

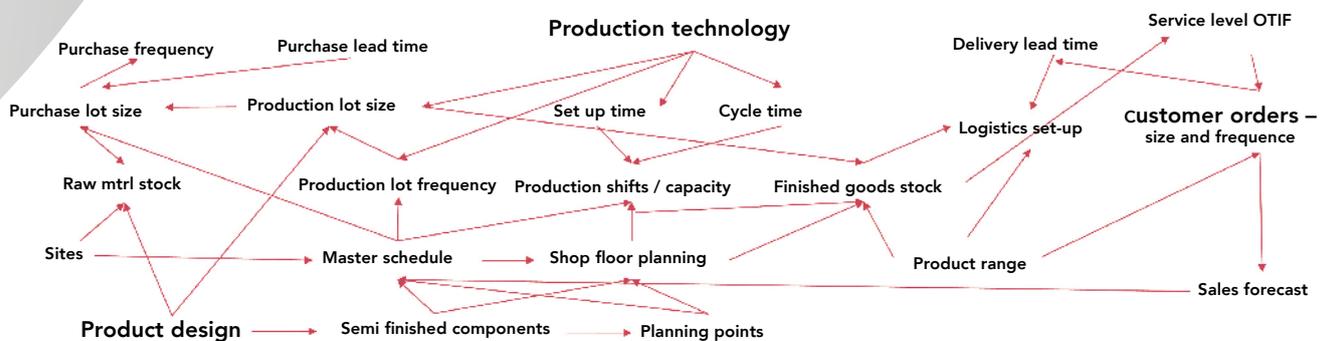
Supply Chain Set Up

Choosing your Supply Chain Set Up

When working with companies in different industries and different countries, we frequently encounter supply chains that are not setup optimally for the company's business situation.

We have seen examples where tied up capital could be reduced by as much as 50%, or through-put time reduced by 40-80%, just by selecting a supply chain design that is better suited to the business environment. And this, within the framework of the company's existing MPS system, and of course, without harming promised service levels!

How you should configure your supply chain depends on the demands and limitations set by your customers and suppliers, logistic options, the structure of your markets, available technologies, product architecture, investment capacity e t c. The effect of all these factors is what makes the "best" configuration of your supply chain a complex, multifunctional, challenge. The continuous development in this field also makes it a moving target.



Setting up the supply chain is a multi variable optimization that has no perfect answer!

Despite all this, we will try to address the subject from an overall perspective. There are a number of reasons why a supply chain set up can be unsuitable for a business, but IT/MPS “solutions” that actually limit possibilities and complicate reality, cause a lot of harm. An example of this is when systems have been set up based on Material Requirement Planning (MRP), irrespective of the business environment. MRP is the IT-supplier’s dream, as it confirms the need for adaptation. In contrast, a Re-Order Point (ROP) system can be a more suitable, simpler, choice and requires less special adaptation – and is frequently overlooked (at least by your IT supplier...). Both MRP and ROP are explained further on.

Another obstacle can be that organisations tend to stick with how things have “always been done” – especially if you haven’t experienced how other companies have approached a similar situation.

The following is mainly based on examples from manufacturing processes, but in most cases, these are fully applicable to administrative processes.

What do we mean by the Supply Chain?

When referring to the Supply Chain, we include:

- Supply of materials and/or services and supplier interactions
- The internal value adding processes; layout, choice of technology (e.g. automation vs manual), stocking points (internal and external) and MPS-systems
- Delivery to customers and/or own sales companies
- Product development and, especially, creating a product architecture that has a positive effect on the supply chain via commonality, carry over, modularisation etc

When should you consider reviewing your supply chain set up?

This is usually necessary if there has been a significant change in technology in your manufacturing process or of your product, or if market requirements have changed. However, other indications are that you are experiencing:

- An uneven capacity utilisation
- Capital tied up in inventory greater than 20% of production value
- Lead times exceeding 50 times process time
- Productivity improvement lower than 5% per annum

What should you consider when re-assessing your supply chain set up?

There are four main areas where you want to see improvement:

EXTERNAL

- Meeting market/customer requirements regarding **delivery time, or delivery options**, plus the **service level** (OTIF – On Time; In Full)
- **Offering what customers value¹⁾** – i.e. what they are prepared to pay for – in regard to customisation/customer adaptation/differentiation of product and services

INTERNAL

- Effectiveness and efficiency via better **capacity utilisation**. This involves planning changeovers to minimize the total changeover time (# of changeovers x time).
- Lowest possible **tied up capital** in raw material, work in progress and finished goods.

