PROSTEP
integrate the future

WHITEPAPER

STRATEGIC PLM CONSULTING

Product lifecycle management (PLM) is a crucial factor for a successful digital transformation. This makes the task of introducing a new or modernizing an existing PLM landscape a complex process involving various domains and disciplines. The present White Paper explains the advantages of PROSTEP's capability-based consulting approach when defining and implementing a forward-looking PLM strategy.


PLM

Introduction/Abstract

Many businesses are faced with the challenge of having to modernize their PLM architectures. This process is considerably more complex than the task they faced when introducing the first generation of PDM systems, a step that was primarily driven by mechanical product development. Because PLM has since become a key technology for the digital transformation, it is now necessary to harmonize the requirements of various domains and disciplines. That is why it is advisable to call on the expertise of external consultants when defining and implementing a sustainable PLM strategy. The consultants should be as vendor-neutral as possible, have experience of comparable projects and use methodological tools that make the choice of system transparent for everyone involved. This White Paper explains more about PROSTEP's process model for capability-based PLM strategy consulting.

There are many reasons for modernizing the PLM architecture

There are many reasons prompting businesses to search for one or more new product lifecycle management (PLM) applications. Sometimes, they are start-ups or fast-growing innovators that have arrived at the point where they first recognize the urgent need for a PLM solution. In other companies, the existing solutions are starting to show their age and are no longer being further developed by their vendors.

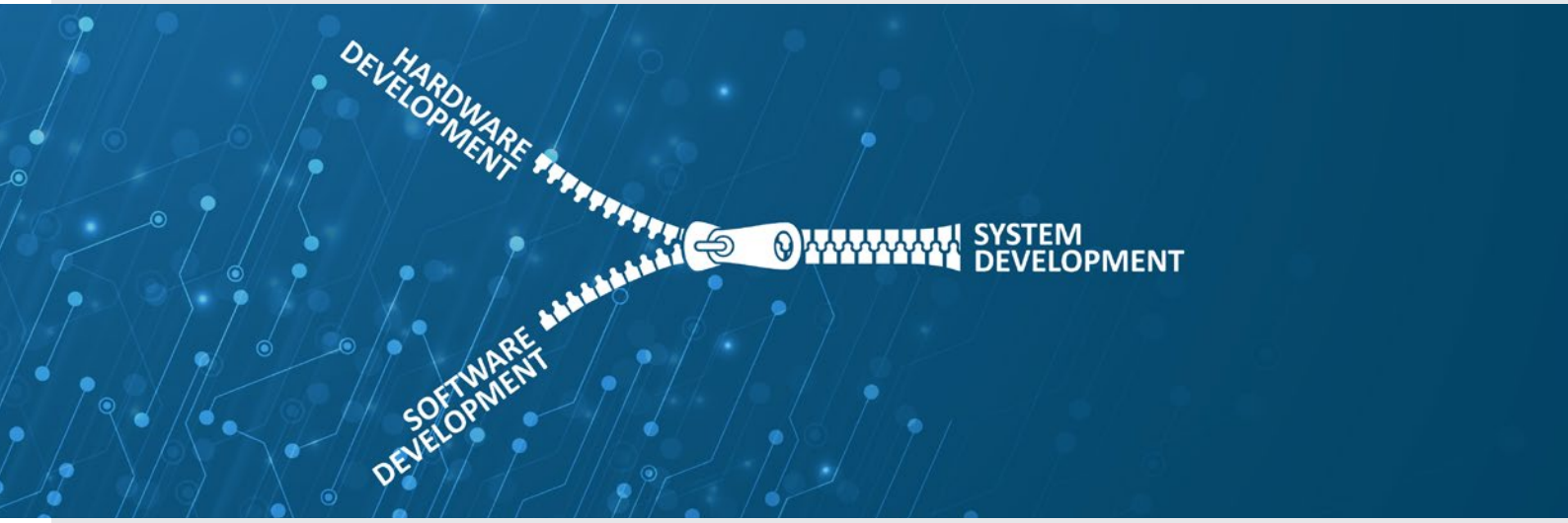
In many cases, enterprises have gone as far as they can with their existing solutions and want to make a fresh start. There are also cases where aspects of the PLM architecture have become so complex that their maintenance imposes an enormous strain on the IT budget and further development is almost impossible. Even simple system updates can be a major challenge, with the result that users have to wait for a long time before being able to benefit from new functions. In this context, Cloud-based PLM applications promise to deliver accelerated deployment of the required PLM capabilities, the more cost-efficient operation of infrastructure and applications, as well as better protection against cyber-attacks.

