



How to Drive Business Value from Digital in Process and Manufacturing Industries

Midagon White Paper



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Forewords

How organizations drive value from digital is in constant transformation, and at Midagon, we are continuously monitoring these changes in order to provide industries with valuable insights. This white paper aims to support companies in process and manufacturing industries in their digital journey, as they move from technology centric, individual initiatives to scaled and standardized, digitally boosted business models.

First, we create an overview of the challenges of digital transformation in the 2020's, describing how new types of leadership and advisory will enable a shift towards the customer interface. After this, we present a series of successful cases showcasing what has already been achieved.

Enjoy the read,

Ilkka Töyrylä
CEO, Midagon Oy



The challenge of digital transformation in the 2020's

During the last decade, some very good foundation stones for digital development were laid in industrial companies. However, the focus on digital transformations was, until recent times, on investments that intended to protect, rather than grow the business. A small portion of R&D budgets was typically used for experimenting with new digital technologies, which were not ready to scale nor to make money. The focus has now moved more into digital transformations of the business core to enable growth, new product and service offerings and profitability. This is the reason why Midagon has released its renewed digital business service offering, which is designed for the needs of process and manufacturing companies on their journey towards increased intelligence across products and operations. In this white paper, we will offer views and real-life examples on how large-scale digital development can be utilized for creating business benefits, competitive advantage and improved customer experiences.

Digitally mature companies enjoy multiple benefits arising from their digital transformations, such as improved efficiency, revenue growth, quality, customer satisfaction and employee engagement. All of these benefits, together with their focus on

Digital development can aim to cost reductions and increasing efficiency, but the real challenge is to boost new business through innovations. Therefore, the focus of many companies has moved to digital transformation of the business core to enable growth and profitability.

innovations, have driven a positive impact on financial performance. Most companies have not reached this stage yet, but those, whose digital transformation of their business core is already on the way, can see the benefits.

Making money by digital transformation and new service and product offerings has become an increasingly important challenge. Digital transformation can be seen as a way to achieve cost reductions and operative benefits. However, the real challenge is to boost growth and innovation to fulfil digital transformation's potential in the business core. This calls for restructuring established practices and structures more than ever.

// An increasingly important challenge of scaling digital to make money, will require restructuring established practices and structures more than ever.

From meeting to exceeding customer expectations

Companies must constantly keep up with the rapidly evolving expectations of their digital customers. The customer expectations of industrial customers are closely related to the customer experience. According a Gartner survey, this is one of the biggest challenges that companies currently face. This will require a company to provide the best service and build the best customer experience. Access to information and data will also be a key element of the customer experience. Customers seek to have transparency in their operations based on data. They want to have access to information from the products that they are using, as well as have better capabilities to optimize the process. A great customer experience is built when expectations are met and sufficient information is provided. An amazing customer experience can be achieved by exceeding expectations or offering something innovative that was not expected.

// The customer expectations of industrial customers, similar to consumers, are now closely related to the customer experience.

Who can use the product data in different lifecycle phases has become an important question. Open boundaries with the right set of information for suppliers, customers and partners will be a major benefit for any company's future success. An intelligent product that is gathering real-time data from the different customer applications is a unique opportunity. The company's own and its vendors' R&D processes could also be enriched, by getting data back from the customer interface and creating access to unique data. Established connections in the company's network will also create new commercial opportunities related to data-driven services or a data exchange platform related to complementary assets, like IoT data. A digitally

enabled supply chain, that is based on integrated data flows within ecosystems and supply chain analytics, enables better decision-making and flexibility. This maximizes the financial benefits of all parties. It also creates an opportunity to excel in customer satisfaction, as it becomes possible to serve the local market needs of the customers more precisely.

// An amazing customer experience can be achieved, by exceeding expectations or offering something innovative that was not even expected. A digitally enabled supply chain creates opportunity to excel in customer satisfaction, when it becomes possible to more effectively serve the unique and localized market needs of the customers.

Customers that use industrial assets strive for advantages by utilizing intelligent production, operation and maintenance of the equipment. Customers are looking for new ways to minimize their operational downtime and maintenance costs. This demand applies to the intelligent production, operation and maintenance of equipment. All of the intelligence is based on data, which creates new opportunities and offers a competitive edge to the companies reconfiguring their product and service offerings. For example, flexibility and the ability to manage costs are driving customers to acquire long-term assets without capital expenditures and to get intelligent maintenance services included. This kind of shift to a subscription business model is possible because of the data and analytics captured from the asset. However, it will require a broader digital transformation of the company.

// Intelligence and data shared in an ecosystem create new opportunities and a competitive edge for the companies reconfiguring their product and service offerings.

Transformation of business core is needed

The time for a digitalization hype is already over and the technologies required are already here. Over the last decade, companies have made numerous experiments and performed pilots on digital technology and business models to gradually transform their business to digital. Thanks to these experiments, companies undertaking digital transformation can now boost growth and profitability right in their business core. All the required enablers are available, as emerging technologies support innovation, digital platforms can be found from most of the companies and customers are ready to adopt new digital industrial services. Data is also frequently turned into value in many companies, by utilizing intelligent analytics. Companies are capable of delivering services that used to be impossible to offer, without initiating digital product and service innovation. Digital services are now seen to be in the business core and they are expected to drive financial performance.

