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

1. Introduction

technologies available.

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 bySaaS& 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 industryobjectives, 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 clearcut, 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 regulatesaccording to variations or fluctuations. A network joins an on-going procedure that cores around the adaptability or flexibility of the business and safeguards that objectivesare 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?

		Mu mba i	Del hi	Ko lka ta	Be ng alu ru	Che nnai	Hye dra bad	Pu ne	Ahe mad abad	Su rat	Visha khap atna m
1	Mum bai	0	144 7	205 6	845	103 3	618	120	530	289	1103
2	Delhi	144 7	0	130 4	174 2	175 7	1257	145 1	946	115 6	1376
3	Kolka ta	205 6	130 4	0	187 8	167 2	1183	206 3	2092	201 5	764
4	Benga luru	845	174 2	187 8	0	290	290	837	1489	124 8	1005
5	Chen nai	103 3	175 7	167 2	290	0	627	915	1843	160 1	798
6	Hyedr abad	618	125 7	118 3	290	627	0	562	1219	973	503
7	Pune	120	145 1	206 3	837	915	562	0	659	412	1189
8	Ahem adaba d	530	946	209 2	148 9	184 3	1219	659	0	266	1259
9	Surat	289	115 6	201 5	124 8	160 1	973	412	266	0	1601
10	Visha khapa tnam	110 3	137 6	764	100 5	798	503	118 9	1259	160 1	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.

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			Mumbai	Delhi	Kolkata	Bengaluru	Chennai	Hyedrabad	Pune	Ahemadabad	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	1485	1248	1005	
	5	Chennai	1033	1757	1672	290	0	627	915	1843	1601	798	
	6	Hyedrabad	618	1257	1183	290	627	0	562	1219	973	503	
	7	Pune	120	1451	2063	837	915	562	0	659	412	1189	
	8	Ahemadabad	530	946	2092	1489	1843	1219	659	(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	

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 **dif**(All different) as manager has to visit one city only once & using evolutionary solver to minimize the objective function.



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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	Product	Product
Product	Α	В	С	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.

	Product A	Product B	Product C	Product D			
Profit/unit	₹ 80.00	₹ 110.00	₹ 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			
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Production Unit/ Mo	onth	4889	3980	9056.00	4153.4	22078.40	
Monthly Profit		391120	437800	452800.00	124602	₹ 14,06,322	
Labour Hours		2200.05	1592	3169.60	1038.35	8000.00	8000
Production Time		166.226	258.7	416.58	1079.884	1921.39	2100
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As we can see that Labour hours are fully utilized & Production hours are almost utilized. Still company lacks to meet the demand of product D by approximately 847 units. Hence the company needs to recruit more labour to fulfil its demands & increase its profitability.

5. Data Visualization & Data Base Management.

"To create architecture is to put in order. Put what in order? Function and objects."

That is a statement from Le Corbusier, one of the best architects of the twentieth Century.

Le Corbusier saw instinctively how to reduce everything to its least complex and most rich structure, in other words into its most simplest & elegant form without sacrificing on what mattered most: the purpose of each creation and how people interact with the space around them.

Data Visualization is particularly similar to design architecture. One needs to start with the objective or function (the trend, specification, pattern, configuration or vital piece of information imparting at a glance), then the user (how they traverse or navigate through the visual representation of data base and interact with the data) and only then the final step: how to make it as simple, clean and rich as possible.

MS excel is used by approximately 75% of companies to create their data base. It has many powerful & user friendly tools like pivot pal that creates visually interactive graphics.

Indian SMEs still lags on data base management, visualization of crisp data & analysing their market performance.



These SMEs can create their own interactive dashboard that would help them to boom their grow rate. Benefits of creating interactive dashboard are as follows:

- User Friendly & easy to use: One of the major advantages of using it is that it can be easily learnt without the need of any specialized knowledge. SMEs can easily summarize its large data base into crisp interactive visual results.
- **Data Analysis:** With the use of excel pivot tables, one can easily handle large quantities of random data in one single go. These tables allow taking a large amount of data from data base and work on it in such a way that one needs to view merely a few data fields. It helps in the easy analysis of market performance.
- Data Patterns: Manipulating data using visual representation helps to find cyclical patterns in the data. This also will helps in accurate data forecast regarding sales & expected profit.
- Smart Decision Making: It creates reports automatically in most efficient way, without expanding long & strenuous hours.

This saves a lot of time & efforts that can be utilized in other ways to grow business.

Also, Visuals give a clear cut idea of the particular situation. It in turn helps in making smart, precise & quick decisions.

6. Conclusion

There are more than 42.50 million, registered & unregistered SMEs together. That's a stunning 95% of the total industrial units in the country .Giving employment to nearly about 106 million, 40% of India's workers. That is next to the agricultural sector. These facts explain inevitable contribution of this sector in the Indian Economy.

Optimizing this sector would lead to a huge boost to the economy, creating new jobs as well as new market opportunities.

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 fundscan help this sector to grow at enormous rate. That would help India to out market it's Asian& other global competitors [4]

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