Resilient Supply Chains: Rocket Science or Common Sense?

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Resilience, what is it really about?

Natural disaster, revolutions and wars, terrorisms, industrial accidents or disputes, supplier withdrawal, strikes … as many disruptions that may occur and put in danger the enterprise performance, especially on its supply chain no longer capable to deliver the right product or service at the right place at the right time. How to face unpredictable events? How to be sure that the supply chain will overcome the pitfalls?
In front of these legitimate fears, many concepts and solutions have been built leading to buzzwords as flexible or agile or robust or resilient supply chains, to new concepts as SCEM (Supply Chain Event Management) or SCRA (Supply Chain Risk Assessment) or RVO (Resilient Virtual Organization) and of course to new software solutions promoting real time information to "anticipate"… when it is already too late. Many enterprises are ready to try any solution to be prepared, and resiliency is often perceived as the ultimate goal.

Going back to definition (found on Wikipedia), resilience is a technical concept from materials sciences to characterize "the ability of a material to absorb energy when it is deformed elastically, and release that energy upon uploading". Below the yield strength characterizing the elastic limit, material will recover its original shape without any distortion. Proof resilience is the maximum energy that can be absorbed before reaching the yield strength and it is depend of the Young's modulus characterizing the slope of the stress-strain curve in the elastic zone.

So the analogy to enterprise or supply chain should be its ability to go back to previous state after a disruption having injected "energy" and grown entropy (i.e. disorder) in the enterprise. Challenge becomes: how can we decrease the Young's modulus to increase size of disruption that can be absorbed with recovery of initial state … after uploading.

But "energy uploading" impact or costs is rarely mentioned in supply chain resilience evaluation. One speaks only about the ability to face disruption without major impact. So very often there is confusion between "robust" (capable to resist to a disruptive change) and "resilient" (capable to absorb the disruptive change in an elastic way and go back to the initial state by uploading the change impact in some way).

Nevertheless is it really sense full to "go back to initial state"? Should the enterprise place all efforts and resources to "go back" or should it take benefit of the disruptive change dynamic to "go further"?

In other word, Dr Rafe Sagarin, marine ecologist and environmental policy analyst at the Institute of the Environment in Arizona, illustrates resilience by "homeowners using flood insurance to rebuild on a flood plain" [1].

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Supply Chains buzzword capabilities

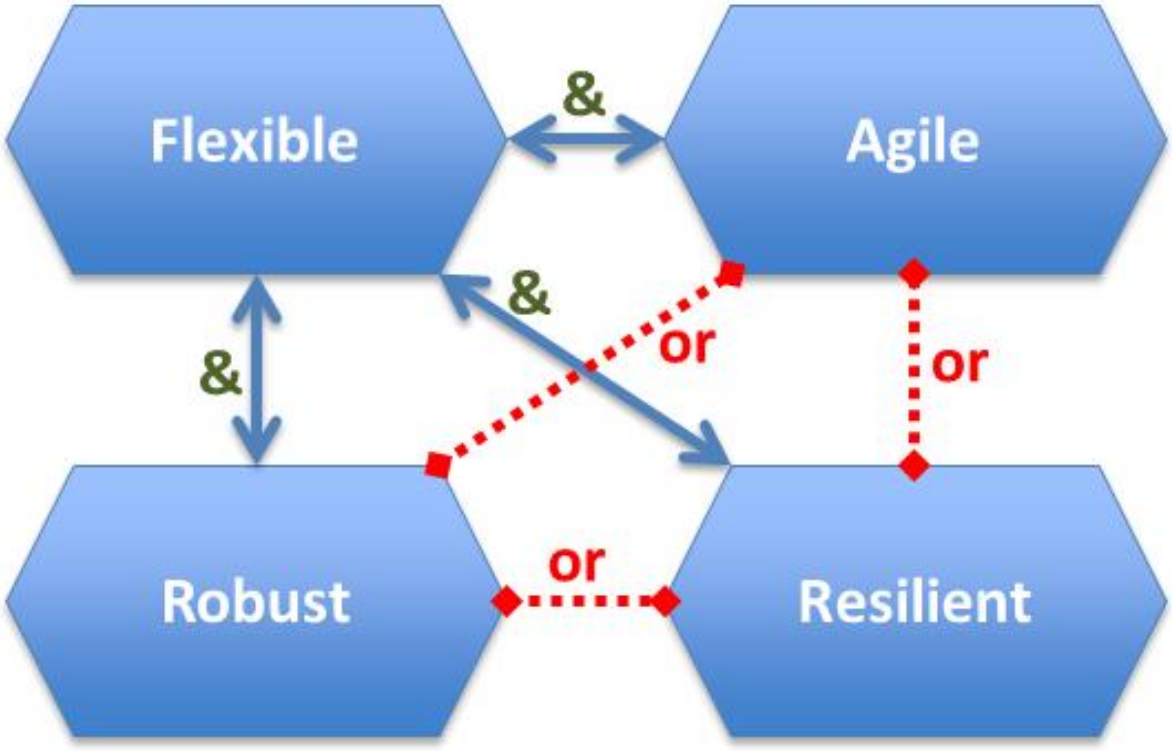
Jan Husdal published on his blog in 2010 a review of how the four most common buzzword linked to Supply Chain (resilient, robust, flexible and agile) are used by different authors [2]. He emphasizes how there are several cases of use, and how resilience is often not standalone but said to be enabled by agility or flexibility or robustness or combination of these, depending upon the different authors.