“The pre-conditions for the development of new digital-enabled products and services exist in most of the companies today but succeeding in this task requires major organization-wide changes in the business core.”

Companies must innovate in areas other than their current products and business models. The goal is to benefit from digital at an organization-wide scale and create integrated, ecosystem-oriented solutions, in which digital capabilities are utilized. This digital development can result in new intelligent products, intelligent lifecycle services and intelligent operating models of production. Intelligent products, that communicate important information about their functions and can be intelligently controlled, are the pre-requisite for intelligent lifecycle services, in which product data is utilized. On the other hand, intelligent production is the key to manufacturing high-quality products with the highest level of overall operational efficiency.

A company should start designing digital elements and standard interfaces to their products to read equipment data for automation or operation

management systems. This will increase autonomous and optimized operations, if it is not already being done. Reading equipment level data for maintenance purposes is also a requirement. New digital services can optimize equipment maintenance and operational management of the equipment. Combining data from operations, operational conditions and maintenance with the original manufacturing data of the equipment can bring new insights to product problem root cause analysis. Intelligent production is based on a digitally enabled factory, where all factory operations are being optimized. Applications of advanced analytics can improve manufacturing-line performance. New state-of-the-art tools can be offered for blue- and white-collar employees to enable holistic decision-making and end-to-end transparent production. This will also increase employee satisfaction.

“The transformation towards intelligent operations and changing corporate culture must start from taking ownership of the change and be supported by strong leadership.”

The transformation towards intelligent operations must start within the company. It may require a change in the corporate culture. However, the culture doesn't change itself. A strong ownership of the change is needed starting from top business leaders and extending throughout the organization. Leadership is the most important factor in the change process creating direction, alignment and commitment in the organization and ultimately changing the culture. Comprehensive ownership and leadership are needed throughout the transformation lifecycle, from forming strategies to implementing and deploying solutions.

Unfortunately, many parts of great strategies fail in their execution. Thorough understanding of a company's strategy, business and operations combined with knowledge of digital technology opportunities create a solid basis for defining roadmaps, target operating models and designing the solution and use cases. Program and cutover management are also key factors for successful execution. Cross-functional development of operating models and capabilities, architectures, data and analytics, tools and technologies will

Many great strategies fail at execution. To succeed, comprehensive ownership and leadership are needed throughout the transformation lifecycle, from forming strategies to implementing and deploying solutions.

be needed. Purpose-built and agile operations play an important role in increasing them even further. This also requires the ability to engage and motivate all parts of the organization, as well as third party collaborators, such as service providers. There is also a continuous need for local experts who deploy the new changes to the shop floor level and facilitate the interface between the line teams and the advanced analytics team. Digital transformation in the business core requires deployment in large scale which is always a substantial business change. Deployment could include, for example, changes implemented in 50 factories around the globe or a new operation model with a mobile tool implemented globally for 20.000 field engineers. The ability to implement large-scale deployments is a key asset in the 2020's and a new requirement if compared to digital development in the 2010's.

Data-enabled business models make further digital development possible

Companies have noticed that innovations that make the products intelligent have given them the opportunity to capture data and turn it into insight. This increases the overall efficiency of the processes and operations. This development also helps their customers to conduct their operations more efficiently. Industries have moved from data capturing projects towards data utilization projects, which affects their whole ecosystem. Data has become a valuable asset. Connectivity, data and analytics, in general, are key enablers that can make equipment and processes intelligent and involve stakeholders at all levels. Being able to increase efficiency can alone justify investments made in digital transformation. However, using data in innovative data-driven services can be very profitable and make the business grow. Leveraging data can enable companies to ramp up new business, optimize their operations and boost their customer experience. Data collection

and analysis must be backed by strategic choices, which make it purposeful and ensure that data is ultimately turned into value and creates digital-enabled customer offerings.

The development of new digital-enabled products or services may require profound changes to the current business model. The shift to new data-enabled business models, like to a subscription model, will require a cross-functional digital transformation affecting the whole organization. This includes sales, marketing, services, product management, engineering and finance. A data-enabled business model needs to be created to support digitally connected products and services. This will be an essential element to enable growth and profitability. Companies exploiting data from their digital-enabled products and services should design and build platforms with their customers and other parties in their ecosystem to offer value-added services. Exploiting network effects in their ecosystem will drive further growth and provide a competitive edge.

Shifting to new data-enabled business models will require a cross-functional digital transformation affecting the whole organization and operating models as well as requiring advanced capabilities in cybersecurity.

Data-based insight is pivotal for any digital solution. It must be backed by statistics, mathematics and good master data management. Clear objectives must be set and models for data analysis created. This fundamental insight is what helps to do the right things and avoid any effort that will not result in an implemented, beneficial solution. Data collection from sensors, actuators and other systems, as well as data integration and warehousing are also important capabilities. However, the importance of finding the right use-cases and the groundwork that takes place before any of this begins, cannot be highlighted enough. Without that step, data collection and analysis cannot produce valuable information. Therefore, data-based insight means, on one hand, data collection and analysis, and on another, fundamental statistics, goal setting and data modelling capabilities.

