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WHITEPAPER

COLLABORATION SCENARIOS IN THE PLM CONTEXT

The influence exerted by the Internet of Things (IoT) means that there is a steadily growing need for collaboration in industry. Partners from new industries and areas of application need to be integrated in cross-company business processes to ensure that the lifecycle of smart, connected products can be managed from end to end. At the same time, the collaboration scenarios to be supported are becoming increasingly complex. Companies therefore need collaboration tools that are both powerful and flexible, and they need a partner who understands their process requirements.

This PROSTEP white paper describes the collaboration requirements and offers approaches for designing collaboration processes more efficiently.

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Management abstract

There's cross-company collaboration- and then there's cross-company collaboration. A machine and plant manufacturer working with a large number of small partners has different requirements when it comes to collaboration from those of a carmaker wanting to work together closely with one of its large system suppliers. Large-scale cooperations and joint ventures need different mechanisms to protect intellectual property from those required for communication between different company sites with heterogeneous IT landscapes. Collaboration during the quotation phase or in the aftermarket requires different information to be provided than during the product engineering process. Companies therefore need collaboration tools that can be configured flexibly, and they need a partner who understands their process requirements and who can support them when implementing and integrating a suitable solution. The complexity of data communication is often underestimated. And anyone who believes that the IT department will somehow sort it out misunderstands the strategic dimension of collaboration within a company.

Growing need for collaboration

The fact that companies collaborate with external partners when developing and manufacturing products is nothing new. In industries the automotive industry, the proportion of outsourced work has been stable at around 70 or 80 percent for a considerable time. In other words, the majority of the value added is generated in the supply chain. So where is the growing demand for collaboration, as noted by many PLM experts, coming from?

One important driver is undoubtedly the development of smart, connected products and services, which demands additional expertise that many companies simply do not have in adequate measure. At the same time, the connectivity provided by the Internet of Things (IoT) promotes the development of new, service-oriented business models, which leads to the integration of non-engineering departments in the collaborative processes. Of course, in industries such as machine and plant engineering, which continue to have a relatively high manufacturing depth, the traditional drivers of collaboration, such as cost savings and compensation for capacity fluctuations by outsourcing peripheral activities, still apply.

The growth of cross-company collaboration has a qualitative aspect as well as a quantitative one. The complexity of the information to be exchanged is increasing. Companies do not content themselves exchanging just development data; they also want to exchange other sensitive information reliably and securely. Because development cycles are becoming ever shorter, this information needs to be sent back and forth and synchronized at very frequent intervals. Data exchange is no longer a one-way street. Tier 1 system suppliers in particular often act as an information hub between OEMs and the extended supply chain.

And the exchange relationships themselves are becoming more complex. On the one hand, joint ventures and other forms of long-term collaboration demand regular synchronization of the information, and manually controlled exchange processes are unable to guarantee that this can be done with the required level of process reliability and an acceptable level of effort. On the other hand, there are development cooperations whose composition changes from project to project, with the result that it is necessary to establish partner networks and dismantle them again rapidly.

Adaptable collaboration solution

The requirements placed on cross-company collaboration are becoming more complex, and they demand solutions that can be adapted flexibly to match the requirements of the partners with whom data is exchanged. On the one hand, they have to support the secure exchange of data via the Internet and other communication channels. And yet, on the other, they have to be so deeply integrated in the enterprise systems (PLM, ERP, etc.) that the exchange processes and ancillary processes such as any data conversion that may be necessary can be fully automated. Flexibility must not come at the price of excessive outlay for customization. In other words, the software should be preconfigured or should be easy to configure using templates. It should also provide standardized connectors that allow it to be rapidly integrated into the corporate IT landscape.

Exactly what information is to be exchanged or provided to the partners, what IT systems this information comes from and in what formats will depend on the use case in question. Therefore it is not enough to simply implement a given software solution. Prior to implementation, it is necessary to carefully analyze the current exchange processes and future requirements in order to ensure that the solution can be used as efficiently as possible. Part of this analysis involves clarifying some fundamental questions, such as who is to operate the collaboration solution. Under certain circumstances, it may be advisable to use the software as a cloud-based service rather than actually installing it. PROSTEP AG already offers this type of operator model.