As an example, Martin Christopher and Helen Peck from the Cranfield School of Management in UK in their research paper published in 2004 on Building the Resilient Supply Chain [3] identify agility as one of the four principles needed to create a resilient supply chains to manage and mitigate risk, together with (re)engineering of the Supply Chain with resilient features, promotion of supply chain collaboration and creation of a Supply chain risk management culture. Agility is then described in terms of visibility and velocity capabilities, to have the ability to quickly respond to unpredictable disruptions.

Jan Husdal then proposes a coherent set of definition for the four buzzwords:

- Flexibility: ability to plan/schedule adaptation to expected changes
- Agility: ability to adapt to unexpected changes
- Robustness: ability to withstand changes without adaptation
- Resilience: ability to survive changes despite suffering severe impact

Can/should a supply chain be the four at the same time? Based on the above definitions, it can easily be understood that only given combinations are existing corresponding to different SC models to serve different enterprise culture/strategy.



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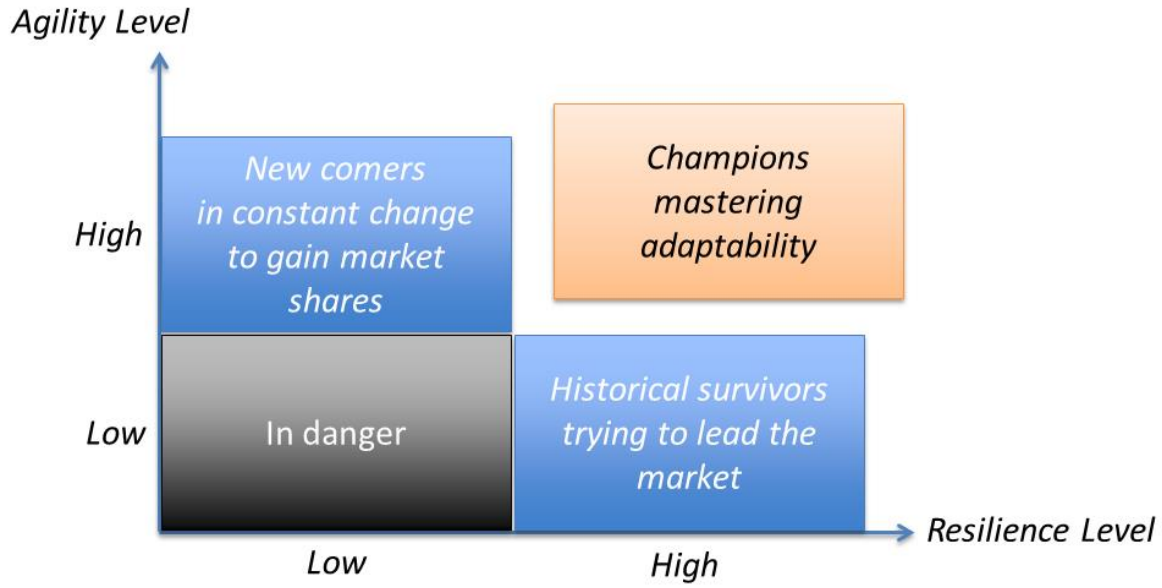
Flexibility is the only characteristics compatible with the 3 others, but you are Robust or Resilient, Robust or Agile, Resilient or Agile. This may explain why flexibility is the most often mentioned needed capability.
A Flexible&Agile Enterprise is in constant adaptation to both expected and unexpected changes, capable to plan its transformation and to react, typical of a startup entering a market with a sound long term vision.
A Flexible&Robust Enterprise is planning everything, is strong enough to withstand any external changes and has the culture of dictating its law to the market … until a severe disruption is making its model fall into parts.
A Flexible&Resilient Enterprise is also planning everything, but with more elasticity when facing severe unexpected disruption, that enables the enterprise to survive, but which prevents it from growing, as it is very often in recovery phases from last disruption!

Erol Gelenbe and Yu Wang from Dept. of Electrical and Electronic Engineering at Imperial College [4] performed a very interesting tradeoff between agility and resilience based on mathematical modelling leading to the conclusion that they are contradictory properties between agents of the two concepts. Agents can be populations, companies, military units or even software code, and major disruptions are represented by viruses. Agile agents are destroyed by viruses but manage to escape by being in constant movements and/or attack the virus prior to be attacked. On the opposite, resilient agent are immunized to viruses and thus manage to survive when being attacked, but they are too slow and predictable to be successful when themselves attacking the viruses.

