Midagon Point of View

Manufacturing Efficiency

In this Midagon Point of view, we focus on how digitalisation supports production efficiency development and enables the implementation of emerging technologies.

All these innovations reshaping manufacturing require the ability to collect, share and process data. The flow of information through each stage of manufacturing is necessary for using new technologies.

New technologies will help companies tackle challenges in their supply chain and give a competitive advantage against their competitors.

Driving forces that are transforming manufacturing

Business trends

Productivity is never out of fashion in manufacturing, and it is often seen as one of the main targets when leaders initiate change projects. Productivity gains can be achieved by optimising operations alone, but real benefits are achieved when there is more integration throughout the supply chain. Integration creates a more agile and resilient supply chain. Digitalisation that enables connectivity, real-time data, and transparency is key for integration. This makes the supply chain more agile and helps corporations with their continuity planning. Integration with better data collection technologies helps risk management and continuity planning.

The main solution elements for integration in the manufacturing environment are manufacturing operations management, manufacturing executions systems (MES), data platforms and analytics, production automation, machine learning and artificial intelligence.

Picture 1. Trends in industrial business and how data collection and integrated systems support companies.

Horizontal integration between suppliers and customers is beneficial. The more low-level data is collected from supply operations and shared via an integrated supply chain, the more continuous improvement opportunities are given to corporations. In traditional thinking, the supply chain has been seen as a linear chain, but it should be seen as a network. This underlines the need for more advanced digital tools for controlling supply chains.

Sustainability has been a topic that initiates more actions for production operations leaders. There is a need for continuous reporting from manufacturing about energy use, waste, chemicals, etc. This will increase automated data collection needs in production, and corporation-level integration will be beneficial to all supply chain functions, as the needs for reporting drastically rise when regulators are tightening regulations and laws.

One implication of how these trends modify thinking can be seen in active reshoring trends.

Case example: Reshoring

Reshoring has been increasing among high-cost nations. The process of companies bringing overseas manufacturing back to their home countries – has led to growth in employment figures across the US and much of Europe. As the new technologies previously mentioned become cheaper, they make it more economically feasible to reshore manufacturing, despite higher labour costs.

Governments demand a reduction in reliance on foreign nations. By establishing securer supply chains for critical industries, companies are reducing their supply chain risks. Companies are at the same time making their own risk analyses and are pressured by politics to stop offshoring manufacturing.

A trend like nearshoring targets robuster supply chains that are less vulnerable to future disruptions. Simply put, this means that companies are relocating capacity closer to their main markets. Another benefit is that when companies operate closer to their customers, it is easier to adjust to regional requirements and regulations and to avoid customs charges, etc. Localisation also reduces lead times and shipping costs. Shipping is also strongly linked with sustainability.

Because of the pressure to move manufacturing to high-cost countries, there is an increasing need to improve productivity and cut costs throughout the supply chain. This supports new technologies implementation, and it's very likely that companies will invest more in digitalisation and new technology investments for gaining these improvements in their supply chain. Manufacturing will be a very important part of that development.

Case example: Situational awareness

The great resignation has already shown how important it is to create a work environment in which employees want to work. Working conditions, safety, advancement opportunities, compensation and work–life balance are increasingly important for companies when they seek to attract new talents and try to keep existing ones.

Technology development gives new possibilities for improving job satisfaction and safety at work in many ways. Situational awareness improvements are one very good example of the new possibilities technology gives us. Situational awareness means that behaviour is actively controlled and balanced based on real-time experience. It can be used to improve e.g. efficiency and safety. New technologies open new possibilities to help increase the situational awareness of human beings in the working environment. This development makes human beings more aware of their surroundings and the activity around them.

How does digitalisation improve situational awareness in the visual design of displays and interfaces? In the visual context, situational awareness optimises the user experience of the interface. This can be achieved with a by human-centric design by customising views for different user groups, optimising the visual interface, and building interactive dashboards and displays. This helps problem identification, improves operational consistency, identifies alarms for users, reduces downtime and errors, and empowers users.