As we said earlier supply chain setup is an area where there is no perfect solution. There are, however, many other methods to improve supplychain efficiency that are “always good” and worth pursuing regardless of your chosen supply chain set-up! Examples are working with OEE (Overall Equipment Efficiency) to optimize the available production time, trimming the throughput time, or cycle time, to improve output per hour in production, and SMED (Single Minute Exchange of Die) to minimize the scheduled time for a changeover e t c.

How do we go about re-assessing our supply chain set up?

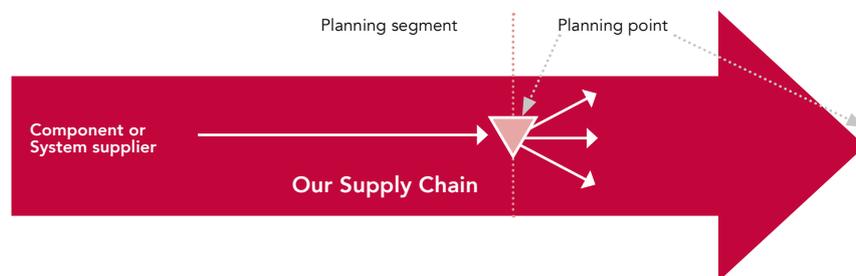
There are several different areas that you need to consider, and the importance of each of these will vary depending on the industry in question. However, it is vital that the different areas are **integrated**, and that they support each other. You also need to steer clear of sub-optimisation and internal politicking, or other personal agendas.

A) Product design. You should strive towards making customer adaptations as late in the supply chain as possible. This allows you to achieve economies of scale in the beginning of the chain via standardisation, i.e. few variants of material and components, and benefit from shorter changeover times later in the chain. There are different approaches to this:

- **Commonality**, i.e. using the same components in different finished products. This delivers both economies of scale in e.g. procurement, production, and lower tied up capital, as flexibility is maintained as late as possible in the supply chain.
- **Platforms** provide economies of scale in e.g. R&D and production and allow late differentiation.
- **Modularisation** is similar to using platforms. By using combinations of standard solutions, customer adapted products can be created in a cost-efficient manner.
- **Carry over** is another method, i.e. using solutions from an earlier product generation in a new product.

B) Choice of manufacturing technology. The objective is to achieve the lowest total cost considering effects on fixed and variable costs. Automation leads to higher capital costs and, often, longer changeover times when compared to manual solutions, but results in shorter cycle times. The optimum level of automation depends on what volume per product that can be expected, e.g. via standardisation of components, and the flexibility of the automation solution allowing more, or less, frequent changeovers.

C) Layout, inventory and planning points. The supply chain layout includes planning segments with planning points in between.



Usually, you need to split the supply chain into different segments to reduce complexity. MRP-solutions, however, attempt to address the whole chain at once and, if possible, plan the whole flow based on forecasts of finished products. This often fails due to unforeseen fluctuations, such as shortages caused by low forecast accuracy, machinery breakdowns, absence, late delivery of components the list is long! This is where the human brain with its cognitive, creative and problemsolving capacity is, so far, superior to IT systems. IT systems are unbeatable when it comes to handling large volumes of data, but as soon as there is an unforeseen disruption, they are as thick as a brick.

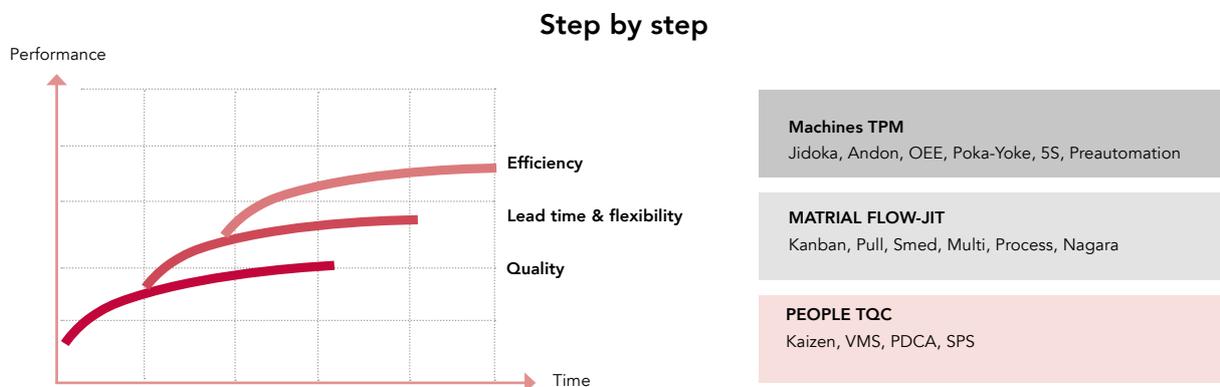
Within a suitable planning segment, you should try to integrate operations as far as possible in cells or lines e.t.c. Normally, intermediate stocks are then positioned at the planning points between the segments. For the production flow to run smoothly you need to achieve predictability, and to do this the QLE-principle is worth highlighting.