So how can one resist to major disruption and even take benefit of them? Agility or Resilience alone is not sufficient, and both are said to be incompatible!

Adaptability: the ultimate Supply Chain capabilities?

Dr Rafe Sagarin gives us a trail when explaining that life is not about going back to previous state, but in fact about continuous change and adaptability to external disruptions: “Life is about solving problems as they occur” [1].



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Joseph McCann author of a book on "Mastering Turbulence in Teams and Organization" intuits similar conclusion by considering Agility and Resiliency as the "two sides of a single coin called adaptive capacity" that are mandatory to "master turbulence" [5], but he does not link directly the adaptability capability to the problem solving capability.

Focusing on solving problems may seem obvious… but enterprises and managers do not like "problems", they like "solutions". How often are solutions implemented just because they are said to be "best practice", "best of breed", "opportunities" or "hype topics"? Prior to solution implementation, was it carefully investigated which "problem" this solution would help to solve? And last but not least, has the enterprise a sufficient analysis of its problem root causes?

One of my favorite illustrations is a MRO Claim Department manager that was very proud to show all the implemented solutions to increase productivity in processing claims… but without a single word on actions to be undertaken to decrease the number of claims.

Identifying and understanding the faced or potential problems is thus the most important aspect of the adaptability capability, to focus on the right issue and define in which direction one has to change.

So in conclusion, one can say that "resilience", in the sense of taking benefit from major disruptions, is about the capability to analyze the occurring/expected problems and change towards a better stage, but not necessarily about going back to the previous stage.

Back to common sense

In a stabilized ideal world or environment, without any unpredicted events, SCM is not even needed once the network has been designed, as material flow goes smoothly from supplier's supplier to supplier to plant to distribution center to customer, along predefined rules and procedures. It corresponds to a "laminar flow" state.

But in real world, problems or "turbulence" occur all the time with unexpected demand, capacity losses (shut down or strikes), product loss or damages, late deliveries from suppliers, over consumptions of production, unrespect of production plan, … not even speaking of natural disasters. All these turbulence can induce to some point a transition from laminar flow to chaos with unpredictable behavior. The issue is thus to capture signal of these "turbulence" or problems as soon as they occur to solve them before they induce an unstable stage.

Based on nearly 20 years of observations in various industries, from MTS (Make to Stock) to ETO (Engineer to Order), on both discrete manufacturing and process industries, I have built my convictions that problem analysis and problem solving in supply chain arena is very often relying on common sense:

1. What are the decisions I should have been capable to take to prevent the problem?
2. Are appropriate processes in place to give me the required information level to take on time the right decision?
3. Does everyone in the organization understand his/her role and contribution to these processes?

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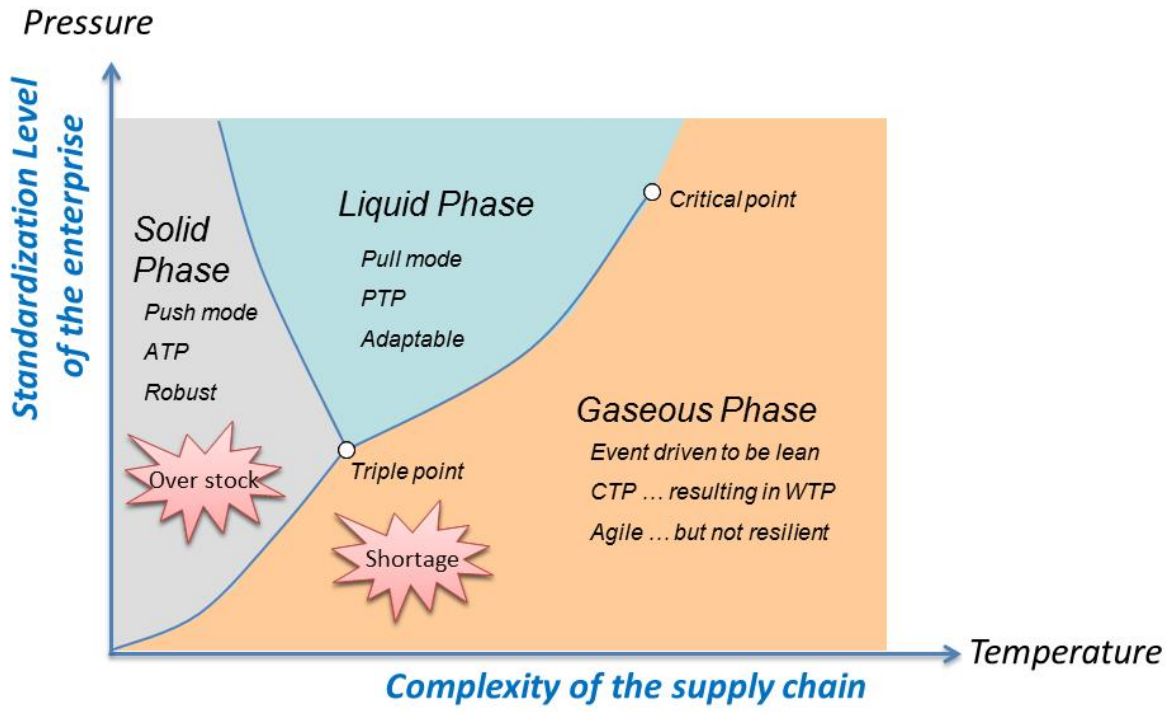
Easy questions, that everyone from workshop to top management can understand, even if not being a supply chain expert. It is neither about reengineering nor ERP or APS deployment. It is basically about aligning the actors for efficient decision making. But many enterprises still face large difficulties in doing it.