Last but not least, businesses are recognizing the key role played by modern PLM infrastructures in ensuring the successful digitalization of their business processes and are questioning whether or not they are still on the right track. Smart products with a growing proportion of electronics and software demand new development methods such as model-based systems engineering (MBSE) and new tools for the control of the software development processes (ALM or application lifecycle management). To accommodate these methods, businesses very often have to modify their PLM architectures.

PLM and ALM must grow closer together

Products are becoming smart systems that capture data and communicate with other systems. They are being endowed with ever more functions that are controlled via software. As a result, it is necessary to consider mechanical, electrical/electronic and software components as an integrated system and harmonize the development processes used in the different disciplines much more closely with one another. This is difficult even at the level of a single company and even more so when it is necessary to collaborate across enterprise boundaries due to the fact that certain function scopes are contributed by suppliers.

The challenge lies in the fact that in many companies the product development processes and the PLM systems that support them are, for historical reasons, extremely focused on mechanical aspects. By contrast, the software is developed in a separate universe, referred to as application lifecycle management (ALM), which has so far had only few points of contact with the PLM world and its user community. To anchor the systems-oriented philosophy in the development process, it is necessary to bring together PLM and ALM in a shared development environment.



Requirements and test management must be designed to cover the entire system and must be distributed across the development domains by means of a functional structure. In this scenario, the system architecture forms the framework within which the different development teams each occupy their own clearly defined position. A variety of interacting simulation methods are used to check the system functions at an early stage and take the necessary countermeasures in good time if discrepancies are observed. To emphasize this important interaction between PLM and ALM without, however, placing the focus on any one specific discipline, we like to use the term “system lifecycle management” (SLM).

The aim of capability-based strategy consulting is to bring the IT landscapes of the different disciplines and domains together in an overall architecture and adapt their process worlds to the new requirements of SLM. However, this presupposes that the consultants are well versed not only in the PLM world of mechanical engineering but also in the ALM world of software development.

MBSE demands interdisciplinary collaboration

The greatest challenge in developing smart, software-dominated systems can be found in the field of interdisciplinary collaborations. Mechanical, electrical/electronic and software developers speak different languages; they work with different IT systems and manage their artifacts in different data stores. To ensure cross-domain traceability, PLM and ALM systems must be combined to form an overarching SLM solution. But that is not enough. The disciplines also need tools and methods that will enable them to get to grips with the growing complexity of interdisciplinary product and system development. One of the methods that has met with widespread interest in industry is model-based systems engineering (MBSE).

According to INCOSE (International Council on Systems Engineering), MBSE is the formalized application of models in order to support all activities from the capture of requirements through design and analysis and on to system verification and validation. It is a model-based approach that is intended to bring together the needs of different stakeholders within a single concept and helps the various disciplines better understand the interrelations in complex systems.

In many of the projects undertaken by the prostep ivip Association, PROSTEP concerns itself with the practical application of model-based system development. Drawing on this experience, we also advise customers regarding the introduction of MBSE tools and methods and their integration in PLM processes within the framework of our capability-based PLM strategy consulting services. When doing so, we place the expectations and concerns of the stakeholders at the heart of the consultancy project in order to develop realistic, achievable roadmaps.

En route to a modular PLM architecture

From the foregoing, it is clear that when we talk about PLM today, we are not thinking of just a single system. Instead, we are referring to the interaction of multiple systems along the entire product lifecycle. Despite this, most projects still continue to focus on product development, thus narrowing the horizons.