In the Technology trends chapter, there are more examples of how technology adjusts manufacturing industry by increasing safety and giving human beings more demanding work tasks. Manufacturing efficiency can also significantly improve, and new kinds of supply chains can be created which offer new possibilities for organisations to develop their business.

Technology trends

New technologies will help companies tackle challenges in their supply chain. Various disruptions and downtime are things companies have been facing, and the major focus is now on increasing resilience. The simplicity of a single digital foundation reduces operational complexity while boosting resilience.

Automation can help companies be flexible and adapt to what increases agility and makes their business more resilient. Automation adjusts the operation speed, which can even be adjusted on the fly. New machines like robots, cobots, and automated guided vehicles increase flexibility. For example, traditional conveyor lines could be replaced by AGVs, or entire factories could be reconfigured and create more flexible and seamless production flows. This would increase productivity and cut costs.

Widely used technologies like CNC and new technologies like 3D printing supported by higher automation enable adjustments to component geometry without any need for tool changes. This makes it possible to produce in sizes of one. This may be the optimal way to manufacture in many businesses because it decreases the need for inventories, which offers many benefits.

All these innovations require the ability to collect, share, and process reams of data. If separate systems are used to manage, each manufacturing phase is siloed. Allowing the free flow of information through each stage of the manufacturing cycle is necessary for using new technologies.

An integrated enterprise resource management (ERP), manufacturing execution system (MES), and product lifecycle management (PLM) platform empowers Industry 4.0 by connecting core systems and provide manufacturers with all the necessary data to achieve higher levels of quality and productivity.

AI, machine learning and digital twins

AI technologies can improve workforce productivity, and this has been one reason for companies to investigate AI. AI technologies that help the workforce perform its task are called an augmented workforce. Other benefits identified are that AI technology can be key to solving critical challenges or helps companies accelerate their digital transformation. Many analyses suggest that companies that are early adopters of AI technology will see a positive increase in cash flow compared with companies that fail to pioneer the implementation of AI. AI with other new technologies can be a game changer for manufacturing companies.

Digital twins are software models that represent the attributes and operating behaviour of physical assets and processes. Manufacturers must evolve their manufacturing operations' management architecture to take advantage of digital twins. Digital twins support better decision making by simulating how assets behave given certain inputs.

Internet of Things – smart factories

In the Industrial Internet of Things (IIoT), interconnected devices are used in manufacturing and industrial environments to collect data. The collected data can be used to enhance manufacturing processes.

The product-as-a-service trend means that data collection is increasingly important. Sensors that collect data help manufacturers understand how machines perform. They can optimise maintenance processes, reduce downtime, and create predictive elements for their offering and their own manufacturing. Collaboration between machine manufacturers and manufacturing operation representatives is also crucial for ensuring that all the benefits of IIoT technologies can be utilised. Data standards for collaboration between OEMs, asset operators, and maintenance service operators are emerging. Companies can use their own manufacturing data and findings to improve their offering. The visibility of this big data and gathering it will be essential for industrial companies.

Virtual and augmented reality

VR and AR technology is quickly becoming more entrenched in manufacturing. R&D, service, inventory management, and employee training are examples of fields where VR/AR technology can be found and used. Sensitive manufacturing environments can also be areas where technology can be used to help employees, as they can provide information about temperatures, sound levels, and other critical information, or offer user manuals or assembling and disassembling instructions.

Robots, cobots and automated mobile robots

in manufacturing, robots are taking on physically strenuous tasks. Exoskeletons and collaborative robots – called "cobots" – can help with or handle heavy lifting tasks. This will improve productivity and operational efficiency and reduce the risk of injury to human beings. Automated mobile robots will deliver parts and tools. The primary growth motivators are cost-effectiveness and consistent quality.

The industrial use of robots is again increasing, with technology accelerating the deployment of machines. New investments in production facilities offer an opportunity to design the space in a way that allows the wider use of these technologies. These machines also enable data collection and increase productivity.

