



White paper

Monetizing data in manufacturing

How manufacturers can increase efficiency and drive service innovations and new business models based on data

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DATA IS A KEY ENABLER OF DIGITAL TRANSFORMATION

More than ever, industrial manufacturing companies face the challenge of remaining globally competitive. In addition to measures aimed at increasing efficiency at all stages of their value chains, it will be a key differentiator for manufacturers to align their products and services precisely to the needs of customers, including the ability to address increasing demand for individualization, faster delivery times and time-to-market for innovations but also new customer-centric business models that offer products “as-a-service” rather than selling a physical product. This will require a digital transformation of enterprise and production processes by means of technologies such as IoT, analytics, artificial intelligence, augmented reality, cloud, mobility etc. And, besides technology, data in particular will play a key role in such a digital transformation. However, why is data so important for digital transformation?

Data is a key building block of a successful digital transformation strategy as it is a vital enabler to either optimize efficiency of manufacturers' value chains or to develop new data-driven business models.

And, according to PAC's vision, there will be a future business architecture that puts data at the center and allows to capture, store, transform, and analyze both internal and external data from a wide variety of sources and in different formats in a way to make this data available and accessible to processes, interactions, and applications.

However, basically, data as such and by itself is not a value driver. In fact, many industrial manufacturers today are not challenged by a lack of data but too much data, which has been captured, for example, from production machines and tools in operations or maintenance, and repair data that is kept in service and support applications.

Manufacturers across the globe are challenged by the sheer amount of data, which is already stored and available, but for the majority of which they have no use or do not know that it even exists or how to use it. And, the amount of data being

Data is a key building block of digital transformation, and in fact will fuel digital transformation.

Manufacturers have no use for the majority of data available or do not know how to use it.

captured is set to increase exponentially due to products increasingly and rapidly becoming connected, thereby providing ever more data from field operations.

So, when talking about data, it is not only about capturing it and making it accessible. This is important, yes, but it is definitely more a question of how to gain value from all this data and monetize it. The big potential of data comes from applying intelligence to it, by leveraging big data analytics, advanced analytics, artificial intelligence etc. in order to transform data into insights.

Moreover, given the increased availability and affordability of high computing power and storage capabilities, the time to start turning data into insights and to leverage them for fueling digital transformation is now.

In this paper, we will show how industrial manufacturers can monetize data to both increase efficiency in their value chains and also to drive service innovation and new data-driven business models.



HOW TO MONETIZE DATA IN VARIOUS MANUFACTURING VALUE CHAINS

Many of our conversations with manufacturing companies have shown that they are sitting on large amounts of data, which they do not use at all and which they have no use for or do not know how to use in a smart way to gain additional benefits. Particularly in manufacturers' core value chains such as R&D, engineering, shop-floor operations, or service and support, we see a lot of potential to leverage both existing data but also data from an increasing share of connected products and assets.

Monetizing this data does not necessarily mean that manufacturers have to come up with and develop new business models right away, which is what many manufacturers today often think due to data-driven "as-a-service" business models and innovations being hyped by the trade press, trade shows, and media. In our point of view, monetizing data starts right with the basics, which means looking at how data can increase the efficiency of their value chains. In the following, we will take a closer look at how data can be monetized by increasing efficiency in some of the core manufacturing value chains, namely in R&D and engineering, shop-floor operations, and service and support.

IN R&D AND ENGINEERING

Increasing efficiency in the R&D and engineering domain is all about further reducing the time to market for new product developments or shortening development cycles for product improvements.

In order to develop new products or to improve or enhance products, it is essential to be able to make better product-related decisions based on data. This can be data from sales and marketing (e.g. to gain insights on customer needs), from service and support (e.g. to design products that are more serviceable), from finance and procurement (e.g. to design products using components from suppliers with

The time to start turning data into insights and to leverage them for fuelling digital transformation is now.

A data-centric approach which integrates all relevant data silos of an enterprise will allow a holistic view on data, thus optimizing decision-making around product optimizations and innovations.

the best framework contracts and rates), or from the channel (e.g. to design products that fulfil the requirements of channel partners).

Currently, this data is often kept in silos in various applications such as in CRM or CPQ applications, MRO applications, field service management solutions, and ERP or SRM applications. And, in order to speed up product development cycles in times where market demand is changing fast, having a data-centric approach which aims at integrating all these data silos will be key to enable a holistic view on all of this data, in order to serve as a better basis for decisions around product optimizations or product innovations.