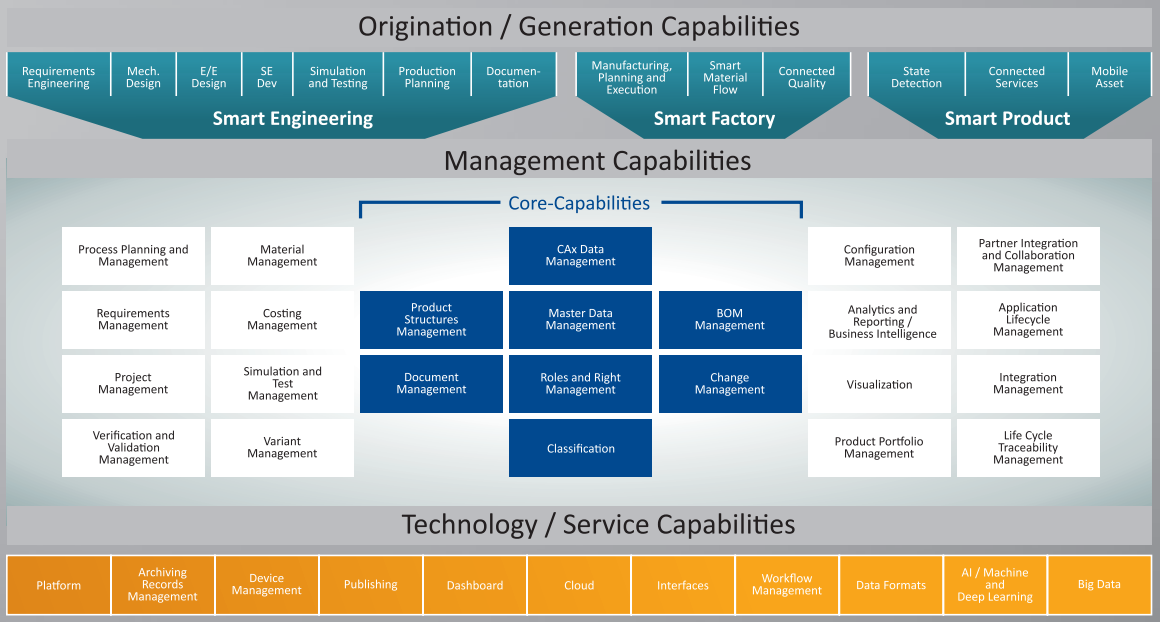
Though perfectly comprehensible, the desire to have a single system that meets the needs of development engineers, production planners, test engineers and possibly also product and project managers is unachievable. No single system is able to optimally support all the development disciplines, address commercial and technical issues and keep pace with business development when new enterprise divisions are acquired.

In reality, each system is simply one module in a complex infrastructure, whose various components address specific individual tasks and are connected to one another via more or less complex interfaces. This is why monolithic solutions are increasingly being replaced by “composable” architectures whose software modules function independently of one another and communicate with each other via microservices. Instead of replicating data from different silos, they are often simply linked semantically.

For businesses, this means taking a close look at their PLM strategies and possibly having to adapt their PLM architectures. The structure of these architectures determines the functional performance capabilities, the future viability and the costs of the entire PLM infrastructure. This is why the design of the architecture is an important aspect of capability-based consulting, in particular from the IT perspective.

Analysis of available and missing PLM capabilities

Capability-based PLM strategy consulting is based on a modular process model that ensures a structured approach, from the analysis of the current situation through the elaboration of the target concept and the evaluation of the envisaged PLM solutions and on to roll-out planning. Taking the company's business model as a starting point, the first step consists in identifying the business-critical processes and determining the PLM capabilities required for their conduct.



After prioritizing the capabilities by means of a heatmap, the consultants look in more detail at the capabilities present in the company and determine their level of maturity based on the discrepancies between the actual and target situations. Areas where there is a need for action are clearly indicated by means of a radar chart, which forms the basis for the target concept for the future PLM architecture. One important element in this target concept and the key to its successful implementation lies in developing a shared understanding of the priorities.

Based on the prioritized capabilities, the consultants work together with the customer to develop area-specific concepts, for example for optimizing product structure or configuration management. These concepts may bring about process enhancements or lead to the implementation of new PLM applications or functions. A system-neutral information model describes what information has to be made available and how in order to ensure optimal process capability.

The conceptual design of the PLM architecture and architectural structure (i.e., the associated application landscape) is based on a layer model that describes the various scenarios for a potential IT architecture. This makes it possible to start by localizing the PLM capabilities on a system-neutral basis and assigning individual applications to them if required. This graphical localization of the PLM capabilities in the IT architecture is intended to provide a clearer overview and reveal potential incompatibilities between the corporate and IT architectures. A roadmap for implementing the capabilities is then developed based on the PLM maturity model.

The information model as the motor of the digital twin

The digitalization of business processes forms the basis for many initiatives in the field of the digital transformation. The aim here is to ensure the efficient provision and end-to-end use of huge quantities of digital information that is generated during all phases of the product lifecycle – from development, through production and on to live operation. The aim is to construct a consistently applicable digital product model that reflects the “as configured” state of a product in every phase of its lifecycle.