Additive manufacturing – 3D printing

Additive manufacturing (AM) has taken on a major role in the development and production of components and spare parts. As 3D printing becomes more cost-effective, efficient, and scalable, manufacturers will increasingly be able to make products using 3D printing methods – which use fewer materials and create less waste than traditional manufacturing methods.

This will fundamentally disrupt existing supply chains and business logic. 3D printing reduces material use and therefore cost; it also reduces the need for assembly. This may change manufacturing philosophies in the future. It also enables new business models like mass customisation or the manufacture of unique products. It has also been seen as shaping long-term future spare part component manufacturing, as it gives new opportunities for companies operating in spare parts or service business.

Additive manufacturing can also be seen as a disrupting technology in e.g. the machining business, where additive manufacturing can replace traditional manufacturing methods in component manufacturing, or it can decrease the need for traditional methods, as components can be manufactured differently from what has traditionally been the case. By including this with additive manufacturing, it is possible to manufacture components with shapes that cannot be manufactured using traditional manufacturing methods.

Predictive analytics and maintenance

In the manufacturing context, predictive maintenance refers to the use of sensor data and artificial intelligence (AI) to detect failure patterns in machinery and components. Manufacturers can take preventive actions before machines or components are likely to fail. The next step is predictive resolution, which helps technicians resolve issues. Customers prefer higher utilisation hours, and predictive maintenance is a key offering for many manufacturers.

New technologies that will be essential for manufacturers are AI and natural language processing (NLP), which makes it possible to extract unstructured data from documents. NLP makes predictive engines much easier.

Real-time data is key for manufacturers in creating predictive analytics. A wide range of new technologies provides this data. Companies must adopt new applications to be ready to use big data for their benefit. By using big data efficiently, companies can accelerate predictive analytics, improve quality, and increase yield and productivity in manufacturing. It can also help optimise the supply chain and reduce overall costs.