When selecting a suitable collaboration solution, various factors that impact on complexity and cost must be taken into account. The allocation of roles during collaboration is also important. The decision as to which system to use is usually made by the solution operator and not its external partners, which is why special attention is paid to the operator's collaboration requirements.

Positioning

Before selecting a collaboration solution, every company should first determine its position in the supply chain and clarify the question of whether it can specify the collaboration platform or whether it has to follow the lead taken by its partners. The deciding factor is not necessarily whether a company is a customer or a supplier since some customers are significantly smaller than some of their suppliers, who will therefore not follow the lead taken by the customer. If necessary, the company has to find its bearings in a number of different roles. Sometimes, as a customer, it can specify the processes and tools used in the context of the collaboration, and sometimes it finds itself in the role of a development service provider and has to accept the customer's lead. The variations are manifold, which means that the question of what a company can demand from its collaboration partners has to be determined on a case-by-case basis.

Product complexity

Important factors to be considered are the complexity of the products, the PLM data that has to be transferred in a given collaboration scenario, and the disciplines and domains that need to be incorporated into this scenario. It makes a difference whether simple mechanical components are to be exchanged or a complex mechatronic product with electrical/electronic systems, software and numerous variants that is subject to frequent changes. The latter generally means that multiple product management systems have to be integrated and the requirements of the numerous people involved have to be matched. Another key factor is whether processes such as requirements or change management are to be provided with company-wide support. Taking all these factors into account when developing the requirements specification requires a competent partner with experience in setting up corresponding collaboration scenarios.

Level of automation

Most companies want a collaboration solution that requires as little manual, and thus error-prone, intervention as possible. The level of automation will depend on the previously mentioned level of product complexity but also on the processes relevant to collaboration and the question of what exactly should be done with the data. For example, does it have to be changed or checked during the processes? The greater the number of process steps to be automated, the more complex and time-consuming the rollout of a suitable solution will be. System administrators, for example, are needed to set up the workflows and ensure their availability. All this drives up implementation costs but can also lead to greater savings over time. One of the tasks to be performed by the implementation partner is therefore to also weigh up the costs and benefits of automation.

Level of integration

Another by no means insignificant cost factor is the integration depth, i.e. the level of integration in the company's own PLM landscape and possibly that of the partner(s). Usually, each collaboration partner has its own product data management system. The more complex the products and the larger the companies, the greater the number systems that have to be taken into consideration. A high level of integration in the backend systems of both parties is needed in particular if the collaboration partners, who for example are developing a vehicle platform together, are participating as equals. As these systems in larger companies are generally highly customized, they cannot simply be integrated using standard interfaces but instead require customer-specific integration solutions.

Sustainability

Constantly changing partnerships with short on- and off-boarding phases pose different challenges to those of long-term strategic partnerships where both sides are willing to invest in a collaboration solution. The greater the number of ever-changing partners a company has, the simpler the solution needs to be – with self-explanatory clients that can be rolled out easily and standardized processes that have been automated to the greatest extent possible. This is why standards like STEP, JT, XML, OFTP, ENGDAT, etc. have become established in the automotive industry. Although they do not support collaboration without restrictions, they do support simple file-based data exchange via managed file transfer (MFT) applications. The standards also make it possible to decouple the collaboration processes in a flexible manner: One partner can opt for a high level of system integration, while the other simply uses an OFTP server to send and receive data. Web clients offer the advantage that they do not require deployment and are easy to use. However, they are not always popular with collaboration partners due to the fact that they only provide a low level of automation.

Intellectual property protection (IPP)

Collaboration today takes place on a global scale and is becoming increasingly complex. Companies that otherwise compete with each other work together on certain projects. For example, if two leading rail vehicle manufacturers are developing a train together, they need to be careful that they do not disclose too much of their intellectual property (IP). Carmakers use headlights from competitors such as Hella and Bosch in their vehicles, two companies that also have to protect their IP during collaboration. IPP therefore plays a major role in the context of collaboration and is at the same time an obstacle because data protection mechanisms make solutions more expensive and involve additional operating expense. Roles and rights need to be managed, compliance rules and approvals have to be taken into account during ramp-up and ramp-down, systems may have to be decoupled, and costly, time-consuming data conversions may have to be performed in order to guarantee maximum know-how protection and security. All this, however, increases the complexity of the system architecture.