QLE – and how to select the optimal planning points

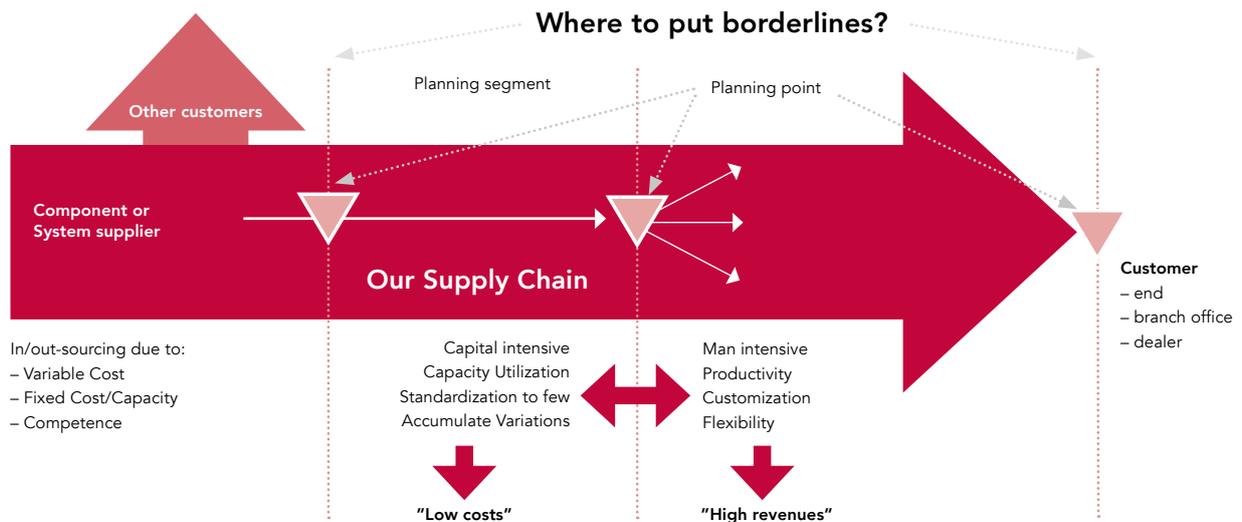
There are some learnings from the Lean/Toyota Production System that are worth reflecting on:

1. Encourage a high level of self-criticism, nothing is swept under the carpet. In other words “**love problems**”!
2. Strive for **Perfection!** Right from me! Right first time! Zero deficiencies! Poka Yoke (“inadvertent error prevention”)!
3. When lead times, quality and quantity are predictable, you can create continuous flows (lines, cells, e t c) without needing quality controls or detailed planning. Throughput time and intermediate stocks are reduced to a fraction of what they were.
4. Waste, and every disruption, now become obvious and can be dealt with in a systematic way.

This is the QLE principle (Quality, Leadtime, Efficiency). First, you need to secure process **quality** and that means that you can attain **predictability**. Then shorten **lead times and/or increase flexibility**. Not until this is achieved, can you expect to achieve real efficiency. Reaching this level takes time and requires persistence. When you see how truly successful companies have configured their supply chains, you realise that this is the result of an unwavering effort over a long period of time.



Getting back to the issue of relevant planning points the first question is: What delivery service level does the market demand? Are we talking about over-the-counter delivery or can the customer wait for us to design the product, purchase the materials or components you need and, finally, manufacture the product? Normally, you end up somewhere in between, i.e. with a short throughput time and components in stock, you can assemble the product to order.



As explained earlier, you usually want to place stocking points as far back in the chain as possible and then, based on the number of product variants, determine where the explosion of variants takes place. You want to create customer adaptation as late as possible in the supply chain and that is where you position a stocking point. Where you place your planning points thus depends on requirements on delivery time, economies of scale and what the product architecture allows.