PAC's vision of a future business architecture which will have data at its core will therefore help to overcome these data silos and increase the efficiency of R&D and engineering processes accordingly. For example, cloud-based innovation platforms, which have PDM applications and/or PLM solutions at their core, can help to integrate product-related data from various other domains, sources, and applications (e.g. from CRM, ERP, SRM applications).

The benefit of this kind of data-centric approach, which aims at overcoming numerous data silos, is that product development cycles can be shortened. This has the potential to reduce product development costs quite significantly, but also to improve the customer experience by providing product innovations faster, which is key to staying globally competitive in the long term.

There is also considerable potential to speed up product development cycles by using data from products or assets, which are increasingly smart and connected and which deliver operational performance data when in use.

Equipping products or assets with sensors and connecting them to the Internet allows performance data to be sent back to the OEM who, in turn, can use this data for simulations, for example. Such data is of huge value to product engineers as it enriches simulations with real-world data and also allows them to make product improvements even faster. Once again, accelerating product improvement cycles can help to reduce product costs and stay globally competitive in the longer term.

IN SHOP-FLOOR OPERATIONS

Particularly on manufacturing shop floors, we often find very large volumes of data already being captured and stored (e.g. in applications for acquiring machine, production, or personnel data), but only a small part of it is actually used and monetized. Therefore, instead of collecting more and more data, we see huge potential in first working out how existing data can be leveraged. Very often, this current data is already useful for identifying weak points in production, in order to speed up throughput or to avoid waste production, for example. By applying data analytics solutions, relations very often become clear, which help to identify such weak points. A very simple example is the analysis of production data. This could reveal that a certain machine produces a significantly above-average share of defective

A holistic view on data can shorten product development or product improvement cycles, thereby reducing development costs.

Data from connected and smart products in use enrich simulations with real-life data and allow product engineers to realize product improvements faster.

Existing data from the shop floor can help to improve efficiency by increasing throughput and the utilization of machines and assets. This also allows product engineers to realize product improvements faster.

or misassembled products only on certain days when operated by a particular employee. This allows appropriate measures to be taken, which, in this case, could be machine training for this particular employee. Such a “simple” analysis of existing data (e.g. machine and workforce scheduling data) already helps to increase efficiency on the shop floor and is a good example of monetizing existing shop-floor data. Furthermore, existing data can also be used for factory simulations that help to optimize production schedules in order to increase factory throughput and the utilization of machines and assets.

From our point of view, monetizing existing data represents the harvesting of low-hanging fruits and should not be underestimated as major benefits can be realized here. Also, prior to collecting more data, every head of production, plant manager, or assembly line operator should first consider existing data.

In addition to existing data in numerous shop floor applications, there is particularly considerable potential to increase the overall efficiency of production equipment (OEE) in the operations technology (OT) domain by leveraging technologies from the IT domain such as industrial IoT and predictive analytics. Such technologies, which enable asset and machine data to be collected and analyzed in real-time, help to realize asset and machine monitoring as well as predictive maintenance concepts, for example. These can assist in avoiding machine failures, reducing unplanned machine downtimes, and optimizing energy consumption, thereby helping to further reduce costs and increase efficiency on the shop floor.

IN SERVICE AND SUPPORT

Increasing the efficiency of service, support, and maintenance processes is a major lever for OEMs to reduce costs, but at the same time – particularly in some industry sectors – it is also key to overcoming the increasingly obvious need for skilled and experienced service engineers and technicians.

After products, i.e. production machines, have been sold and shipped to customers, they may require service tasks in case of failure or maintenance. There are two approaches to increasing efficiency, and thereby monetizing data, in the service and support domain of manufacturers:

Increase the efficiency of service personnel: Here in particular, technologies such as IoT, augmented reality (AR), mobile devices, and wearables (e.g. smart glasses) enable service technicians to increase their efficiency. For example, by leveraging these technologies, service technicians can access service instructions for a complex production machine, for instance, by wearing smart glasses which display service instructions on them. This also allows them to carry out maintenance tasks hands-free. In addition, giving field service workers remote access to relevant data (from various data silos) by leveraging mobile devices and AR can speed up repair times and reduce service costs. Or, it can even help to carry out services remotely without sending a costly field service expert on site, thereby

IT/OT integration can help to increase efficiency and asset utilization on the shop floor by analyzing data from the OT world with the help of IT.

Mobile access to relevant data as well as new technologies to access data such as AR increase the efficiency of on-site service engineers and also help to overcome the lack of experienced service engineers.

again addressing the increasing lack of experienced service engineers and technicians.

