

GREATER ENGINEERING EFFICIENCY THANKS TO ARTIFICIAL INTELLIGENCE

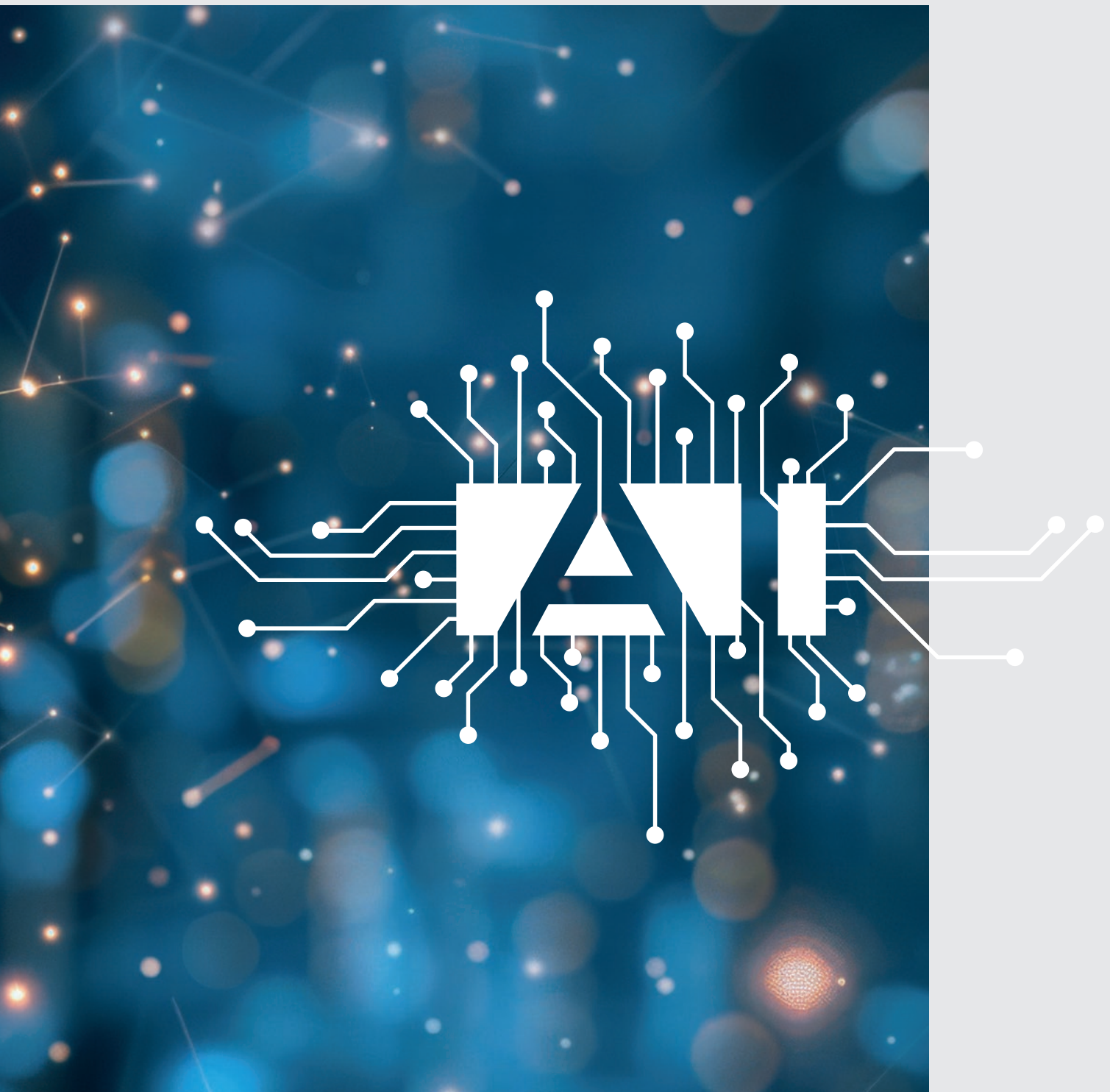
Artificial intelligence (AI) promises enormous potential benefits, also in the area of product development. However, small and medium-sized companies with limited financial and human resources find it difficult to leverage this potential on their own. They need help from a partner with experience in AI. PROSTEP's new white paper "Boosting Engineering Efficiency with Artificial Intelligence" explains how PROSTEP can help you implement AI in your PLM processes.