It is not our intention to analysis in the rest of this presentation, why it is so complex, but to illustrate some "common sense" recommendations based on our experience.

Inventory: to be taken as a stabilizer

Considering that supply chain consists basically of different flows (material, information, cash and risk), analogy to fluid dynamics is straight forward.

In 2008, I investigated the different states of supply chain using a simplified phase diagram (T,p) [6]. "Pressure" is considered to be the level of standardization or structuration of the enterprise that contributes to constraints the supply chain. "Temperature" corresponds to the level of complexity of the supply chain in terms of number of actors that increases the risk of contradictory objectives and thus increased unrest of the chain.



The Solid State for a supply chain would corresponds to a traditional logistics centered on the enterprise with few actors and thus little complexity but many redundancies and safety buffers, resulting in a static supply chain, working in push mode with ATP strategy (Available to Promise) and often overstocks.

The Gaseous State can be observed in extended supply chain with many actors and real time information extensive exchange, but few regulation or stabilization processes. It often induces over reaction and high sensitivity to any disturbances. Strategy is to integrate the chain to minimize

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inventory levels and perform CTP (Capable to Promise), but in fact it results more into "WTP" (Wish to Promise). Lean supply chain tends to distend and weaken the chain, being very agile but not resilient with high risk of total vaporization….

The Liquid State is capable to manage several actors while having structured the processes to ensure stability. PTP (Profitable to Promise) becomes possible, tradeoff between stock and service is supported by the pull mode, and supply chain is both stable and adaptable.

The next step is to master the speed of the liquid. The more "rapid" the flow and "thin" the pipe, the higher is the risk of unexpected turbulences leading to chaos. Buffers are thus key to "stabilize" the flow and benefit has to be taken from inventories at appropriate decoupling points.
Since 2009, chaos and non-linear dynamical system theory are used to model and understand complex manufacturing flows and try to prevent non linearity and instability of the flow. The idea is to have a simple way of assessing the Reynolds number of a given supply chain, to evaluate when there is a risk of transition to chaos. Several scientists have started to investigate that field as Pietro Romano [7] and Johannes H. Schleifenbaum [8], supported by extensive modelling, that we will not further discuss in present paper.

Reynolds number (Re) represents the ratio of inertial forces to viscous forces: laminar flow occurs at low Re whereas turbulent flow occurs at high Re. Thus for a flow in a pipe:

$$Re = \frac{Mean\ velocity\ of\ the\ fluid\ x\ Hydraulic\ diameter\ of\ the\ pipe}{Kinematic\ viscosity}$$

In a simplistic but intuitive way, let us consider following analogy to have a dimensionless ratio:

Mean velocity = Speed to deliver (total cycle time / committed lead time) to assess supply chain velocity, i.e. how reactive I can deliver my customers, considering the total time that is needed to go through the extended supply chain

Hydraulic diameter = SC size (total number of SKU / number of finished goods) to assess the supply chain scope

Kinematic viscosity = Inventory speed (total coverage / total cycle time) to assess the inventory level taking into account the total length of the supply chain

Thus:

$$Re = \frac{\frac{Total\ cycle\ time}{Committed\ lead\ time}\ x\ \frac{Nber\ SKU}{Nber\ FG}}{\frac{Inventory\ coverage}{Total\ cycle\ time}} = \frac{Total\ cycle\ time^{\,2}\ x\ \frac{Nber\ SKU}{Nber\ FG}}{Committed\ LT\ x\ Inventory\ coverage}$$

If complexity is increasing with more SKUs or if committed lead time to customer decreases, Re will increase unless inventory coverage is also increased to stabilize the flow. If supply chain is extended by including additional actors (outsourcing strategy, multitier scheme) or by far sourcing, and inventory is expected to stay the same … Re will increase power 2 and instability may occur.
On the opposite, any action leading to a total cycle time reduction will enable to decrease inventory coverage power 2, and standardization on component to decrease SKU number will also enable to decrease inventory level.

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So the problem one should seek solving is not to reduce inventory, but to balance inventory in the appropriate way and to position it at the best place along the supply chain to increase reactivity and mitigate risk.

By demonstrating this global approach, we convinced Finance Managers of a train manufacturer enterprise to better balance inventory objectives between Component and Integrator sites: the Component site inventory target level was increased, while the Integrator site inventory target level was decreased and the frozen horizon between the 2 sites was revised from 3 months to 2 weeks. This enabled to limit bullwhip effect when end customer demand fluctuation occurred and to decrease the global inventory level of the enterprise.