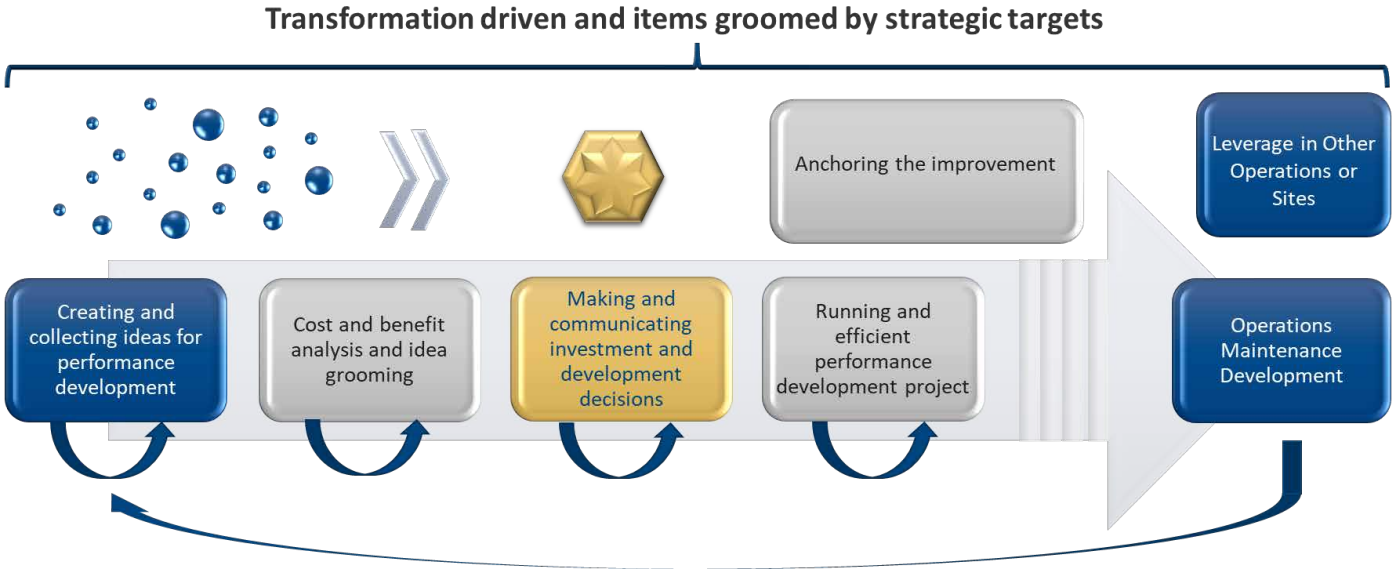
Midagon offering

Project management services from change initiation to commercialisation

Midagon offers senior programme and project management services to support customers' production management and supply chain management, etc. We can manage and facilitate large transformation programmes or smaller projects. Our experience underlines that we understand the trends, concepts, and market conditions that are transforming industry. Midagon knows how these can be adapted in strategic and operational activities.

Development programme facilitating is one of our core competences. We can also facilitate projects focusing on e.g. manufacturing strategy and roadmaps. Our consultants can help identify suitable functional and technological solutions in the market. We also have experience of managing investment and implementation projects that have led to significant development.

Organisational, functional, and technological development leads to the need for change management, and successful well-managed projects are key for success in implementations. We have strong experience of leading change management projects.



Picture 2. Securing improvements requires a consistent approach from initiation to continuous operations after the transformation

We can facilitate change projects from the strategic and idea generation phase to the commercialisation phase. The change initiation phase can also include projectisation, competitive bidding, and partnership forming. Under the manufacturing efficiency topic, the technical capability development, multi-vendor management, and change communication projects are examples of areas where professional project management is needed. Facilitating a change in the commercialisation phase can include actual ramp-up projects and project follow-up management.

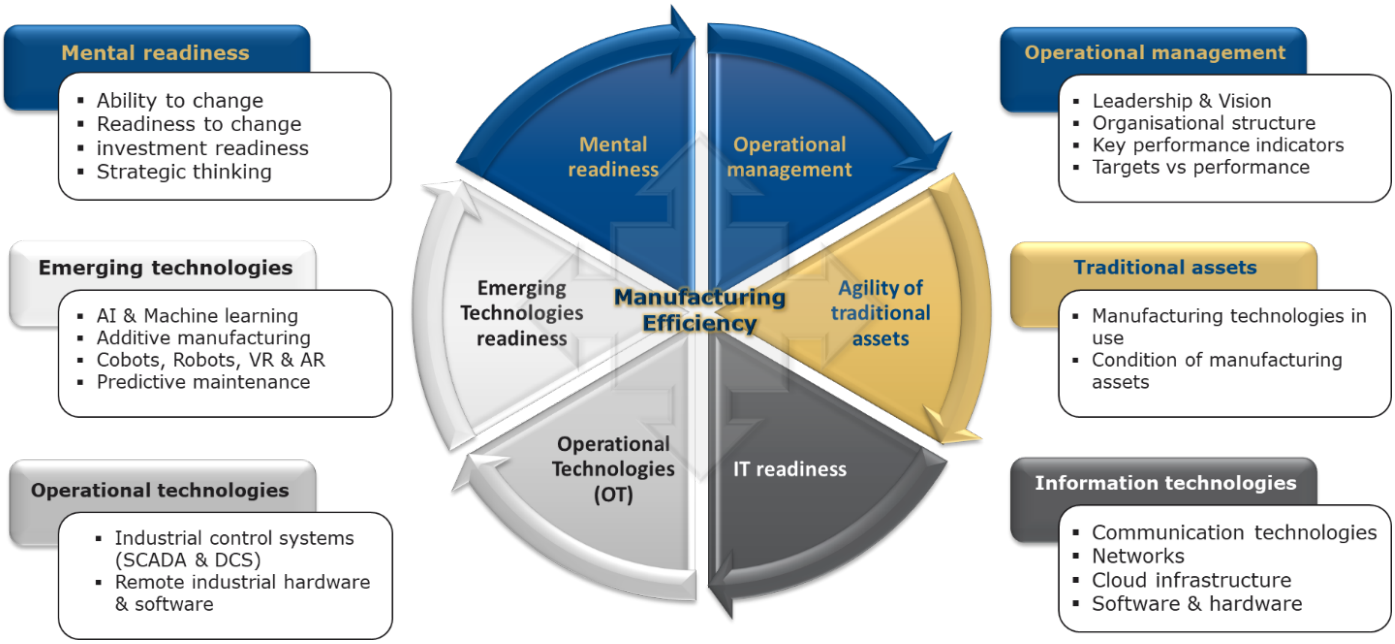
How stakeholders buy in changes can be the difference maker. Improvement anchoring is the stage that really measures how successfully change management has been done. Systematic processes are also needed when development is spread to other operations and sites in the organisation.