Introduction

Artificial intelligence (AI) will dramatically change the way we live and work over the course of the next few years. It also promises significant potential benefits in product development and engineering. Companies that do not make an effort to understand and deal with the impact and potential benefits of AI run the risk of falling behind in the long term. Small and medium-sized companies with limited human and financial resources in particular are asking themselves how they can best tackle this challenge. One way to speed up the implementation of AI applications in business processes is to work together with a consulting and software company that has experience with AI. This white paper takes a look at how the AI experts at PROSTEP can provide you with support in the context of defining a future-oriented AI strategy and implementing appropriate AI initiatives.



The growth potential of artificial intelligence

According to bitkom, the percentage of German companies that use artificial intelligence (AI) increased to 15 percent last year; 68 percent consider AI a key future technology. According to an older study by the Association of the Internet Industry, eco, it promises German companies savings of 330 billion euros and additional sales potential of 150 million euros by 2025 – provided they fully exploit the potential that AI offers. AI-based support for production accounts for just over half of this potential. But there are also potential applications in engineering that offer considerable potential for growth.

AI technologies can help companies identify and develop new markets by analyzing and predicting market trends. The AI-based analysis and use of data enables them to develop new, service-oriented business models. AI supports the development of new products and services that would otherwise not be possible. Prime examples include intelligent household appliances and autonomous vehicles. And it can be used to enhance existing products and services with smart functions based on the analysis of usage data.

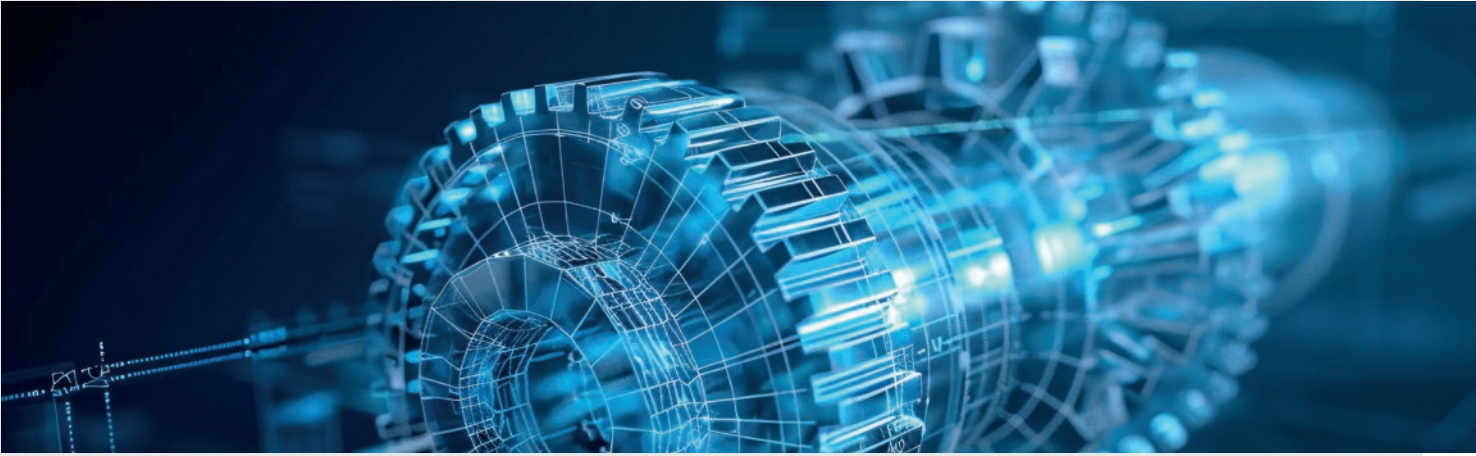
AI relieves engineering staff of tiresome routine tasks and makes it possible to automate certain processes and thus save time and money. The IT systems at companies contain vast amounts of data that can be analyzed with the help of AI in order to simplify and speed up decision-making. AI-based assistants also improve customer service and open the door to greater personalization of the customer experience by taking account of their usage behavior.