The importance of finding the right use-cases and the groundwork that takes place before, cannot be highlighted enough. The maturity level of the technology and related risks must also be understood profoundly in order to avoid risking the business core with inappropriate or immature solutions.

In the area of emerging technologies insight, competitive advantage is achieved by combining present-day technological possibilities with ambitious business goals. Carefully planned, yet open-minded use of emerging technologies creates brand new possibilities for producing, sharing and analyzing data, and turning it into insight and finally, knowledge. However, when not just doing proofs-of-concepts, the maturity level of the technology and related risks must be understood profoundly, in order to avoid risking the business core with inappropriate or immature solutions. Since data collection is already on-going in most companies, the value of emerging technologies insight is in creating new ways to process it and turn it into value. Digital solutions development and data analysis require elements from both emerging and conventional technologies. Some traditional technologies include, for example, cloud, business intelligence and post-modern ERPs, whereas artificial intelligence, IoT, digital twins and 5G are examples of emerging technologies. The greatest benefits are generated by combining both traditional and emerging technologies, in a way that best suits the organization.

Of course, with new development there are also new threats and concerns to be considered and mitigated, such as data ownership, data privacy and cybersecurity issues. New business models will also require new information governance models and information security management.

A digitally boosted business core requires new advisory

Because the digital transformation is occurring in all areas of business and operations and also changing the business core, manufacturing and process industries are looking for a new type of digital advisory and leadership to foster digital

capabilities. Increasing internal efficiency through digital transformation is still important, since it will reduce costs and release resources. However, today the focus is shifting to creating new product and service offerings and supporting growth. The consulting services are now needed to boost the business core, which involves consulting business owners, such as heads of product lines, operations, production, maintenance and R&D. This requires that an advisor has an in-depth understanding about industrial businesses and leveraging and combining widely different competencies and methodologies. An advisor working closely with management, customers and technology developers will be in a key position to catalyze the development.

Today, consulting services are needed to boost the business core which involves consulting on essential business owner roles. The scope is always wider than a company's boundaries. As supply chains, ecosystems and customer expectations set new requirements, advisors must also possess a more holistic perspective.

There is a long tradition of advisors supporting the translation of new business goals to purposeful initiatives. Management benefits by gaining a thorough vision of the ways in which technology and efficient use of data can contribute to their strategic business goals. On the other hand, this also benefits developers, by enabling better planning and solution design, since management can factor in the requirements and constraints involved. The perspective is always wider than the organization's boundaries, since supply chains and ecosystems are profoundly impacted by the digital transformation. Concrete and measurable business benefits can only be realized by delivering better customer value, which should be a starting point for all digital business development. When customer expectations are understood and shared within the developers' ecosystem, the precondition for successful digital development is in place. This sets new requirements and advisors must possess a more holistic perspective than ever. Consultants and developers focusing only on technologies are not by themselves adequate to deliver integral projects targeting business core changes.

Digital advisory services can be utilized for overall business solution development or for a defined part of the solution, such as tailored advisory services for the development of intelligent, digitally boosted products. An advisor can be included to support the entire development lifecycle from deriving a strategy from customer demand to roadmaps and development programs aligning development with the strategic objectives and creating digital-enabled integral business solutions.

The most important activities are the implementation and development of solutions. A company must ensure the realization of targeted operational and financial benefits. Therefore, a holistic and business-driven approach with strong ownership of digital transformation and managing the impact of changes inside the organization is needed. The ownership must, therefore, be assigned to business units and the

“ An advisor is required to have in-depth understanding of industrial businesses and to combine different competencies and methodologies widely.

essential business owners must be appointed first. By using external advisory services, an organization can significantly shorten the lead-time of the founding centralized governance function to lead and support the digital development. An organization can implement, for example, a center of excellence, which can act as a backbone for scaling up and deploying the digital transformation. A center of excellence can be responsible for the digital solutions development and to study the new capabilities that are needed and to find more efficient ways of operating, in cooperation with local sites. It can also be a project management office running all possible large-scale digital transformation deployment projects. Alternatively, it can have a supportive role and focus on training and coaching key-experts who undertake local deployments. In both scenarios, the training and coaching of local key-persons is a critical change management enabler for the deployment phase.

Conclusions

“ Companies building new digital capabilities in their business core are also transforming themselves in a profound way. The transformation requires strong ownership and leadership inside the company. As it is also a race against competitors, they could benefit from external advisors to speed up and win the race. However, contributing advisors must possess a more holistic perspective of industrial business and relevant technologies, as well as the ability to carry out complex transformations.