Operating concept

The issue of the cloud is also closely related to IP protection, as is the question of whether a company wants to have its collaboration solution run in a cloud. On the one hand, this is a question of the trust placed in the cloud operator, but on the other hand, it is also a question of the effort that the company in question wants and is able to put into implementing and managing the solution itself. The answer depends on whether an IT department is available to do this, something that goes without saying at larger companies, or whether developers in the specialist departments will also have to take on these tasks. In this case, outsourcing the IT to just any outsourcing company cannot make up for the lack of a company's own resources since the collaboration processes have very special requirements that are often not understood by traditional IT companies. The more limited a company's own resources are, the more advisable it is to implement a simple, standards-based solution.

Different use cases

Ultimately, the choice of operator model will also depend on the use case in question. On the basis of its experience gained from numerous customer projects, PROSTEP has identified three use cases or scenarios and developed corresponding best practices for implementing a suitable solution. There will undoubtedly be other use cases or hybrid forms, but these can be catered for without difficulty, thanks to the openness and scalability of the software solution. An open integration platform and a powerful solution for secure data exchange are core components of the different collaboration solutions.

Changing partnerships

Partnerships that change frequently and where emphasis is placed on a high level of data security and robustness when exchanging files prefer MFT solutions. Solutions such as these have been used in a number of different industries for many years, are correspondingly mature and offer a multitude of functions. The development of these solutions was based on the exchange of files via telephone or ISDN lines using standards such as OFTP and ENGDAT – a widespread practice in the automotive industry in particular. The advantage of fixed-line telephony is considered or was at least considered secure, because today it is no longer possible to be sure whether communication is to some extent performed via the Internet.

The exchange of files via the Internet means that the issue of data security is taking on a new dimension. MFT solutions must therefore offer sophisticated and highly developed encryption mechanisms – if possible as standard functions and without the need for a great deal of effort on the part of the system administrators or users. They should also support different operating concepts in order to offer companies and users maximum flexibility.

The automotive industry has supplemented the use of upload and download functions via the Internet with familiar standards. There is for example the OFTP2 protocol, which has been tailored to the Internet. Leading providers of MFT solutions have integrated functions for exchanging data via OFTP2 in their software in such a way that they can be used in parallel with the other means of exchange. All data exchange processes are logged via the MFT solution, which is a crucial selection criterion for many companies. At any time, they can trace which data was sent to which exchange partner and when.

MFT solutions are usually designed in such a way that a company operates the solution and, if appropriate, integrates it deeply into its backend systems or uses automated workflows for outgoing and incoming data. There are no high requirements that have to be met on the partner side, which make the fast, automated on- and offboarding of partners possible. In the simplest case, the partners are integrated via a web client so that they can use the solution from anywhere in the world without having to deploy software. They are, however, free to use special clients, set up workflows and integrate their backend systems.

Integration of the data exchange solution in the users' familiar Windows and Office environment ensures that files of a certain size, in certain formats and/or for recipients in certain countries are always made available in encrypted form on the exchange platform. And if necessary, new partner profiles can be created automatically. The ability to send data spontaneously yet securely from the familiar working environment makes a significant contribution to promoting acceptance of the solution and ensuring that it is used as a matter of course. Another benefit is that the solution operator is able to implement and enforce security measures and compliance. It can, for example, prevent all attachments or attachments of certain sizes and formats from being sent by e-mail. This ensures that sensitive data is only exchanged via the data exchange portal without placing any additional burden on the user.