The implementation of AI in companies and business processes is therefore a necessity if companies are to remain competitive in an increasingly data-driven and automated world. It speeds up research and development processes and allows companies to launch innovative products onto the market faster and more efficiently. There are numerous possible use cases, especially in product development and engineering.



Numerous use cases for AI methods in engineering

Different AI methods are used or combined with each other, depending on the use case in question and the available database. Frequently used technologies for pattern, image and speech recognition are machine learning (ML), deep learning (DL) based on artificial neural networks, and natural language processing (NLP), which also uses neural networks to understand, process and generate natural language. Computer vision combines the principles of image processing, pattern recognition, ML and DL to mimic human vision.



AI methods can be used to increase innovation and efficiency throughout all the phases of the product engineering process from the initial concept to validation and production. This starts with the automatic collection, analysis and verification of requirements. Based on these requirements, AI-based tools can generate initial product ideas in the concept phase by evaluating large amounts of data and existing designs. AI also provides product developers with support in their search for the best possible combination of materials and/or the selection of sustainable materials.

In the context of simulation, AI methods complement traditional finite element analyses by modeling and simulating complex physical processes. These methods are also increasingly being used for the purely synthetic simulation of products based on existing data and simulation results, which saves an enormous amount of time and money. In the context of quality assurance, they detect faults and defects in components by performing visual inspections or identifying deviations from the product specification. They can also be used to monitor and optimize production processes and to predict when machines should be serviced.

Creating AI expertise with the help of external partners

Which use cases promise the greatest benefit also depends on the degree of digitalization in the respective company, as digital data provides the basis for AI applications. Small and medium-sized companies in particular are often faced with the questions of which use cases they should prioritize and how they can exploit the potential that AI offers if there is no relevant in-house expertise. It is important that they develop this expertise in the medium term to ensure that they are able to respond flexibly to new use cases. But in the short term, it may be useful to collaborate with partners like PROSTEP, who have the relevant AI expertise and can help you jumpstart your AI journey.

External partners can help companies define a sustainable AI strategy and identify the use cases for which AI promises the greatest potential benefits. This requires that they not only have the relevant AI expertise but also a good understanding of the processes and the treasure troves of data available in the company that need to be unlocked with the help of AI. This is precisely why PROSTEP focuses on the symbiosis of AI and PLM. We provide customers with support from the definition of the AI strategy to advice when selecting technologies and methods through to the development and implementation of appropriate AI applications.

Our experience shows that starting with small, manageable pilot projects is a promising approach to introducing AI. Companies can not only test the feasibility and benefits of AI applications but also ensure a high level of acceptance among users, many of whom take a skeptical view of AI. The development of prototypes and proof of concepts (POCs) enables them to gain initial experience and develop their own know-how.

External partners like PROSTEP provide support for developing AI expertise among their customers in a variety of different ways. We contribute our knowledge and experience dealing with different AI methods to the projects and pass this knowledge along to employees in training courses. In addition, our involvement in a variety of research projects in the field of AI gives us access to the latest AI technologies and tools, which we can make available to our customers.

AI as part of a comprehensive digitalization strategy

AI offers companies the opportunity to revolutionize their products, speed up their processes in product development, production and service, and explore new ways of approaching customers. However, these opportunities also bring risks that result from misjudging the scope of the topic. PROSTEP helps companies recognize these opportunities and counter the risks with confidence. To this end, we develop individualized AI strategies together with our customers.

The starting point for this strategy development is the question of what objectives the respective company is pursuing with the use of AI. It makes a big difference whether the primary aim is to optimize existing processes in development or production with the help of AI, whether the product itself should include AI-based applications, or whether the company wants to reinvent itself through the use of AI. The concepts and recommendations for action vary accordingly.