Reduce the number of unplanned costly service calls: Unscheduled machine downtime at a customer site results in costly service calls to OEMs. Therefore, the goal should be to prevent unplanned downtime. In order to avoid expensive ad-hoc service and maintenance tasks at the customer site, predictive maintenance concepts (e.g. by leveraging predictive analytics and IoT) can help to better plan service tasks, reduce associated costs, and subsequently increase the efficiency of service and support. Furthermore, such predictive maintenance concepts also help to replace periodically planned maintenance tasks (that are possibly unwarranted most of the time) with predictive maintenance calls, and only if they are necessary.

As you can see, data can be monetized in various manufacturing value chains. However, how can data be monetized for service innovations and new business models?

Predictive maintenance concepts, which leverage IoT to analyze machine data with predictive data analytics, help OEMs to reduce costly service calls in case of unplanned downtime.



HOW TO ENABLE DATA-DRIVEN SERVICE INNOVATIONS AND NEW BUSINESS MODELS

In our point of view, monetizing data starts right with the basics, which means looking at how data can increase the efficiency of manufacturers' operations in R&D, engineering, production, and service and support. However, of course, there is an even greater added value to data if you can develop innovations or completely new business models which, in addition to cost savings, also generate additional revenue streams.

So-called data-driven business models can be built based on data from the company's own domain. And, even from – and here are even more potential business opportunities – external data, which comes from the company's ecosystem.

However, a starting point for many OEMs is to offer their customers value-added services based on their connected products or production machines.

DATA-DRIVEN SERVICE INNOVATIONS

We see a lot of industrial equipment manufacturers that have already launched initiatives to connect their equipment to IoT platforms and provide asset monitoring or predictive maintenance services. However, although the idea is quite attractive from a commercial point of view, reality shows that there are several challenges related to this: one is that most customers are not yet prepared to pay for such smart services. And, what is even more a challenge, customers do not want OEMs to have insights into the operations of their production equipment. They want to remain the owner of their production-related data. These challenges are preventing OEMs from monetizing data from connected products. However, this does not mean that the concept of offering value-added services on smart and connected products is not working, per se. It only shows that customers do not see the value, meaning that they are not prepared to pay for it and therefore do not want to share the data.

In order to monetize data from connected products, value-added services need to offer a real value-add, otherwise customers will not be prepared to pay for them and will not be willing to share their data with the OEM.

So, the main thing that OEMs need to do in order for customers to pay for value-added services via their connected products is to offer a real value-add, for which the customer is prepared to pay and for which it will be willing to accept a data sharing model that allows a secure and trustworthy handling of data.

DATA-DRIVEN BUSINESS MODELS

One major trigger which could encourage customers to share such production data could be if production machines were offered to them “as-a-service”. For some customers it might be an interesting option and a huge benefit if they can avoid high upfront investments such as buying expensive production equipment (e.g. robots) and hire production equipment “as-a-service” instead. The benefit for the customer is about shifting costs from CAPEX to OPEX, while the OEM benefits from ongoing revenue streams instead of one-time payments as well as insights into usage of their products. This information can form the foundation for product improvements or be used to increase customer experience and satisfaction, which again helps to secure a competitive advantage.

However, although offering products “as-a-service” delivers value for both customers and OEMs, there is still a long way to go. This is because it requires OEMs to have both the IT infrastructure in place (e.g. IoT platforms and analytics solutions) and the processes integrated (e.g. spare parts logistics, field service planning). Only if this has already been done is an OEM in any position to offer products as-a-service. Only then can an OEM guarantee 100% availability of its equipment, i.e. high service level agreements. Otherwise, high claims for unplanned equipment downtime and product failure will be applied, which must be avoided by all means.

Interestingly, the more OEMs offer data-driven value-added services or products “as-a-service”, the more they will become service providers, and the more this happens, the more they will need to increase their expertise and know-how in enabling technologies such as IoT platforms, analytics solutions, cloud-based platforms etc.

Moreover, as already mentioned, new data-driven business models can use not only data from the manufacturer’s domain, but also external data from the ecosystem. This in fact holds even more interesting potential for new business models. The idea is that manufacturers enrich data from their own domain with data from the ecosystem to develop services that are of value to customers and can therefore be monetized. An often-cited use case is smart farming. Solutions already available on the market include those where seed and fertilizer producers work with tractor manufacturers and weather data providers to offer farmers paid services that provide individual and location-based recommendations on fertilizers, seed application etc. This is a very nice example of the added value of data from an ecosystem. Another example is the cooperation between car manufacturers and insurance companies offering car insurance policies based on the customer’s driving behavior. This so-called usage-based insurance is another example of how data shared

Data-driven business models will transform OEMs into service providers, which will require deep know-how of enabling technologies such as IoT platforms, analytics and cloud.