As described earlier, digital transformation can provide a huge opportunity for a process or a manufacturing company, by increasing the intelligence and efficiency of their operations and offering new insights. A shift in the focus from just protecting the existing business to developing new intelligent products or services in the business core, can bring growth and profitability supported by new kinds of business models. Digital transformation can also be an important method of risk management that helps companies to survive and prosper in the future. Companies can build new digital capabilities and business models that provide resilience against competitors' actions and markets affected by a new kind of customer needs. Digital transformation can not only help companies to survive, but also give them the ability to gain new business and customers. This race of building digital capabilities and transforming companies' business core can appear to be challenging. As a result, companies can now benefit from utilizing external digital advisory and leadership, to foster digital capabilities in their business core.

Case study

Launching Digital Services Successfully Requires Fixing the Foundation First

Written by: Jukka Kauppinen

Jukka Kauppinen has acted as Executive Advisor for Industrial Companies at Midagon since 2016, and for the past 10+ years, Jukka has been supporting large Industrial Equipment Manufacturers in the fields of Service & Digital Transformation, Data Driven Customer Engagement, Product Data and Lifecycle Management as well as Digitalization Enabled Asset Optimization.



The value of data and digitalization enabled products and services has been well understood by industrial equipment manufacturers. For the last two decades, a large number of OEM (Original Equipment Manufacturing) companies have been heavily investing in, testing, running proofs-of-concepts and piloting different types of new digital concepts and services. However, the wave of digitalization enabled true game changes still remains to be seen.

Some of the main reasons for companies not yet recognizing the full potential of the digital services on the market, can be traced to the foundational pre-requisites of successfully implementing any data-driven services, such as insufficient master data management and the difficulty of integrating new digital capabilities to the existing service portfolio and the legacy backbone systems, specifically the ERP systems. Both, however, are critical in order to fully leverage these data-driven capabilities. The following case illustrates this situation.

Company A is large, global industrial equipment manufacturer. For the past 20 years, their strategic ambition has been to grow their service business significantly, in order to make the company less vulnerable to the negative impacts of economic changes and cycles in new equipment sales. Their service business has traditionally relied on spare parts sales and field services.

Since 2010, the development focus in the service business has shifted towards implementing and launching industrial internet capabilities and data-driven services. They have spent considerable time and effort to implement a solution to gather, store and analyze equipment condition and process data from their equipment in the field. From a technical perspective, the data-collection and analysis solution itself was ready many years ago. However, it was launched commercially less than a year ago and it has not yet proven to be a game changer for the end customers.

One of the main reasons for the delayed launch was missing or poor customer and installed base data. Unless you know who your equipment has been sold to and the end-customer, selling and promoting digital add-on services becomes fairly difficult. In addition, if your customer data is not well-developed, conducting in-depth

analyses and sharing these insights from the field could become an issue from data security and confidentiality perspectives. You do not want to share critical process data from one customer to his / her competitor.

Second, by not having an up-to-date visibility of the installed base and the outstanding configuration, the equipment condition and usage data can be misinterpreted. As a result, the analytical insights provided to the end-customer or to the field services personnel might be misleading. Therefore, the linkage between equipment-related engineering data, sales data and service data must be created and maintained. In other words, there must be a clear mechanism for maintaining virtual product data and physical product data and utilizing the linkages between them.

This company also struggled with integrating the new digital capabilities with the existing service portfolio. As a result, they missed the opportunity of having integrated service capabilities. This is essential, since customers are only willing to pay for tangible results. Simply providing the visibility to the equipment or the fleet condition, might not be enough. If you, however, can convert this insight to improved field services capability, finally leading to higher equipment availability levels, the service becomes truly beneficial for the end-customer and the associated cost is easier to justify.

In practice, this would mean that the insights based on the data collected from the equipment would automatically lead to e.g. updating maintenance plans for the existing customers with service agreements or creating leads for new service jobs for the customers that do not have adequate service agreements in place. From a systems and data perspective, this would require integrating the analyses and insights to the installed base, customer data and eventually to the maintenance management system, CRM and ERP of a company.

This company fortunately understood the criticality and the impact of these foundational issues from the systems, data, processes and people perspectives. They are now taking corrective actions to get back on the track in providing their end-customer new digital services that have a real impact on their operations.

Case study

It's all About Data - Driving Business Value Requires Leadership and Asking the Right Questions

Written by: Ilkka von Schulman

Ilkka is a very effective digital development leader, with the ability to connect business and technical expertise. He can quickly make sense of fuzzy and complex business problems and projects.



The reference is a manufacturing company, which would like to grow their service businesses and to know how to get started on their digital journey. They have already done several pilots. However, one of their key questions was whether they have enough high-quality data to build on.

This is actually a very good question. Most of the data we have is based on business systems and machine operations. The most common way to process data is based on exact relationships between data objects and large datasets (coming from various subsystems), which tends to be inconsistent.

The other major source of data is automation systems, which have become fully digital during the past two decades. For automation engineers, IoT is not really new. However, the automation data is traditionally generated in "black boxes" and is not intended for any outside use. Therefore, it is difficult to interpret and serves mostly just the original purpose.

However, if we look at the data statistically, it opens up totally new perspectives. We can use somewhat inconsistent and incomplete datasets reliably for many business purposes. A good example is digital marketing, where we do not always need to know exactly the prospective customers but have a target group that is statistically good enough. We can also merge data from various sources to complement each other. The data can be used in new ways to improve the products, customer reporting and even for totally new services.