PROSTEP believes that the AI strategy cannot be separated from the digitalization strategy, especially in the context of product development and production. Instead, it builds on the level of digitization that has been achieved. That is why in the next step we analyze the maturity level of digitalization at the company in question and in particular take a look at the state of the PLM architecture. Further development of the PLM architecture is of key importance when it comes to making product development more efficient with the help of AI. Industry 4.0 and the associated concepts play an important role in production processes.

Based on the maturity level of the customer's digitalization, we work together with the specialist departments to identify possible use cases for AI, assess their feasibility and potential benefits, and determine which should be implemented first. An important criterion is that they promise a quick benefit for employees and thus increase the level of acceptance of the technology in the organization.



One of the biggest challenges when it comes to implementing AI is ensuring that the company is willing to accept technical and cultural change. AI must become a key competence in the different business units. Therefore, when defining the AI strategy, we also take a look at the organizational changes that will allow the customer to use AI over the long term. We provide employees with information about what AI entails with the aim of building up knowledge and reducing fears. Enabling them to recognize the cases in which AI can help is also part of the AI strategy.



Integrating and preparing data for AI applications

Digital data is the backbone of state-of-the-art AI applications. It not only plays a role when using AI but also in the development, training and continuous learning of AI applications. This data is usually stored in different data repositories and needs to be collated and processed if it is to be used effectively for AI. Data integration and data modeling are among PROSTEP's core competencies.

We provide our customers with support not only when extracting and preparing data from leading PLM, ERP and ALM systems and other enterprise applications but also when selecting the data required for the various use cases in advance. We analyze the available data together and determine the form in which it is to be merged in an AI data hub or whether it might be enough to simply link it via our OpenCLM digital thread platform and then analyze the impact of changes with the help of AI.

The information model that we develop for the AI use cases is relatively generic. It is adapted repeatedly over the course of time in order to address new use cases. Some of the data extracted and made available in the AI data hub still needs to be cleansed and processed before it can be used for a specific application. Here, too, we can provide customers with the best possible support thanks to our many years of experience with data conversion and migration.

The definition of uniform semantics is essential when it comes to evaluating data with the help of AI. It structures company and/or domain-specific knowledge and makes it easier to integrate data from different sources. It also ensures that AI can interpret the data consistently and unambiguously and identify incorrect and inconsistent data more easily. Our AI experts have extensive experience with standardizing domain and company-specific terminologies.



Creating an enterprise-wide AI data hub

If digital data is the backbone of state-of-the-art AI applications, then digitalization of the processes in product development, manufacturing and service is a prerequisite for AI. Or to put it another way, the use of AI is actually just another step on the digitalization roadmap. This is why the starting point for our AI consulting is normally the analysis and optimization of a company's PLM architecture and PLM capabilities.

Many companies are trying to integrate AI applications into their existing PLM solutions. This may make sense in individual cases but it is not a particularly sustainable approach, especially in view of the heterogeneous PLM and IT landscapes at larger companies and the potential that AI offers in downstream departments such as production and service. We therefore help our customers make AI-relevant information from any data repository available in a dedicated AI data hub that can be used by any department in the company.

A key component of this AI data hub is our PLM integration platform OpenPDM, which ensures connectivity. It provides standardized connectors to widely used enterprise applications that make it easy to extract data from the connected systems or to link data via OpenCLM. Data lakes and data warehouses can also be connected using configurable templates in order to create an enterprise-wide AI data hub.

OpenPDM controls the data extraction process and the level of granularity with which the data is extracted in the initial step depending on the use case in question. Further processing of the data in the AI data hub is performed in the subsequent steps. The data is first of all cleansed and made available to all AI applications in generic form. It is then tailored to the respective AI use case in a subsequent step. The architecture of the AI data hub makes it easy to expand the data pool and automate the preparation process.

Developing customer-specific AI solutions

Customer-specific AI applications are often required in order to implement the use cases identified and prioritized as part of AI consulting. We develop and implement this type of application on behalf of our customers, placing focus on solutions for PLM, ALM and engineering. We connect the AI tools to our Open-PDM integration platform so that PLM data can be prepared for analysis or training purposes.