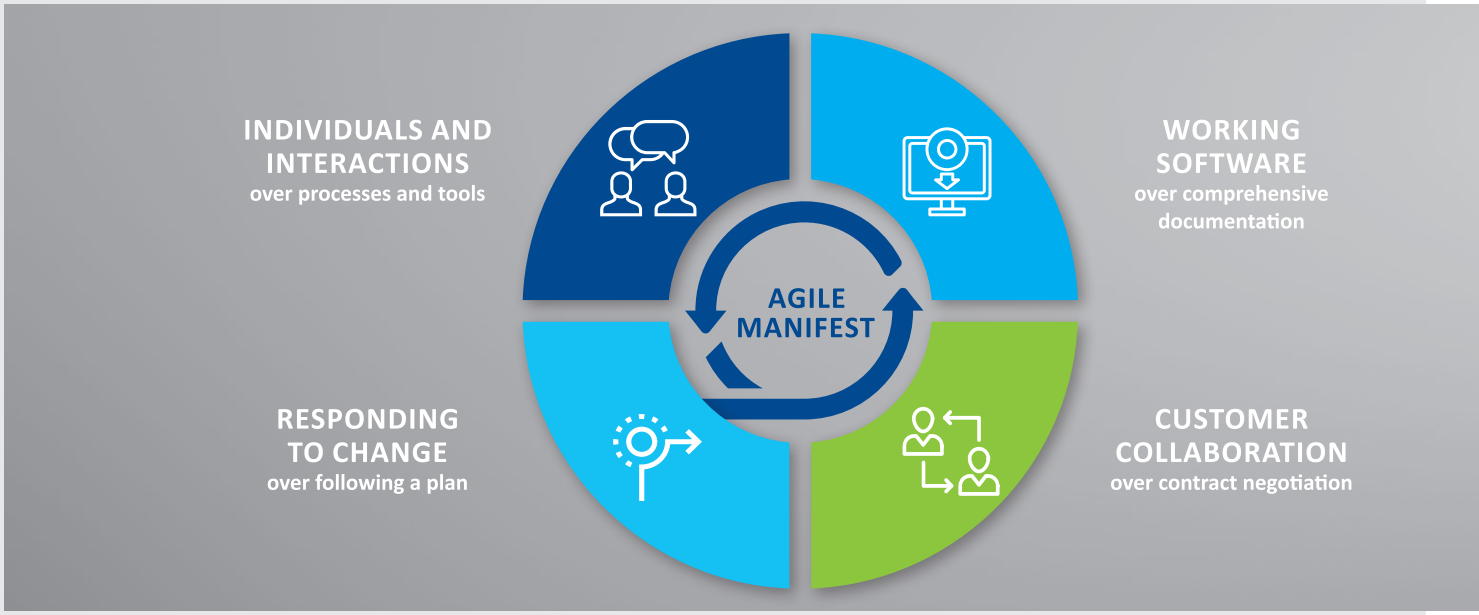
This digital master, from which the digital twins of the shipped product will subsequently be derived, is in some ways the motor of the digital transformation. It not only supports the optimization of the existing business processes but also, in combination with information from live operation, permits the development of new value-added services and service-oriented business models. To do this, it is necessary to analyze the information flows and determine what information is needed where, by what processes and who provides it. Only in this way is it possible to identify where its transmission is slowed down or even completely interrupted by media disruptions.

This analysis of the information flow results in a system-neutral information model. This model in turn serves as the basis for the further development of the system-specific data models and the technical implementation of a modular PLM architecture. The information model is closely related to the enterprise architecture (EA). It starts with the company’s strategic goals and passes through the organizational structures and the integration of the process and system landscape right down as far as the IT infrastructure (see Figure). In combination with the PLM capabilities, the information flow analysis lies at the heart of the capability-based consulting approach, which is itself closely based on enterprise architecture management (EAM). This makes sure that the PLM architecture does genuinely correspond to the company’s current and future business requirements.

Combining the requirements specification with an agile approach

The decision to introduce a new PLM/ALM solution or modernize an existing one involves a high level of investment. It is therefore understandable that companies draw up requirements specifications in order to avoid the risk of making the wrong choice and to be certain of what they are getting for their money. Due to the fear of overlooking something and the need to involve all the different entities, these specifications are often very extensive. This makes the selection and implementation process more time- and cost-intensive – without, however, necessarily improving the result. Would it not be better to be much more agile in order to be able to react flexibly to new or changed requirements during the process?