S&OP: to be tailor-made

S&OP (Sales and Operations Planning) or SIOP (Sales, Inventory and Operations Planning) is not a new concept since Dick Ling from Oliver Wight first described it in 1987 according to the historical review made by A. Coldrick, D. Ling and Ch. Turner from Stratabridge in 2003 [9]. Many skilled professionals and researcher have written on that topic as Tom Wallace and Bob Stahl.

But in 2003, AMR announced that S&OP was still to be invented [10], in 2007 Aberdeen published a Research Brief announcing that despite 92% enterprise claiming having implemented a S&OP, only 62% considered having taken benefit of it [11] and in 2012, Aberdeen reported that 56% of companies outside Best-in-Class do not have a formal S&OP in place [12]…

As of today, S&OP pertinence is not questioned by anyone and understood as part of the enterprise governance process. S&OP is recognized as the tactical process enabling to align all the actors of the extended supply chain to synchronize their capacities and serve as a “drive belt” between the enterprise strategies and the operational capabilities. So why this key process is not yet deployed and mastered by all companies after more than 25 years of existence?

Back in late 90’s, when S&OP concept was not yet so common in Europe, we were facing less difficulty to implement capacity planning processes in the enterprises. At that time, very few enterprises asked for an “S&OP process implementation”, but they were asking us to “solve their capacity bottlenecks resulting in service level issues”. By brainstorming on the capacity issues and on the type of decisions to be taken at various horizons, appropriate long/medium/short term planning processes were defined to anticipate the needed capacity levels. It was in fact easier than today, as no “off-the-shelves” solutions were preventing us from thinking!

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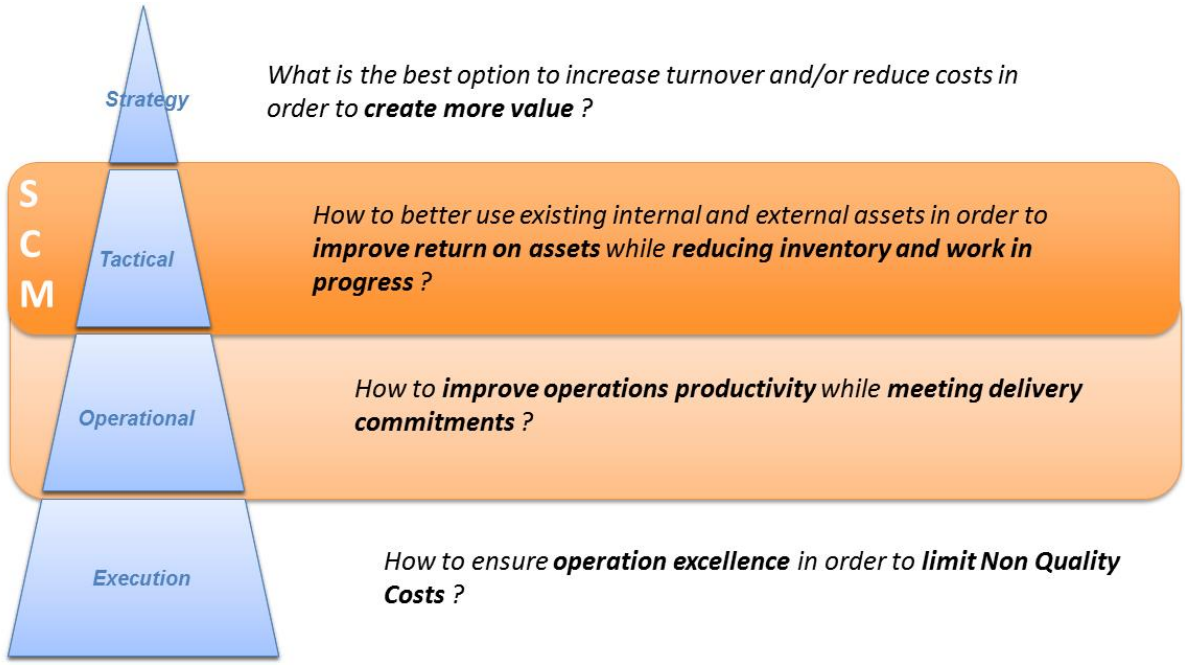

Return on experience is that designed planning models were all very different depending upon the enterprise, as illustrated hereafter.

A traditional ceramics sanitary furniture manufacturer was faced to the problem that the mold for a shower tray has to be used nonstop 100 days to produce every day 1 single piece, called a "raw", that has immediately to be painted and cooked to become the finish product, with batch constraints on the colors. Dilemma is thus: "For an order of 100 pieces of an exotic shape with an exotic color …. Shall I install 100 molds to produce the batch on day 1, but what shall I do with the 9900 remaining pieces (100 molds x 99 days) or shall I have 1 mold to produce the 100 pieces and find other shapes requiring the same color, or shall I refuse the order!" The company was used to sell what was on stock (typical after-war reconstruction market logic), but was now facing increasing competition and customer requiring specific products.