Data quality analysis: The 4 sprint methodology

Ilkka von Schulman was leading a team of data scientists, who were gathered to evaluate the case. The manufacturer gave the team one year of event data and one month of sensor data from one of their largest customer installations. They had two simple questions for the team:

- a) what is the quality of the data?
- b) based on your professional opinion, what business value you can derive from the data?

The project started with a one-week deep dive into the manufacturer's business, products and the data. During the second week, the team started to dwell in the data and asked clarifying questions. Ilkka started to prepare the coming one-week sprints. Each week had a specific theme to focus on. The themes of the sprints were:

- Sprint 1: quality of the data and calculation of various metrics and KPIs based on it
- Sprint 2: predictive maintenance indicators
- Sprint 3: predictive algorithms to optimize the machinery operations
- Sprint 4: advanced algorithms to discover "missing" data and possibilities for machine learning from sensor data

Sprint 1 was a no-brainer. The team had a deep dive into the data quality and found the data to be correct and consistent enough for further analysis, and ultimately for business value. It was obvious that the data had limitations, because it was not originally planned for analytical use. It was only intended for machinery monitoring and problem-solving. Ilkka gave the data scientist team a set of business KPIs, and they introduced various ways to calculate them based on the data. Interestingly, the team was also able to evaluate the reliability of alternative calculation methods and recommend the best one.

Sprint 2 focused on predictive maintenance indicators. As in many other similar cases, it was very easy to find events that correlated with upcoming machine failures and disturbances. The real question was, is there a cause-effect relation between them or is something else explaining both of them? This also raised the question of the real root cause, i.e. is something happening before this? It is very important that the leader of a study like this is familiar with analytical deduction and statistical methods. This is because correlation does not necessarily mean a cause-effect relationship. There can be a third factor or a prior event, which causes both. A traditional example is that ice cream sales and drowning correlate highly, but the real root cause is hot weather.

An interesting side note to Sprint 2 was that the team acquired complementary datasets from completely external sources, like local traffic and weather data. This external data combined with own data shed new light and clearly improved the statistical models.

Sprint 3 continued from where Sprint 2 ended. However, the focus was now on predicting the next operations the machinery would do. The challenge is that some parts of the overall process are well-optimized and automatized. However, in a long process, the information does not flow end to end. This leads to sub-optimization. The team was able to reliably predict the machinery operations for the next 15-30 minutes. However, this had very little value, because the machinery was typically running under a full load and could not do any optimization to improve its performance. The key takeaway was that if we had full visibility to coming work orders in customer ERP, we could then optimize the use of machinery.

The sensor datasets were huge, as usual. A month of data was a total of 2TB. Some sensors were read twice a second, while others were read more often. Nevertheless, the data was not sufficient to fully

understand what was happening. The statistical modelling and machine learning algorithms enable the creation of models, based on actual incomplete data, which will fill the gaps. In this case, in **Sprint 4** we found that the data was insufficient to calculate the true energy consumption of the machinery (based on how it is used). However, the team created a model, which was verified against actual monitoring in the field. The original model reached +/-5% accuracy and after field monitoring it was refined to reach +/-2% accuracy. This was a great result, that enabled an energy efficiency advisory service opportunity for the manufacturing company.

Leading data scientists to the right findings

Leading a data scientist team requires some special skills. First, a data science team needs a leader that can ask the right questions. The business problems and opportunities need to be translated to the language of data. Ilkka has extensive experience working with large volumes of data and various automation systems (in both process and discrete manufacturing). This experience is very helpful in understanding different kinds of data. The sensor data and customer behavior data need to be reviewed and analyzed very differently from the exact transaction data. Finally, the leader needs to be a sort of data scientist him/herself, in order to evaluate the findings and their reliability and correctness. Not all initial findings are correct.

The overall outcome was that the manufacturing company received confirmation that they have the basis to start building data enabled services. The study also suggested several methods for utilizing the data. The team also proposed various ways to improve the products and automation systems.

After the study, the manufacturer built an impressive set of digital services. Customers can now follow their own machinery in near real time, while the manufacturer provides predictive maintenance services and even sell completely new information and professional services for various stakeholders.

Case study

Metsä Board: Transforming the Value Chain – Business First, with Sound Technologies

Written by: Matti Ketonen

Matti is a business process development professional with a solid and practical background in various supply chain processes. He has applied his technological knowledge and leadership skills in various transformations and environments.



The task came from Metsä Board management exactly as I like them. It was exact enough for actioning but broad enough to have my own interpretation. It was like “Now that there is this artificial intelligence, what can we do with it? Can we benefit from our data using advanced tools? How can we improve our customers’ experience using novel technologies?”

Of course, being solution oriented, we quickly turned this into “What are our never-ending challenges?” “Where do we always reach for next levels, even when we are already successful?” “How can we solve these challenges by utilizing (digital) technology that we haven’t successfully used before?”