Data-driven business models which are based on ecosystem collaboration will be the ones that will deliver the highest long-term value for their customers.

in an ecosystem can offer customers value (e.g. a lower insurance premium than compared to a traditional insurance model).

Sharing data within an ecosystem is still in its very infancy, however. Industry sectors such as farming and the automotive industry (in its collaboration with insurance companies) can be considered as very early movers, but industrial equipment manufacturers, for example, are not really among the forerunners of this idea. However, we see more and more initiatives here, showing that this topic is increasingly seen as important. Industry-related initiatives include the Industrial Data Space (IDS), founded in Germany, which aims at defining data standards and data governance frameworks to be used in collaborative data sharing environments, or Combient, which is a cross-industry collaboration network in the Nordics.

From our point of view, in order to stay competitive globally, manufacturers will have to collaborate in ecosystems and share relevant data accordingly to be able to offer their customers true value-add and remain a relevant player in the long term.

PAC'S CONCLUSION

How to monetize data is an important question for many manufacturing companies around the globe today. This question gains even more significance as the amount of data increases, e.g. from connected products and assets. Key technology enablers such as IoT and advanced analytics will make it possible to monetize this data by both helping to increase the efficiency of manufacturers' value chains and driving service innovations and new data-driven business models.

However, it is important to understand that monetizable data is not only derived from the manufacturer's own domain. In fact, we believe that even greater value lies in data leveraged from their ecosystem, which can be used for service innovations and new data-driven business models.

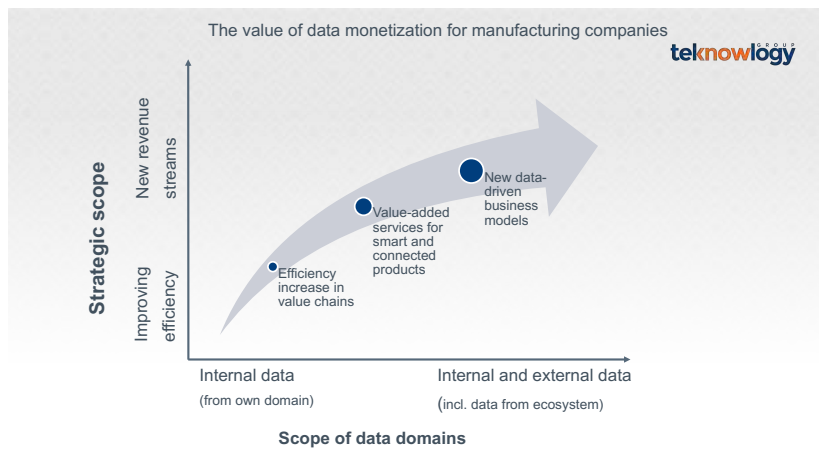


Fig. 1: The value of data monetization for manufacturing companies

However, besides all the monetization potential of data, there are naturally some obvious, common obstacles that need to be addressed first. These relate to customers' general concerns around data sharing, i.e. giving someone else (e.g. the OEM) access to the product's or production machine's performance data etc. This is a bigger obstacle in the B2C environment than in the B2B one. OEMs have also experienced that customers are not really prepared to pay for so-called value-added services. Therefore, we currently see a lot of proofs of concept in the market where the technical, logistical, and organizational set-up has been tested, but with very little real revenue streams.

However, PAC believes that all of these challenges can be addressed by the manufacturing OEM, but it needs a good understanding of customer demand and what will increase customer value. If customers see value, they will be prepared to pay for these services and will also be willing to share data so that the OEM can monetize it.

WHY INFOSYS?

INFOSYS' APPROACH TO DATA MONETIZATION

The manufacturing industry is on the threshold of modernizing to monetize. Manufacturers across the globe are embarking on the path to smart products, smart factories, servitization and B2B2C. The digital embrace has become mainstream and it is imperative for clients to assess and redefine the ways of running business to stay relevant in the digital age.

With data being the undercurrent for everything, Infosys helps clients monetize by navigating through the data economy. With a rapid evolution in the technology space from big data, Data on Cloud (DoC) of the recent past to AI/ML in the present, it is critical for clients to have a modernization blueprint. As they pursue this opportunity, manufacturers are looking for a partner who can help them navigate every facet of the journey. Infosys' deep domain expertise in manufacturing coupled with our agile digital capabilities and data & AI expertise positions us well to partner our manufacturing clients in this journey. As a founding member of the consortium that defined the Industry 4.0 maturity framework, Infosys brings a practitioner's viewpoint of setting up the right data foundation and the most effective analytical techniques across the manufacturing ecosystem.