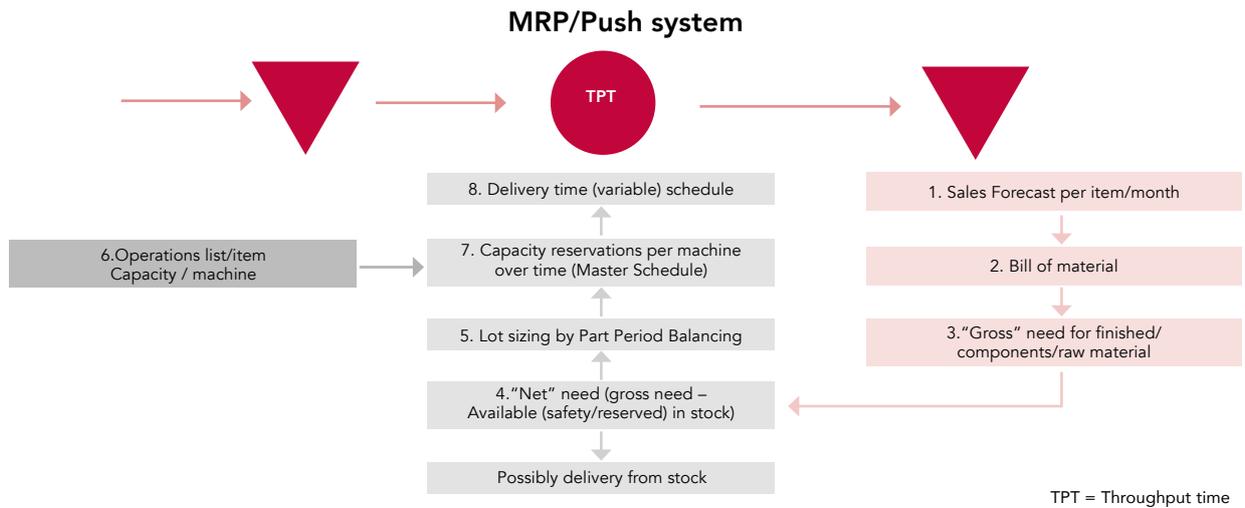
What are the differences between MRP and ROP?

As mentioned earlier, the set up of the supply chain is often a consequence of the selected set up of the MPS system. Today, most IT/MPS systems can be set up either in "Push" or "Pull" mode, but usually the default setting is Push, i.e. MRP.

PUSH/PROACTIVE/MRP

Push/Proactive systems use MRP (Material Requirement Planning) systematics. These systems are based on per item forecasts from sales companies, or firm orders, for planning future production and rawmaterial demand. With the help of BOMs (Bill of Material) and operations lists (operations sequence, what machines, cycle times etc) a Master Schedule is calculated. As long as there is a forecast, material is purchased and production is started, whether you have customer orders or not.

As a consequence, if the forecast is wrong for just a few customer items (using the same materials as customer items for which the forecast is correct), this tends to create variable delivery times. Delivery times can then range from very short, if there currently is an over production with large stocks, to very long, if you need to order long lead time materials before production can start.



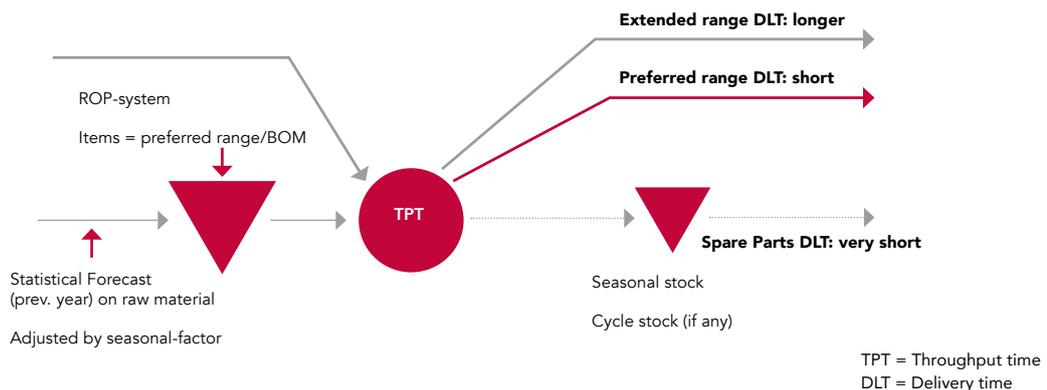
Since **MRP** tries to take care of all planning (capacity, order and shop floor), at the same time, and is based on firm orders + detailed forecasts at individual item number level, MRP works well when you have:

- A stable/predictable end customer market
- A long order backlog
- A limited product range
- A short throughput time in production
- Short lead times from suppliers
- Customers that accept varying delivery times

PULL/REACTIVE/ROP

The other main philosophy – as discussed above – is what is called a Pull/Reactive system. It is set up based on ROP, Re-Order Point, named after the key parameter in the setup – “The Re-order Point”. The simplest example of a ROP setup is the kan-ban system with two trays, where a new tray is ordered when the first is empty.