Developed planning strategy was:

- Medium term: forecasting and capacity planning performed at "shape" level to define the mold strategy on next 12 months, the installed molds becoming the frame for order intake and a constraints for production plan, as a "raw" piece has to be immediately colored and cooked (no possibility for semi-finished inventory)
- Short term: allocation of the "raw" pieces first to the colors of order portfolio, second to the replenishment need for colors hold on inventory and third to "white" which is the high runner.

This approach enabled to secure the mold investments, to give better visibility to Sales for order acceptance and to conciliate MTS and MTO productions.

Stakes and challenges for a flat steel manufacturer are different. At each step of production, the product can either be a semi-finished product to be further transformed or a finished item to be sold. Objective is to saturate all steps of production including the last one as galvanization. Question is thus at each step "shall I store or shall I further transform". The developed capacity planning

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model consisted in a simulation tool of the load versus a mix scenario, to provide sales forces with indications on what is profitable to sell.

Highly seasonal businesses as skiing material have to anticipate production up to 6 months before assortments/collections have been validated by customers and have to manage both very high runners and very exotic items. Initial strategy was to produce in advance “30% of everything and 100% of the C reference to have a full batch and free up capacity for the high runners in the distribution season” … but the 30% or 100% may result in 0% in case the product becomes a blockbuster or dead stock in case the product is not selected by the retailers! So new strategy was to ask Sales people, 6 months prior to collection selection, the items they were sure to sell (renting models, basic models) to saturate production capacity and thus free up the capacity in high season to produce the high value products in small series based on customer selection and first orders.

These three illustrations have been selected to demonstrate that it is not a standard solution, but the answer to a qualified issue that enables to solve the problem faced by the enterprise. Defining and implementing an S&OP process that will bring value to the enterprise thus requires first to understand the enterprise challenges.

Supply Chain Model: one fits not all

MTS (Make to Stock) production model that applies in most of fast moving consumer goods, automotive and pharmaceutical industries, has been extensively investigated and documented. Numerous concepts have been elaborated and tested as MRP, JIT, CPFR, DDMRP… It may seem complex due to the very rapid takt time and large series number, but in fact for those having experienced MTO (Make to Order), ATO (Assemble to Order), CTO (Configure to Order) or ETO (Engineer to Order) … it looks quite predictable and easy.

How many professionals from automotive industries have failed in trying to force their way of working in small series businesses? But music player experienced that very slow takt time is more difficult to achieve accurately then a rapid one.

Let us try to apply the Re analogy. Below figures are only orders of magnitudes based on average order of magnitude we observed:

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	MTS business Automotiv T1	ETO business Heavy Equipement
Total Cycle Time	3 months	24 months
Committed Lead Time	1 week	24 months
TCT / CLT	12	1
Total SKU Nber	5000	50000
Finished Goods Nber	500	10
SKU / FG	10	5000
Inventory coverage	1 month	12 months
Inventory / TCT	0,33	0,5
Re	*360*	*10 000*

Despite low takt time, heavy equipment industries corresponding to small series businesses are much more complex than repetitive manufacturing, and risk of transition to chaos in the Supply Chain is critical.

Based on our experience we will now review the main challenges for the xTO models and propose some food for thought.

MTO: Make to Order

Enterprises having developed a wide range of products corresponding to customer specific requirements cannot afford to hold on stock all the potential finished product and will prefer MTO model. Issue is then to have the capacity and components available when the customer places an order in order to limit the committed lead time to the manufacturing cycle instead of the total cycle time including the supplier lead time. S&OP process is thus key to anticipate the needed capacity level and consumption forecasts on components must be established based on historical consumption and mix evaluation. The Customer Service performing the order entry process must also be capable to assess based on information provided by Planning what is feasible to secure the on time delivery level. It has thus to rely on a sound CTP (capable to promise) process. Execution must be accurate and reliable to achieve what has been committed, as there is no buffer stock. In case of late deliveries, rescheduling is mandatory to assess the effective level of free capacity that can be used to take new orders while catching up the backlog.

A fasteners manufacturer for Aerospace industry had a very poor service level (less than 65%) and launched a brainstorm on how to improve his service level over 90%. The enterprise strategy was to have no stock (pure MTO), to make no investment on capacity and to take all potential orders with the lead time asked by the market … so basically he was operating in WTP mode (wish to promise), that was intrinsically incompatible with his service level improvement target. Recommendation was thus to either restraint the order entry based on existing capacity level, or to increase significantly the capacity level to be constantly oversized, or to work on standardization of the process to enable

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anticipation of rough machining and build stock on these, … or to deal with the poor service level and work with the Aerospace customers that very often also delay their needs.

Additional challenge is that often enterprises are managing both MTS and MTO at the same time. Capacity reservation has thus to be taken into account into the MPS (Master Production Schedule) for the MTO volume and production of finished goods hold on stock will serve as a regulator to saturate capacity or to free up capacity in case of strong MTO demand fluctuation. Ease to say, but often not well managed.