How to start – maturity assessment for manufacturing

Ground zero point for strategic decision making

When development is needed, it is best to identify organisational capabilities and development needs first. Manufacturing is linked with a wide variety of functions in the supply chain, and it plays a crucial role in successful operations. Development should focus on actions that lead to clear improvements. Without understanding where the organisation stands, target levels for development actions are often set incorrectly. If targets are set at too low a level, investments and time are spent in development that has not targeted benefits for organisation. Conversely, if targets are too high and understanding of the organisation's capabilities is weak, this can have even more serious consequences if strategic changes are made with false assumptions.

Before a decision about development targets is made, it is crucial to identify the current functional and technological status of their manufacturing operations. A maturity assessment identifies manufacturing strengths and weaknesses. The assessment result can be seen as a NorthStar. It should be done before decisions are made about strategic roadmaps and future investments.



Picture 3. Midagon Maturity assessment helps customers identify their technological and functional present state.

The maturity assessment is done by customer operation heads and gives boundary conditions for future development. It's an intensive 8–10-week project in which all functions collaborating with manufacturing are involved in the work. It provides a baseline for future strategic work to be done in the organisation and supports roadmap creation. The target of assessment work is not to create roadmaps but to give an understanding of the current situation.

The maturity assessment deep dives into the organisation's capabilities in different areas. Picture 6 shows six categories that should be examined more deeply when the maturity assessment is made. There are functional topics, e.g. operational management capabilities and technological, e.g., IT & OT maturity. These capabilities may be in good shape, but there can be challenges in integration, underlining the need for collaborative work between different functions.

One example of traditional integration challenges is that information technology (IT) and operations technology (OT) have treated their systems as their own assets that are used to meet their individual goals. Closed systems with communication protocols and proprietary networks have created complicated technical hurdles that hinder data from flowing easily between systems. Such findings create opportunities for more efficient data sharing. When IT and OT integration improves, it enables the implementation of emerging technologies that will give a strategic advantage to the organisation.

Our professionals lead the way in facilitating maturity assessments. We have the skills to dig up a structured and holistic understanding of functional and technological maturity. Without a neutral and objective facilitator, such impact-seeking assessment work can be disrupted by different parties' interests, and the objectiveness of the result can suffer.

The customer's function involvement plays a crucial role in this work. Every function needs to find its place in the assessment, but at the same time, they shouldn't just focus on their own areas of responsibility. Every function should be involved in big picture creation. The challenge in many organisations is that different functions work in silos. Facilitation and collaboration skills play an incremental role in the success of such work. Professionally facilitated collaboration enables opportunities for remarkable development in the future.

After the maturity assessment is made, the customer can start strategic work and planning. Assessment work creates the baseline for future development and enables the next actions, which have already been highlighted in chapter two. It's important that when decisions are made, all the possible information is used to create the best possible snapshot of where the organisation stands.

> *How do you know where to go if you don't know where you are standing?*