Long-term data exchange relationships

Direct integration of the respective PLM systems is recommended if companies in a stable, long-term partner relationship regularly need to exchange large volumes of data but also want to work with their own processes in their PLM systems. This type of integration is used for collaboration between two OEMs, between an OEM and its tier 1 suppliers or when integrating external manufacturing and assembly partners. In this case, the partners have high volumes of data that need to be exchanged and synchronized on an almost daily basis. This is done by directly linking their PLM systems using connectors. The integration platform controls extraction of the metadata and CAx data, its packaging, fast and secure transfer, inspection of the data quality and import into the data structures of the recipient system. This kind of regular provision of data is designed as a round trip, since the data has to be processed and returned by the recipients. However, there are also cases where external manufacturing partners are connected and supplied with development data and, if need be, these partners send the data import report back to the sender.

If the provision of data is to be largely automated, the partners first have to clarify what data is to be exchanged. They also need to decide whether the entire set of data is to be returned or only the data that has been changed. The software must be able to identify what data has changed and therefore minimize the volume of data to be transferred. In order to map, i.e. harmonize, the data and structures, the partners have to have previously defined binding rules, for instance for handling structures, materials, naming and numbering. Although establishing the regular provision of data therefore demands a certain amount of preparatory work, it has the advantage that users then no longer have to concern themselves with data exchange.

In the case of joint ventures and other long-term collaboration scenarios, a selective regular provision variant is often used. This combines automated data exchange with the protection of intellectual property. The challenge here is to filter the data and documents contained in the backend systems in such a way that the partners receive all the information needed for their work, but nothing more. Selective regular provision is also of interest to companies that maintain sites in countries in which there is an underlying risk to intellectual property.

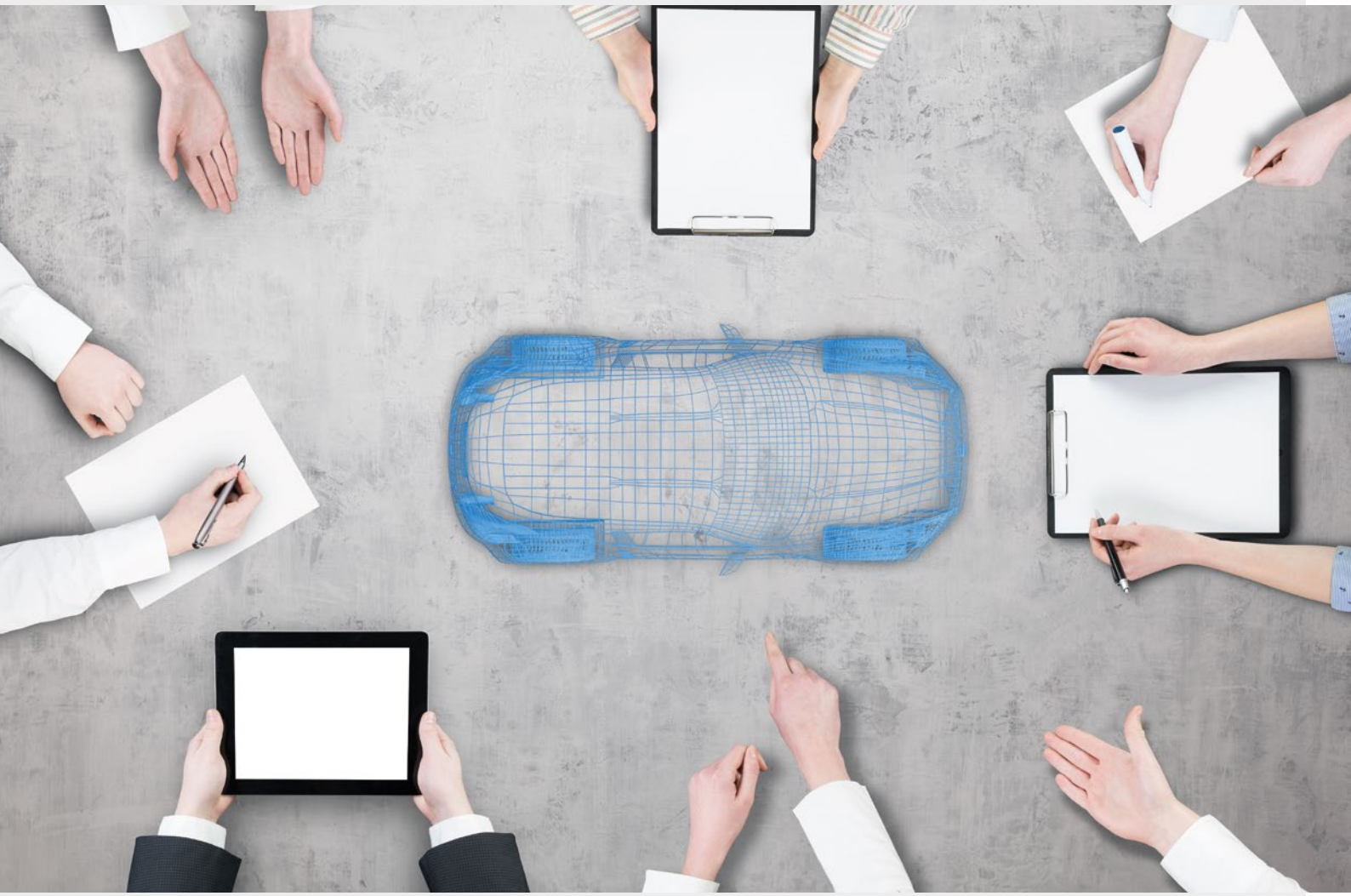
Key characteristics of an integration platform are powerful mechanisms for the finely tuned filtering of the source data down to attribute level. This allows even parts and components fitted in different products to be cleanly extracted and kept synchronized. If the exchange partners use different PLM systems, the metadata can be converted to a neutral format during export and then made available in PLM Services XML or STEP AP242 format. On the partner side, this is used for example to generate a Windchill model, which serves as a reference structure for Catia data provided in native format. It is also possible to extract neutral formats such as JT or to trigger conversion of the data into these formats during export. The integration platform checks and documents whether the data complies with the rules agreed between the partners.