Here you react to real demand (customer orders or a drop in the inventory level). Of course, forecasts are also used, but these are mostly statistically based forecasts (based on what has happened in the past). These forecasts can, and must, be adjusted if you have reliable knowledge of events in the market place that change the assumptions, but only at an overall level.



Re-Order Point (Pull) based systems, will normally work better than MRP if you have:

- Fluctuations in the end customer market, both total volume and by individual item numbers
- A large product range
- Supplier lead times that vary
- Supplier lead times that are longer than a reasonably predictable market forecast period
- Customers that want short and fixed delivery lead times (given the same level of tied up capital!)

A Pull system means never pre-producing or over-producing – just meeting actual customer demands. By holding intermediate stock of a limited number of standardised components, or raw materials, at suitable points in the supply chain, you can then be ultra-fast in the later part of the supply chain where customer adaptation takes place.

We should add that it is possible to create a mix of ROP and MRP solutions, especially if a company runs a large supply chain where the conditions are different in the different parts of the group. Some companies also make MRP set-ups using “forecast orders” to initiate purchases, but only start production when these forecast orders are manually turned into “real customer orders”.

HOW TO FINE TUNE A ROP SET-UP

A ROP setup also enables the use of capacity frame planning and range management to solve two supply chain problems that are hard to resolve with MRP; the manual disruptions of automated production plans and the problem of over- or understocking of tail end products.

In theory, if forecasts are correct, MRP does not require finished goods stock (except for cycle stock) and no production failures or delays in supplies occur.

However, we all know that forecasting, in itself, is difficult. If you, on top of that, also add other supplier and production disruptions, you soon realise that you will need to make a lot of manual changes to the production plan proposed by the MRP system. Manual interventions take time, cause tremendous stress and also block planning resources that often are scarce. As a result, the top 50-80% turnover products (often about 15% of the item numbers) are well run “semi-manually”, with reasonable service levels and an acceptable level of tied-up capital. The real problem starts with the 85% low volume items where the exhausted planners have to let the system do the calculations without them making manual corrections. Either the delivery times become unpredictable, and sometimes very long, or the system starts to create huge stocks, e.g. based on minimum batch sizes covering 1-2 years.

We have seen cases, where the detailed MRP-based master schedule, run overnight, is thrown directly into the paper bin every morning, and the foremen instead make their own daily plan in Excel, without management even knowing.

CAPACITY FRAME PLANNING

A way to limit the manual disruptions of the production plan is the concept of “Capacity Frame Planning” where you let go of the illusion of an automated, integrated, master scheduling all the way from long term plans to the daily production plan. By simply splitting the production planning into three distinctive levels; Capacity Frame Planning (3-6 months), Order Planning (3-6 weeks) and Shop Floor Planning (1-2 weeks), the planning will focus only on issues that are relevant at each level.

The advantage is that key issues of long and short term importance can be separated, and that the inevitable handling of disruptions can be isolated to where it is best taken care of.

The frame plan handles input like number of shifts, supplier frame volume forecasts e t c. Very short-term actions like the optimization of production order sequence during a day, or a week, is handled by the shop floor planning. MRP-based plans almost always fail to take all aspects into consideration, whereas a skilled foreman, or shop floor planner, can still beat the computer (at least until AI-solutions are developed!).

RANGE MANAGEMENT – PREFERRED AND EXTENDED RANGE

A ROP setup can further be improved by sales and supply chain cooperating closely in setting promised service levels, especially when handling the medium and low volume products.

Several studies show that B2B customers do not rank immediate delivery of everything they ask for as top priority. Instead, predictable and reliable deliveries are ranked much higher. From a strategic perspective it is also important that the company carefully considers what it really wants to sell, and to limit the damage that can be caused by just selling everything to everyone who asks for it!