For example, a large tool manufacturer, with 1M+ SKU's, was facing issues of redundant SKU's, stockouts and factory downtime, excess inventory, catalog error, credit issues and financial leakage. This was because of data consolidation errors across 15+ ERP systems with 600+ datasets. Infosys created a simplified metadata-driven boundary-less data lake on AWS with open-source technologies for the customer, which reduced the cost of tools manufacturing, improved the bottom line by reducing the cost of inventory and improving margins.



PAC'S VIEW ON INFOSYS

Infosys can rely on a suite of **comprehensive end-to-end business solutions and services** for manufacturing companies worldwide and has a **solid footprint in manufacturing**. With regards to data monetization, which is a major challenge among manufacturers globally, Infosys is in particular very well positioned with its **global capabilities around data analytics, artificial intelligence, cognitive computing and IoT**. These capabilities will serve the needs of manufacturing companies related to monetizing data. This applies for monetizing data in various manufacturing value chains, monetizing data to generate new revenue streams from connected products, and also to help manufacturers develop new data-driven business models.

In the field of monetizing data in various manufacturing value chains, we see Infosys well positioned – especially because of existing customer references that were shared with us – with regards to increasing manufacturers' efficiency in **engineering** (e.g. developing and implementing scalable engineering platforms to help manufacturers speed up the time to launch product innovations); in **production** (e.g. developing and implementing digital factory simulations in order to increase factory throughput); in **service and support** (e.g. implementing AR/VR solutions for field service engineers to improve service operations).

Moreover, in the fields of monetizing data for new data-driven services and new business models, Infosys also has a comprehensive services portfolio in place to help manufacturers **gain value from data from connected products**. This includes services such as the development and implementation of **condition-based monitoring** and **predictive maintenance** concepts to help manufacturers improve the efficiency of their services operations as well as energy management solutions to improve energy efficiency of their production assets and equipment.



ABOUT INFOSYS

Infosys is a global leader in next-generation digital services and consulting. We enable clients in 45 countries to navigate their digital transformation.

With over three decades of experience in managing the systems and workings of global enterprises, we expertly steer our clients through their digital journey. We do it by enabling the enterprise with an AI-powered core that helps prioritize the execution of change. We also empower the business with agile digital at scale to deliver unprecedented levels of performance and customer delight. Our always-on learning agenda drives their continuous improvement through building and transferring digital skills, expertise, and ideas from our innovation ecosystem.

Our clients and prospective clients are faced with transformative business opportunities due to advances in software and computing technology. These organizations are dealing with the challenge of having to reinvent their core offerings, processes and systems rapidly and position themselves as 'digitally enabled'. The journey to the digital future requires not just an understanding of new technologies and new ways of working, but a deep appreciation of existing technology landscapes, business processes and practices.

Our strategy is to be a navigator for our clients as they ideate, plan and execute their journey to a digital future, to help them 'navigate your next'. We have embraced a four-pronged strategy to strengthen our relevance to clients and drive accelerated value creation. Towards implementing the strategy, we will focus on 4 areas:

	Scale Agile Digital	Invest in digital capabilities & priority services
	Energize the Core	Infuse AI and automation, leveraging Nia
	Re-skill our People	Re-skill talent at scale for us and our clients
	Expand Localization	Hire locally in markets, local delivery & training



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ABOUT TEKNOLOGY GROUP



teknowlogy Group is the leading independent European research and consulting firm in the fields of digital transformation, software, and IT services. It brings together the expertise of four research and advisory firms, each with a strong history and local presence in the fragmented markets of Europe: [Ardour Consulting Group](#), [BARC \(Business Application Research Center\)](#), [CXP](#), and [PAC \(Pierre Audoin Consultants\)](#).

We are a content-based company with strong consulting DNA. We are the preferred partner for European user companies to define IT strategy, govern teams and projects, and de-risk technology choices that drive successful business transformation.

We have a second-to-none understanding of market trends and IT users' expectations. We help software vendors and IT services companies better shape, execute, and promote their own strategy in coherence with market needs and in anticipation of tomorrow's expectations.

Capitalizing on more than 40 years of experience, we operate out of seven countries with a network of 150 experts.

For more information, please visit www.teknowlogy.com and follow us on [Twitter](#) or [LinkedIn](#).

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