Collaboration in development networks

When dealing with distributed development projects involving multiple partners, conventional data exchange is being stretched to the limit, even if it has been largely automated. If regular provision is to be ensured, numerous point-to-point connections have to be set up, which would entail considerable administrative overhead. This makes it more difficult to not only incorporate new partners but also to dismantle the development networks quickly once the project has been concluded. Furthermore, it is possible that the backend systems used by some of the partners may not be designed for cross-company collaboration, for example because they do not offer sophisticated role and permission functionality or perhaps do not make use of PLM software.

Companies that deal with globally distributed development projects involving changing partners therefore need their own platform for the provision of jointly used data. The metadata, CAD data and structure data can be extracted automatically from the backend systems, converted as required and synchronized at the click of a button when changes are made. Synchronization is carried out by comparing the data. The collaboration platform supports both secure online access via the Internet and offline processing of the data with a special client. The platform provides the project partners with all key PDM/PLM functions, including version, workflow and change management, which enable them to coordinate their work on the project extremely well . Due to its PDM-based mode of operation, the collaboration platform is fundamentally different from a traditional MFT solution. New partners can, however, also be integrated in the project work quickly and with a minimum of effort. A large number of clients are available for the integration of partners.

Partnership-based cooperation in the PDM structures is not entirely new. There have long been OEMs (e.g. Ford) who grant their suppliers direct access to their PDM systems and who expect them to work in these structures in return. However, this way working is not particularly popular with larger suppliers because it cannot be automated and the supplier has to manage the data outside of its PLM environment, which requires a considerable amount of additional effort. Furthermore, the data that the suppliers release is no longer protected by a firewall, which means that that it is also visible to potential competitors if errors occur during release.



Simplification of data logistics

In conclusion, we can say that cross-company collaboration will continue to grow and will lead to the integration of partners from different industries and non-engineering departments in the partner networks. The standard configurations of traditional PDM/PLM systems that have become the established backbone for digital product development within companies provide little support in this context. Implementation of a suitable collaboration solution plays a key role in simplifying and automating data provision here. In the form of a collaboration platform, it for the first time provides partners with PDM/PLM functions for joint work on a project that they had previously only known in their own backend systems. It is therefore making an important contribution to improving efficiency in distributed development projects. But it is equally important that the partners harmonize their collaboration processes more closely. When analyzing and optimizing their processes, they are able to take advantage of the support of experienced consultants, who are familiar with a variety of different collaboration scenarios .

