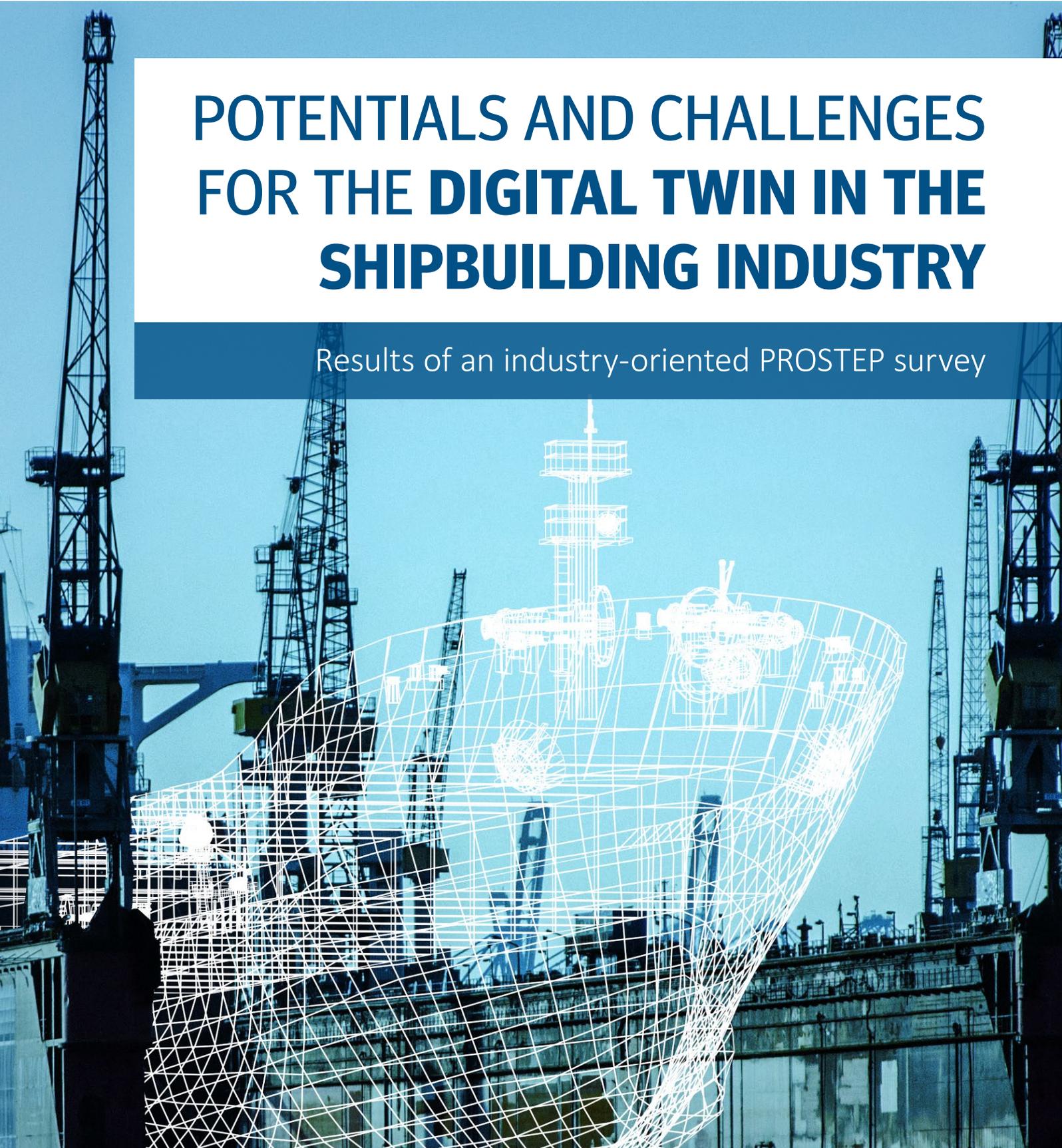


SURVEY

POTENTIALS AND CHALLENGES FOR THE **DIGITAL TWIN** IN THE **SHIPBUILDING INDUSTRY**

Results of an industry-oriented PROSTEP survey





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Motivation

Everyone is talking about the digital twin – even in the shipbuilding industry. But is there something like an industry-wide understanding of what companies in the maritime industry mean by the term ‘digital twin’ and what they expect from it? To find out, PROSTEP conducted a cross-enterprise survey of shipyards, owners, suppliers and classification societies. Due to the novelty of the topic, we assumed that companies have different ideas about the digital twin. In many cases, it is indeed still considered a vision or a marketing buzzword. But there were also positive opinions: “We shouldn’t let ourselves be intimidated by the novelty of the topic. Many things already represent the ‘state of the art’ and can be used for innovation,” said a shipyard representative. At companies already implementing their first digital twin projects, the level of maturity of these projects varies widely. A key finding of the survey is that better collaboration between all the parties involved in developing and using digital twins would be desirable, but the uniform standards needed to achieve this are lacking.



Everybody is talking about the digital twin.



Hypothesis: Everyone has different ideas about the digital twin.



Is this also true of the maritime industry?



Positive side effect: An exchange of ideas and information within the maritime industry is encouraged.

Approach

