another problem for instance for better understanding the mechanics of how businesses can be optimized using solver.

- A company makes 4 products. It has constraints as labour hours & Production Hours & It has to maximize its profit with given situations fulfilling the monthly demands.

Product	Product A	Product B	Product C	Product D
Profit/unit	₹ 80.00	₹ 110.0	₹ 50.00	₹ 30.00
Labour/Unit(Hours)	0.45	0.4	0.35	0.25
Time/Unit (Hours)	0.034	0.065	0.046	0.26
Monthly Demand	4889	3980	9056	5000

Solution Constraints

- Available monthly labour hours: 8,000.
- Available monthly production hours:2,100
- Don't exceed monthly demand.

Using given data, frame the given problem in excel.

Creating tabs for Production Units/Month, Monthly Profit, labour Hours & Monthly Demand.

Objective cell is the one which gives total profit. Variable cells are the production units / Month of each product.

Putting all this in solver gives us most optimum result that company should produce 4889 units of product A, 3980 units of product B, 9056 units of product C & 4153.4 units of product D to make a max profit of 14,06,322 Rs.

This paper focuses on different aspects of supply chain optimization that can be implemented in order to boost business. Using simplest optimizing techniques for SMEs, that can be easily used by anyone without specialized knowledge & large funds can help this sector to grow at enormous rate. That would help India to out market its Asian & other global competitors [4]

References

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