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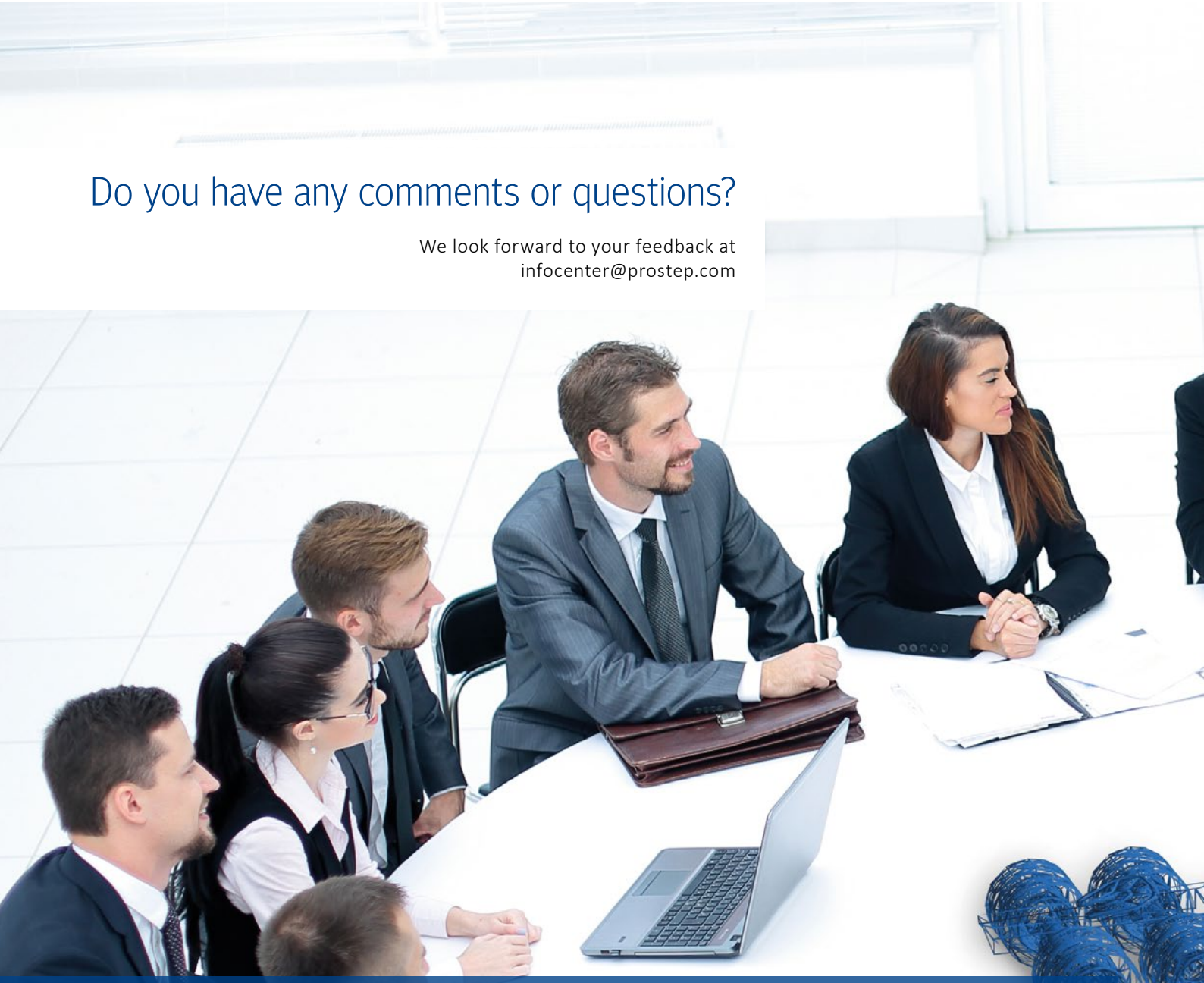

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