The question is how to reconcile the need to be sure of making the right decision with the desire for agility. The answer is that it is not necessary to reinvent the wheel every time a new system is chosen. The use of templates that are the result of our many years of experience of selection projects and which focus on the truly relevant requirements greatly speeds up the drafting of requirements specifications. Our aim is to give our customers a reliable basis for making their decisions while simultaneously leaving them the space needed for agile implementation.



As an alternative to the conventional decision-making process, we recommend a two-stage process in which the requirements specification no longer necessarily guides the choice. Instead, we start with an outline specification and then apply a traceable, reproducible process to select the most suitable candidates. We take one of these over into the project implementation phase, based on either a requirements or performance specification or in agile sprints with clearly delineated user stories. When it comes to making planning more reliable for both parties during agile projects, our experience has shown that the agile fixed price model provides a good contractual basis.

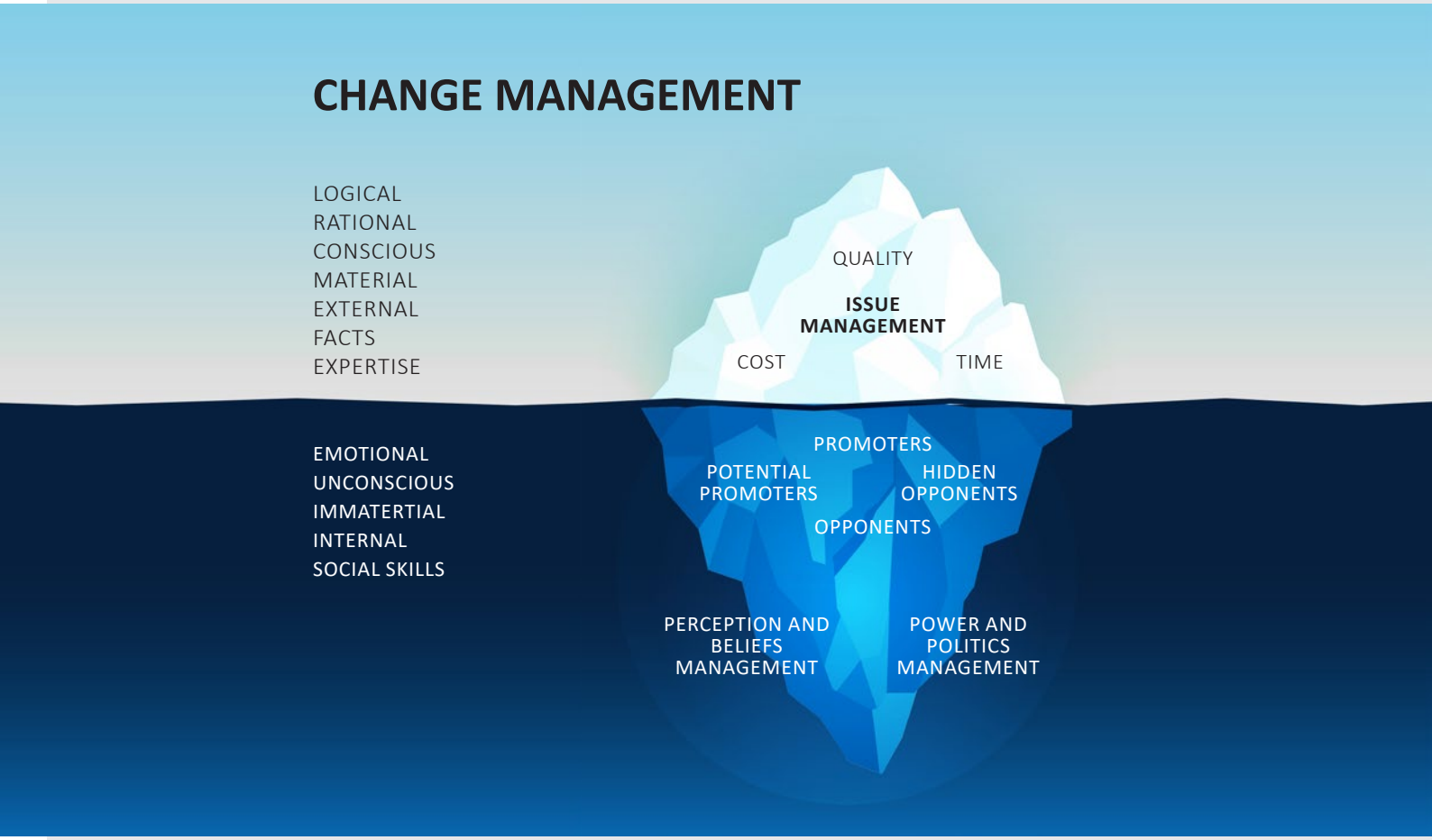
All demanding IT projects must include change management