In the heavy asset and traditionally production driven process industry, data tends to be in abundance in both production and customer transactions and the access to it is straightforward. Therefore, the assumption was that we – if anyone – could use it as the basis for applications of AI. The supply chain is also rather stable and has a relatively small number of variants.

To me – with a background in process automation and because we already had good experience with business process data mining and monitoring - the

task seemed achievable. It was also attractive enough to be of interest to some talented people in the organization. We saw the application of AI as a natural continuum to a lot of work that had been done on developing production automation. We also thought that the long tradition of recording customer interface transactional data would be a good starting point for using machine learning.

Determine your focus areas and stick to them

With developments as vague as this one, the work often starts with enrolling many colleagues, brainstorming some ideas and finally creating a pipeline with proof-of-concepts, pilots and – when successful – deployments to production. This is what I also tried first. I was given an opportunity to bring an expert on “everything digital” to one of our extended management meetings. Roughly 40 top executives of the company gather twice every year. Therefore, a one hour slot is very valuable. It would allow us to proceed to brainstorming sessions and create an initial portfolio later. After that, we would turn to partners who might be able to provide us with solutions.

That did not go down very well. Everything from bitcoin to deep learning and collaborative management of maintenance was presented in an hour. The presentation was excellent but it created

more confusion than expected. We couldn't figure out the connection between what was said and what our daily life was. Of course, that connection is all that matters, when you want to move quickly. Therefore, we needed to be more pragmatic. After a series of discussions with some forward-looking colleagues, we were able to group our opportunities under some headings. We started from our customers or even their customers. Understanding what is driving our demand, capacity utilization rates and prices for our own products would be a big help. It needed to be in a numeric form rather than verbal trend statements.

Driven by better knowledge of demand versus our production capacity could improve the actual interaction with our customers. How do they decide what and when do they want to purchase from us? Is there something we can do to help them to manage their stocks and pipeline in general? Would it be possible to get closer to them and potentially raise the barrier for exit? Existing transactional data might have some value here.

The next step would then be to see how we can improve the agility of the supply chain with the improved understanding of demand patterns. We already had a good planning process. However, if something went wrong, it was difficult for us to react quickly and to identify the errors that mattered most. How could we detect and prioritize our deviations quicker? How could we also make our planning more agile to reach an optimal planning status, even with changes in the environment?

Naturally, production itself creates huge amounts of data that could possibly help to keep product quality consistent. After all, quality is the most critical characteristic of our product. How can we make it more consistent while also driving our costs down? What is the effect of raw material quality?

Different parties work on production facilities in order to keep them running optimally. Extensive communication between these parties must take place for both small repair activities and larger maintenance shutdowns. Information management is very important.

Working together with partners who know

Now that we had defined the rough limits of improvement areas, we turned to our known partners and even contacted some new ones. One of the improvement areas was picked mainly to leave room for already ongoing developments. However, we progressed the other four with one to three proof-of-concepts each. I also kept on talking about these opportunities, both internally and externally, to get as many different viewpoints as possible. This partly replaced the missing brainstorming sessions with a wide audience and – with hindsight – might actually be a more effective way of focusing the work and getting to practical implementations early. Of course, and in any case, we had to tie knowledgeable people with the exercise with enough time to use on this.

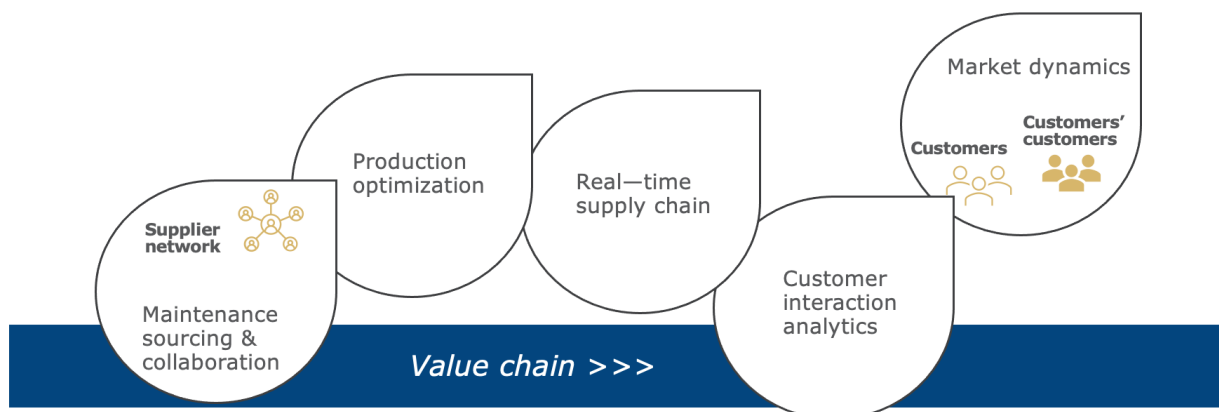


FIGURE 1: One way to eat the elephant: Divide the value chain opportunities into artificial intelligence initial work packages.

When it comes to the partners we worked with, it became apparent that the ones with practical and direct experience in paper or board making and related customers had a big advantage over the ones with a more generic approach to digital technologies in general or to artificial intelligence and machine learning specifically.