The experience we have gained developing our own AI-based solution, which makes it possible for us to analyze and segment 3D scan data from machines and systems and automatically convert it into usable 3D geometry, forms the basis for several AI applications. For example, we are now using this AI-based image recognition technology in a customer project involving image-based comparison of the as-built status of a complex product with the engineering bill of materials and 3D models with the aim of making it easier to identify missing components.

Another example from the world of engineering involves an AI application that analyzes design changes made in the past to determine the likelihood of similar change requests being approved. The purpose of the application is to speed up the processing of these change requests so that users can concentrate on dealing with the really tricky changes.

The AI-based evaluation of support requests, the automatic classification of faults that have occurred, and their assignment to the correct teams is also an AI application that we initially developed for use in-house. AI learns how to perform assignment automatically based on existing faults and their current assignment. The AI application has meanwhile attracted the attention of a major customer from the automotive industry, who wants to implement the AI application in its system within the framework of a proof of concept.



AI functions enhance PROSTEP solutions

The integration of AI-based functions in our portfolio of solutions is, together with the development of customer-specific AI applications, a key component of our AI strategy. We are working on enhancing our existing solutions for data exchange, data integration and data linking with AI-based functions by incorporating the experience gained by our AI experts in consulting projects and in the context of developing customer-specific AI applications in our software products. We are also developing new AI-based services such as 3DigitalTwin, which allows plant operators to turn the 3D scans of their existing facilities into digital twins.

Like other software vendors, we are also currently testing AI-based tools like GitHub Copilot with the aim of speeding up the further development of our software solutions. We are also integrating new AI-based functions in our solutions to expand their level of functionality. These include, for example, new analysis functions in our PLM integration platform OpenPDM, which can be used in migration projects to analyze and optimize the quality of the data to be migrated in advance in order to speed up migration.

Data migration is usually a time-consuming process during which large volumes of data are transferred from one PLM system to another. If errors are not discovered until late in the migration process, migration is delayed even further. These delays can be avoided if unsupervised machine learning methods are used to identify anomalies before migration is started. This functionality ensures successful transfer to the target system and improves the resulting data quality. It also makes it easier for us and our customers to estimate the time and effort required for data migration.

We also see interesting possible applications for AI in our web-based digital thread solution OpenCLM. This solution makes it possible to link information from different domain-specific authoring and management systems in order to trace the development status and development history of a product and assess the impact of changes more accurately. Linking this information is currently an interactive, manual process, and we want to drive the automation of this process forward with the help of AI methods.





Greater benefits thanks to the combination of PLM and AI

AI promises enormous potential benefits, also in the context of product development. If this potential is to be exploited, digital data from different enterprise applications needs to be collated, cleansed, processed and evaluated. As a dedicated PLM and ALM integration specialist, PROSTEP provides customers with support when setting up an AI-enabled PLM architecture and creating an AI data hub that provides the data for the AI applications. This is based on our PLM integration platform OpenPDM, which we are continuing to expand by adding new standard connectors.

PROSTEP provides its customers with support from start to finish when introducing AI. We work together with them to define a sustainable AI strategy that is geared to their business objectives, identify potential use cases in engineering, production and aftersales, and develop a roadmap for successful implementation of their AI project. We also provide them with support for organizational change management to ensure that their employees are in a position to deal with AI.

We place clear focus on the symbiosis of AI and PLM/ALM. We automate and optimize our customers' PLM/ALM processes with the help of the AI methods best suited to the use case in question. These include machine learning, artificial neural networks, natural language processing and computer vision. If required, we also develop customer-specific AI applications for them, e.g. for image-based quality assurance, speeding up change management or automatically classifying error messages from support.

A key pillar of our AI offering is the development of our own AI applications, e.g. for converting the 3D scan data of existing plants into digital twins. We will also be enhancing the functionality of our existing for data exchange, data integration and data linking with the help of AI. We have, for example, already added AI-based functions for data linking to our OpenCLM digital thread solution. We will also be expanding our PLM integration platform OpenPDM to include AI-based functions for analyzing and improving data quality during migration.



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