The personnel responsible for PLM face many different challenges when modernizing their PLM architectures. They not only have to reconcile the interests of different domains, departments, and sites in order to find the right combination of systems, but also have to implement the systems as quickly as possible, while causing minimum disruption, in order to achieve the desired business goals. And all this has to be done in the face of shrinking IT budgets and chronic resource shortages, both in IT and in the company's dedicated departments.

One of the greatest challenges consists in managing the necessary changes to the organization's working methods and processes which, in many cases, are the reason for modernizing the PLM architecture in the first place. This difficulty is exacerbated by the fact that companies are faced not with one-off, localized changes but with an ongoing process that also requires them to anticipate future changes. Even though this means that shaping the changes should be a core component of such projects, it is an aspect that is often submerged by day-to-day project work. Ideally, change and project management should complement one another. This starts with communication. The deployment of a goal-oriented communication plan can bring about a better understanding of the changes and the objectives they are intended to achieve.

Because the pace at which such changes are made has accelerated in recent years, it is also necessary to ask whether conventional project management approaches are still appropriate. Agile practices are growing in popularity, and they are also being increasingly adopted in PLM projects. But can change management also be agile? If they are always to be able to communicate changes to the affected interest groups, the change management and project teams have to work closely together.

At the end of the day, it is the interaction between people and their feedback to one another that guarantee a successful PLM transformation. To guide and harmonize this interaction, consultants not only need specialist PLM-related expertise but also project management skills and knowledge of the design and coordination of change processes.



Neutral consulting services simplify decision-making

PROSTEP attaches great importance to the ability to provide vendor-neutral advice. This neutrality brings with it a number of advantages for customers. First of all, it shapes our approach. Before we look at the question of what PLM application might be appropriate for a company, we perform a completely system-independent analysis of the PLM capabilities it needs in order to achieve its business goals. In some cases, we come to the conclusion that the company can achieve these capabilities with its existing application simply by adapting its PLM processes.

Another advantage conferred by this neutrality is that we are well placed to mediate between the sometimes conflicting interests of different departments and divisions. In particular in projects intended to consolidate hybrid system landscapes in companies with highly-evolved, established structures, there can often be a marked difference of opinions between the advocates of the various systems. The system-neutral analysis of PLM capabilities makes it easier to unite the different factions around a common solution. We act as mediators in this decision-making process.

Just because we provide vendor-neutral consulting services does not mean that we abandon our customers at the point when they have to make their decisions. On the contrary: Thanks to our many years of experience in selection projects, our in-depth knowledge of the PLM applications available on the market as well as of their strengths and weaknesses and our close contacts to the developers, it is very easy for us to identify the systems that are most suitable for the customer. On request, we also provide support during benchmarking and will support our customers during their contractual negotiations with the software vendors.

Summary

The basis for a PLM solution structure that is fit for the future is a PLM architecture that is aligned with the enterprise's business strategy and the business models that will need to be supported in the future. PROSTEP's capability-based consulting approach consists in a structured, methodological process that uses a maturity analysis to determine the PLM capabilities that are already present in the company as well as those that will be needed in the future, prioritize these capabilities and develop a roadmap for their implementation. The analysis of the relevant enterprise information flows, which are mapped in a system-neutral information model, represents another important element in PLM strategy consulting.

On request, PROSTEP supports its customers during the evaluation of the various potential PLM solutions as well as in roll-out planning. Customers benefit from the neutrality of a PLM consulting and software company that is extremely familiar with the PLM market and the available solutions and has close contacts with all relevant system vendors. The company's consultants possess not only specialist expertise but also the project management skills required in order to support businesses efficiently in the change management activities required during demanding IT projects.

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Do you have any comments or questions?

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