The objective of the survey was to shed light on what companies in the maritime industry understand the digital twin to be, to record the status of current or planned applications and solutions with their potential and challenges, and also to see how the companies organize collaboration in the context of the digital twin. A positive side effect is that it encourages an exchange of ideas and information on the topic within the maritime industry. Managers from more than a dozen shipyards, owners, suppliers and classification societies, representing different sectors of the maritime industry from cruise, container and cargo ships to naval engineering, navy and public authorities, were surveyed. We asked participants open-ended questions with no predefined answers. The interview transcripts of the (online) surveys were reviewed and approved by the participants and then carefully evaluated.



Direct (online) interview with each participant



Approval of the interview transcript by the participants

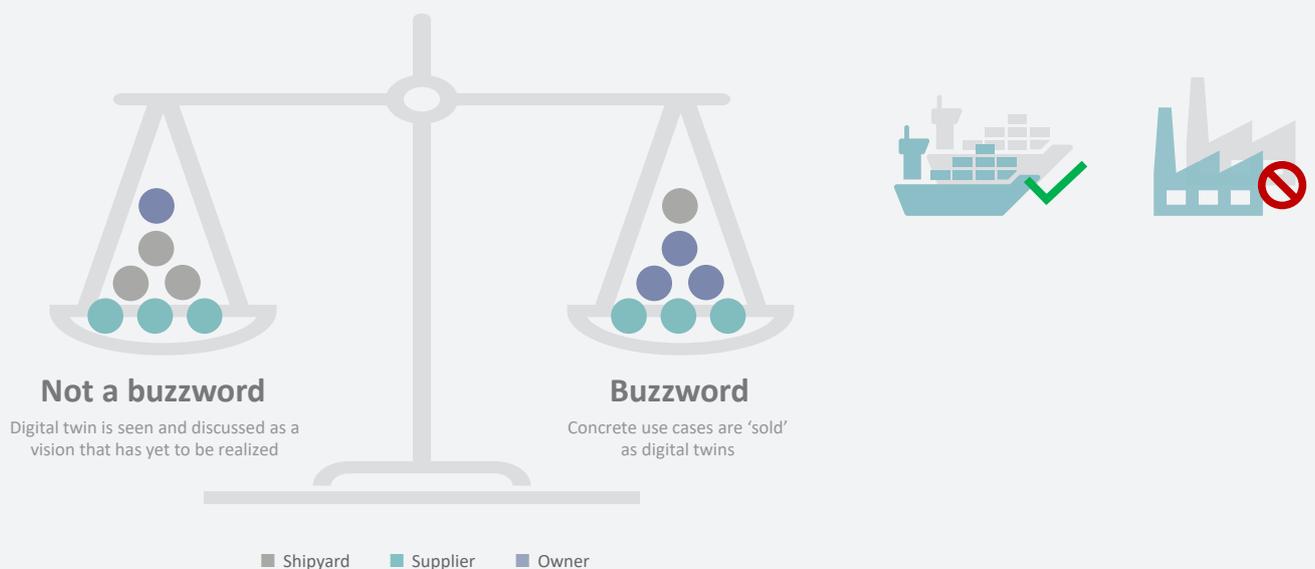


Analysis and evaluation of results

Understanding of the digital twin

For many of those who participated in the survey, the digital twin is at best a vision and at worst a marketing buzzword. It therefore comes as no surprise that there is no common understanding of the digital twin. Although it is perceived everywhere as a digital representation of a real product, it is implemented differently by each individual company. This means that a remarkable similarity across all segments of the industry is the fact that almost all the respondents associate the digital twin with the digitalization of their product or the asset to be operated but not with the digitalization of the production systems, something that would at least be expected in the case of the shipyards and suppliers. Almost all the respondents also believe that this digital twin does not end when the product is handed over to the customer but also accompanies the operating phase, although each industry segment associates this with somewhat different business interests.