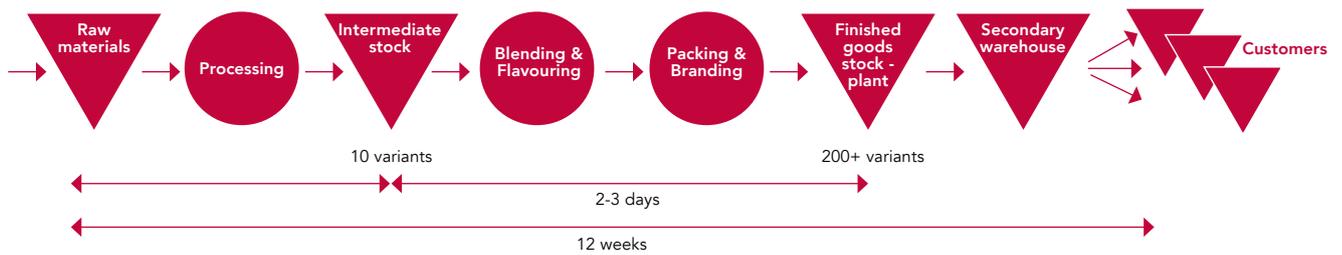
A useful model that works well with a ROP/Pull-system is the concept of Preferred and Extended range²⁾. Customers need to be provided with clear information regarding the conditions offered for different parts of the range.

The **Preferred Range** consists of the product range that the company wants to actively market and wants to offer with short/fixed delivery time.

The **Extended range** covers all other products that the company is “willing” to sell when asked, and therefore can be offered with longer, maybe not even fixed, delivery time.

A real case

The following is an example from a company in the food industry. Currently, the MRP based system attempts to manage the whole production process based on market forecasts at individual item level. The MRP process determines which purchases are required, batch sizes e t c. The total lead time is 12 weeks and – despite a very stable total market – still requires finished goods stocks at the plant as well as at secondary warehouses – and with the customer. Going into the intermediary stocking level we have 10 variants which then explode into 200 plus variants at the finished SKU level.



What if we could increase the basic variants to, say, 15, and create a stocking point there, using statistical/historical forecasts to plan the intermediate stock, instead of basing it on uncertain market forecasts? From this point we can then react to actual customer orders of the 200 SKUs with a lead time of just 2-3 days.

This example would mean that finished goods stocks in the plant warehouse could be reduced to almost zero, as the lead time from the intermediate stock point is so short, and, as we know that the overall fluctuation in demand is very small – i.e. the total production volume can be kept stable, the mix of products can be planned on a 2-3 days period instead of the 12 weeks in the MRP calculation loop.

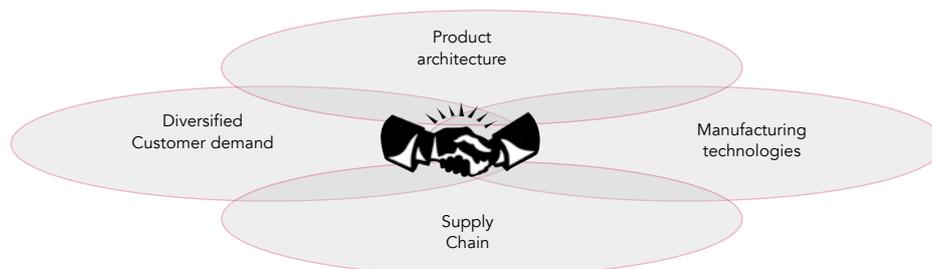
Finally

During our work with companies all around Europe we have seen examples where tied-up capital can be reduced by 50%, or throughput time improved by up to 80%, just by selecting a set up that is better suited to the company’s actual business environment. This can be done without replacing the MPS system and of course without harming the promised service levels.

So, please, be aware when setting up your MPS systems, and do not just accept the default settings until you have determined exactly what demands you need to meet with your supply chain!

In addition to customer requirements, you have all the internal conflicts that also need to be handled. For instance, the sales organisation would love to be able to offer their customers unique products, thereby establishing a temporary “monopoly”. Production, on the other hand, would prefer as few variants as possible, in order to achieve economies of scale and fewer changeovers.

The objective is to reach agreement across functions – we call this the Handshake:



If our findings seem to be relevant to your own supply chain setup, please contact us for further discussions!

OHDE & CO was founded in 1993 and we are today about 15 consultants. Most of us hold master 's degrees, and we all have long experience from both operational management positions and management consultancy. Typical customers are mid-sized companies in manufacturing and services.

We cooperate with Malik Management, St.Gallen and PIMS Associates, London. Through this cooperation we have access to the well-known and extensive database and business simulation tool; PIMS – Profit Impact of Market Strategy.



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