Our first trial to understand our customers' market situation was to use our trade data with them – sales order and invoicing information – to try to estimate demand behavior. However, we did not develop very good models by using generic machine learning tools. We had to reformulate the question a little bit. The tendency in the industry is to fill the production machines, even with fluctuations in demand. Therefore, it is better to use the market prices of our products as an indicator of market balance rather than delivery volumes. It sounds like a simple and evident change. However, in making it, we broke a habit of many years. Second, we turned to a supplier who clearly had done some work in the area and that could combine tacit knowledge and experience with numeric data and could guide the learning of the model very effectively.

It was also evident that in the future, the industry needs to get closer to its customers and turn more sales on to electronic platforms. There are many reasons for this. However, one that doesn't usually come to mind, is that removing the human element also removes the capacity to speculate with your purchases. It also creates much better transparency to the actual mechanics of the marketplace. I'm sure that in my future assignments, I'll work even more on the balancing act of the human capability to create new linkages and to react to anomalies versus the machine's tireless consistency.

A small-scale customer portal was created to facilitate simple purchases by the customer, as well as to provide up-to-date information about the status of the

deliveries. This was taken to use in production with a small number of customers and has served as the basis for discussions about further development.

In the supply chain area, we discussed two improvement ideas with many vendors: First, we wanted to create a solution for monitoring our supply from the mills to our customers in a way the most important deviations would be prioritized by the

solution and that would give the transportation planners time to react to the most important ones requiring a "human touch". Second, we had an idea that our planning operation could be stepped up, by introducing "continuous optimization" of the production plan, until the time when hard constraints forced us to freeze the plan. The first of these ideas was developed to the pilot level. However, the latter one was dropped, due to some other partly overlapping development initiatives.

A statement from Ari Kiviranta, SVP Development, enforces the importance of truly understanding the business context: "Metsä Board has a long tradition of making a quality product. That expertise coupled with powerful data based solutions will give us advantage in the future. We are now looking for opportunities to extend our product quality thinking to include our customers' processes and how our product behaves in them."

Finally, and perhaps most successfully, several machine learning trials were made in our production units. Their target was to identify conditions that would threaten the quality characteristics of the product and then to drive to safe operating parameters. This allowed us to always meet the strict quality parameters of our product, while reducing waste and the use of expensive raw materials, whenever it was possible. Another line of investigation was to identify conditions where web brakes – production downtime – were highly likely. This would allow us to avoid those conditions. The first part of this work was incorporated into operational use roughly one year after the project started. This was also materialized with a partner who already had deep knowledge about paperboard making.

With hindsight

Work on digital tools – and increasingly with artificial intelligence – is here to stay. However, the role of people with these skills has never been more in demand. You should involve your brightest minds, who know their substance but also have capability to stand back and see opportunity where others see challenge. From my perspective, success is based on a good understanding of the target process. This can be insourced. However, if you must outsource, make sure that your partners know your industry. Whoever “runs the show” should be able to tell a good idea from a bad one. You should be able to think big, even when your solutions are dealing with very practical targets. With this approach, you can ensure your business continuity and mitigate risk. However, you can also consistently reap benefits and keep people engaged. Maybe failing with the “brainstorming” in the beginning was not such a bad thing after all.

It pays to run several trials. This is not because you are unsure of what you are doing but because you learn every time. However, don’t throw good money after bad. When you have a promising path in front of you, take it and leave the others. Be ready to reformulate the tasks you are giving to your digital coworkers. You might be able to take shortcuts between cause and effect yourself. However, the machine can’t.

When it comes to shortcuts to gain benefits, Midagon professionals have the experience and growth history that it takes to become effective in this important area.

The opportunity in front of you

A colleague of mine divided digital opportunities into three categories. They are all available to you:

You can automate your existing business processes. With the power of digital solutions, you can continue to become faster and more powerful with just brute force.

You can redesign your processes, by making some actions obsolete. A complex decision or planning process originally had to be split to make it actionable for a human operator. You are no longer limited by the capability of handling large amounts of data or multidimensional optimization. Therefore, you may want to get rid of the traditional structures.

You can also change the rules of the game in the marketplace. This is the area where new products and services are born. Old products and services may also get a new life. The eventual glory will be distributed. Ending up here might first take a lot of rewarding work in areas 1 and 2.

Case study

Enabling New Service Business by Initiating Digital Product Development in a Global Manufacturing Company

Written by: Jarmo Hiljanen

Jarmo has over 18 years of experience in digital product and service development in the manufacturing industry. He has ramped up industrial internet service development twice for two listed industrial companies.



The respected Austrian economist Joseph Schumpeter coined the term creative destruction in the 1940s. Schumpeter describes creative destruction as innovations in the manufacturing process that increase productivity, being the deliberate dismantling of established processes, in order to make way for improved methods of production.

That is exactly what digital product development is today – changing the way to manufacture products, but also delivering products with new innovative features to the consumers. However, this change doesn't happen by accident - it must be driven firmly and continuously for years. Initiating digital product development requires dismantling and replacing existing routines and processes, while also adopting rapidly new technologies and skills.