ATO: Assemble to Order

Standardization at the engineering level enables some enterprises to build the different products or solutions as an assembly of standard semi-finished goods or sub-assemblies that are made to stock. It enables to reduce the delivery lead time and to better balance the production on the sub-assemblies items.
A delivered product will thus use MTS for first step producing the sub-assemblies and MTO for the last step of production. This approach is close to late differentiation techniques, and challenge is then to perform the MPS at the right level, i.e. on the sub-assemblies, with a FAS (Final Assembly Schedule) for the last step of production.

In case of project driven heavy manufacturing, like in gas turbines, several projects are competing for the same resource: engineering for design phase, sub-assemblies as blades, assembly lines or plot for the turbine. Current observed bad practice is that the project manager shouting the most will get the resources … Thus ATO model requires implementing a project portfolio management process to enable arbitration between the different projects, thus customers, in order to maximize profit of the enterprise by allocating the bottleneck resource to the project bringing the most profit and/or having the best chance to be completed on time.

CTO: Configure to Order

The CTO model (Configure to Order) is similar with ATO, but engineering phase is shorter as based on a configurator and usually projects are smaller. To get full benefit from a CTO model, the challenge is to be capable to have an on line configurator to support the order entry process and have in fact the customer “designing” the solution he wants. Best example is in computer industry, but it is also developed for other medium size equipment as pump and valves.

ETO: Engineer to Order

We will focus on heavy manufacturing ETO enterprise as train and aircraft manufacturers, shipyards, power plant equipment manufacturers, construction sites, manufacturing units or handling facilities manufacturers. These enterprises are project driven and customer specifications often require tailor-made solutions: it ranges from small series to unit production.

Small series are most of the time produced on a FAL (Final Assembly Line) inspired from automotive industry that is moving the product between different positions to optimize the foot print for all the

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material to be mounted and balance the workload to ease the access to the product for the operators. Unit production is usually on plot or even mobilizing an entire workplace as for shipyards.

Resources are allocated between the lines and specific skills usually work on several lines at the same time. As described for ATO, one of the challenges is to arbitrate on the resource allocation between the different projects, in a more subjective way then just based on the shouting capability of the project manager. So project portfolio management in line with a global S&OP process is key.

Additional challenge for these supply chains is the synchronization of all the flows to be capable to deliver the finished product: 1 part over 5000 can block the delivery. Critical process to be put under control is thus Missing Part Management, which consists in both anticipating/preventing any missing part and reimbursing them to the line if they finally are missing. This process relies most of the time on excel analysis and daily communication with the shop floor and the suppliers, due to the lack of accuracy of data in the ERP. Engineering Change Management process is also critical to evaluate the impact on the material availability.

Order portfolio gives visibility on a large horizon … but many things can change before the horizon is reached, which induces high level of fuzziness in the visibility.

A turbine and generator manufacturer had implemented an ERP with MRP concept “to procure in Just in Time and thus decrease inventory”. But operational were complaining of the resulting additional workload bringing no added value, and they continued to follow the project material procurement under excel spreadsheet. Were operational resistant to change or was there claim legitimate? This enterprise was pure ETO base with very little standardization … so most of the material was ordered only on a spot base, and never reordered. First year led to over 40 000 SKU creation, with similar volumes anticipated for the coming years. Standard lead time per commodities had been defined to speed up the item sheet creation, but as BOM creation was often late and the MRP could not order in the past, the planned order was positioned after the need date by the system. So the planner had to re key manually the real need date in the system or to give to the Purchaser a separate file with the correct need date to conduct the supplier selection. So basically the MRP concept was not appropriate for their type of business and a shared excel spreadsheet was far more efficient to follow the material availability

Lesson learned is that xTO type of businesses requires careful evaluation of the problems to be solved, to assess processes to be implemented.

Supply Chain Management: part of enterprise governance

The word “Governance” was inherited in the XIV century from the French word “Governance” used to designate the action of governing. It is defined by Jan Kooiman in his famous “Governing as Governance” book in 1993 as a “process of interaction between different societal and political actors and the growing interdependencies between the two as modern societies become ever more complex, dynamic and diverse” [13].