I was selected to lead and manage the digital product development in a global manufacturing company. The manufacturer had noticed that adding digital features would make their product far more interesting. Utilizing sensor technology would reveal a whole new business opportunity.

At the same time, the company struggled while figuring out what kind of activities, processes and skills the new service business ramp-up would require. The situation with the digital capabilities was quite challenging, due to the fact that the company was facing it for the first time. They just didn't have the necessary capabilities to initiate new digital product development.

Gaining competitive edge by entering the digital era

The customer wanted to define, implement and commercialize a new digital sensor concept to gain a competitive edge and to take a leap towards the digitalization era for the first time in its history.

To begin with, the company needed to define the underlying technical solution, including the Industrial Internet of Things (IIoT) architecture and capabilities. They also needed to assess whether the concept was technically and commercially feasible and what the business case for the implementation and deployment would be.

After the assessments, the implementation project was initiated, comprising hardware, firmware, mobile application and cloud capability development activities. A large-scale testing operation was also planned and implemented during the project.

An independent program manager makes plans become reality

Midagon was contacted to lead and coordinate the development program, due to a lack of necessary in-house digital knowledge. I, as the selected program manager, defined the required capabilities, end-to-end solution architecture, business model, business case and the implementation roadmap, as well as the go-to-market plan. I also conducted competitive bidding to establish the development organization and acted as development manager during the implementation phase. Among other duties, I participated in the program board that directed the program as a whole.

The manufacturer has already released the new digital sensor product and is planning to launch production soon. The whole new line of products will be revealed to the public in the upcoming years. The processes, organization and technologies are up and running, just waiting to be utilized after the full roll-out.

Three learnings from the path: How to avoid common pitfalls?

Open the whole cookbook at the initiation of the project

The team knew that the project was much more complex than anything the company had attempted in years. There were many uncertain areas that had to be covered within a tight schedule. Therefore, the whole cookbook, go-to-market plan or GTM, was opened in the beginning of the project.

The go-to-market plan includes all relevant information regarding the project target, schedule, customer segmentation, business case and business model and organization, among other important things.

Planning the GTM early on prevented many surprises. We had, for example, the schedule of when to

initiate testing the product with end-users by country and customer segment. We also had the rough development path for the hardware and software to make sure the required environment tests could be completed in time.

The GTM also revealed the progress of the project for the program board. We knew exactly when to initiate activities, such as for marketing and customer service development in the latter phase of the project, without the risk of conducting them too early.

Data is the most valuable asset

We learned that we would be able to deliver far more interesting service for the customers than we had imagined at the start of the project. This was because of the data.

We knew the value of the collected sensor values, but when integrating the information to the company and customer systems, the value of the data grew. It wasn't just showing those few sensor values but giving predictions, by utilizing analytics. We actually found ourselves developing an information ecosystem that linked the company to other stakeholders. This enabled improvements in the order-delivery process and customer support.

At the same time, it was challenging to communicate the value of the data to the other internal divisions and business units. What we learned was that it is crucial to continue the development in IT, R&D and manufacturing in parallel, in order to reach the goal. Without the integrations to company systems and master data, it would have been impossible to deliver the service to the customers.

Keep business partners close and customers closer

Not all intelligence is found inside the company. We found it to be beneficial to initiate product testing early, when the product still did not have more than 50 % of the features and did not hold in one part in the environment tests. The customer required that both the user experience and product usability needed to be at the highest level to ensure the customer buy-in. We knew that early versions should be shared both internally and with end-users to reveal the weak points of the product. We therefore collected a small group of persons to test the product continuously. We also required them to offer frequent feedback to make sure that we were on the right track.

In addition, showing the product to selected business partners was a great idea. That way we were able to verify that the product would fit the purpose for which it was designed. It would have been quite challenging to make large changes, if testing was conducted too close to the launch of the product.

Through technological innovation towards cultural change

After initiating the new digital product development, the creative destruction wave hit the company's R&D, manufacturing and sales functions strongly. A large set of established processes needed to be modified or replaced to serve the changed situation better.

The new agile development model required preparing for the go-to-market phase at the same time as conducting competitive bidding, to set up the multi-vendor organization in the initiation phase. It also required the participation of the larger test group, including end-users and business partners, which improved the product since the development phase.

Being able to face inevitable showstoppers on time was one of the biggest benefits of having created the GTM plan early on. Being able to make quick turns in the run kept the project on schedule. Furthermore, the GTM plan kept other internal business units and functions informed about the required outcomes that they should deliver.

Creating the product in cooperation with business partners required joint negotiations on the technical details of the solution, cooperation model and

processes. This also mitigated the risk to face challenges while launching the product to market.

Nevertheless, the biggest additional step wasn't in the achievements in technological development. Nor was it the innovative solution that was created during the project. The biggest leap was taken by pushing the digital development stone rolling and demanding that the whole company change. The company had produced traditional products for years, but the strategic decision to move towards digital products actually initiated a cultural change in the entire company.



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