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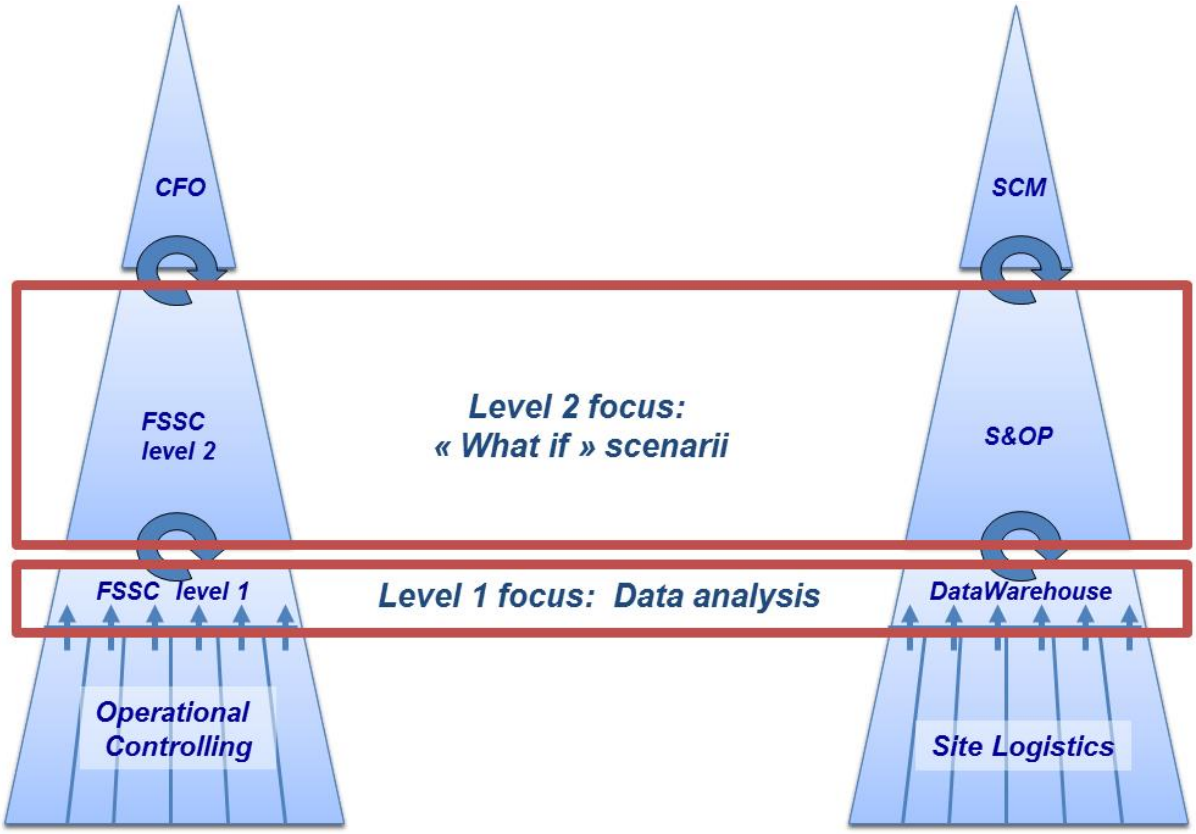
The enterprise being a societal-political system in itself with various actors interacting, S&OP process has to be considered as part of the governance process of the enterprise to better anticipate market evolution impacts and related risk issues.

But SCM functions, that are leading the S&OP process, still face some issues to be positioned at the right level in the enterprise. The Supply Chain Manager should be at same level as the Operations, Sourcing and Sales managers to act as a referee, but it often a level lower, under the CEO.

Brainstorm will CFOs and SCM conducted by Decision Value and Consulting Approach in 2010 on Financial Shared Service Centers, led to the conclusion that Finance and SCM share common objectives and needs.



FSSC initiatives have started with the transactional level (level 1) in charge of producing financial data and reporting by consolidating the information from controllers to ensure transversal visibility. Next step for FSSC is to position themselves on the decisional level (level 2) to support the enterprise with the appropriate “what if” scenarii evaluation. Thus after having “outsourced” the level 1 to external partners and the information systems to the IT department, more and more CFOs are re-insourcing the level 1 to master the data and the system evolutions in order to achieve what FSSC level 2 requires.

Synergy with SCM department is obvious:

- SCM needs transversal visibility, and could benefit from the FSSC data basis
- S&OP is (or should be) a “what if” process

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So our brainstorm ended in 2010 with the quite provocative question of why not positioning the SCM under the CFO? This would guaranty a neutral position between operation and sales, and would ensure SCM recognition in the enterprise governance process.

Conclusion

Ancient text Yi Jing (Book of Changes) announces: "The only fact that will never change, is that everything is on constant change". Champion enterprise is thus the one that achieve to master adaptability in order to make an opportunity out of any disruptions. Supply chain management is a key asset to enable enterprise adaptability.

Is it rocket science? Yes and no. No, because it is essentially about applying common sense to identify the real problems to be solved. Yes, because inappropriate solutions are often imposed before the problem has been correctly assessed, so it feels like rocket science to resist to it.

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SPEAKER PROFILE

Sonia Daviaud holds an Engineering degree from Ecole Centrale de Paris (1986) and a Doctorate in Physics (1989) from Paris VI University. She started her career as a Project Manager in a high-tech engineering company developing payloads for research in microgravity and medical devices. She has consulted in Logistics and Supply Chain and has acted as a senior executive in large consulting companies such as BearingPoint (formerly Arthur Andersen) and Accenture.

She started the company Decision Value in Paris (France) in November 2008 to offer high-value niche consulting services in supply chain to companies. Sonia occasionally teaches supply chain at Masters level and is currently serving on the Board of APICS.

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