Almost all the companies surveyed associate the digital twin with a 3D model. However, ideas regarding the origin and format of 3D model information differ, depending on the industry segment involved. While shipyards use native 3D CAD models from product development for the digital twin, suppliers and service providers often merge model data from different sources in neutral formats. Given the lack of access to development models, owners in most cases use 3D data from laser scanning processes.



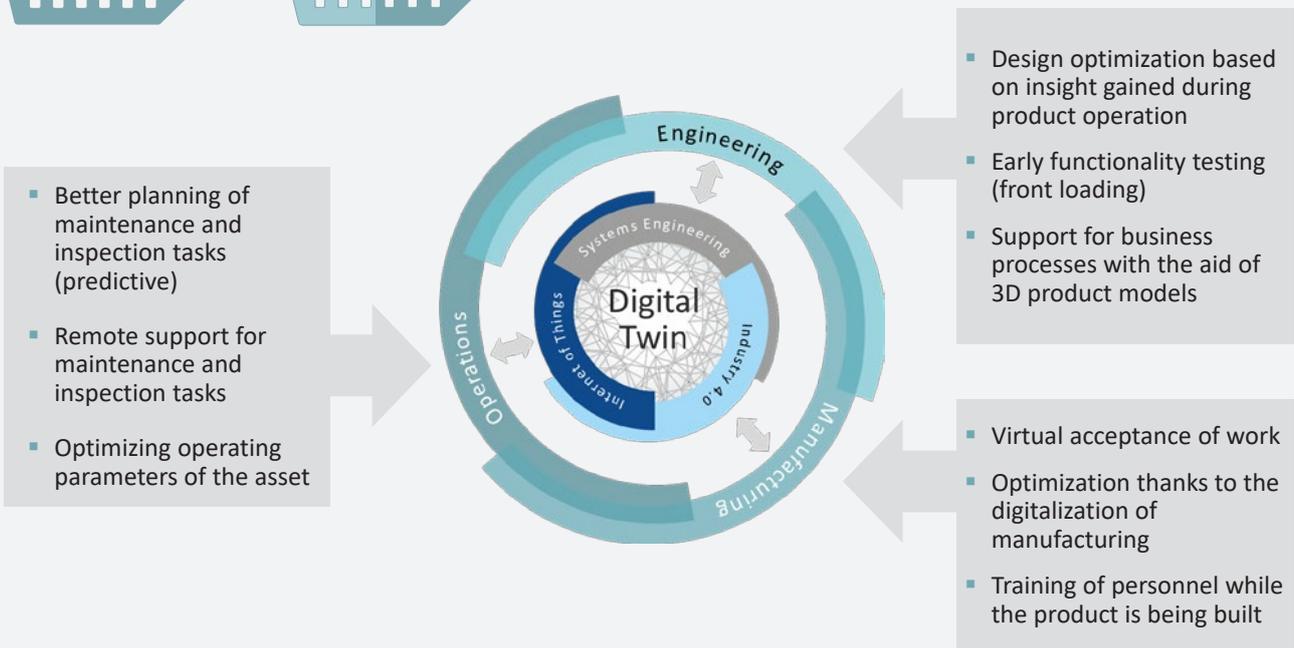
Current status of the digital twin

The differences in the understanding of the digital twin reflect the different perspectives from which companies address the topic. From an engineering perspective, primary focus is placed on optimizing designs based on insights gained during operation, the early testing of functions and providing support for downstream business processes with the help of a 3D product model. For the shipyards, this product model forms the basis for the digital twin. It is primarily used as a navigation aid for the models, data and documents. PLM and ERP initiatives are therefore of key importance when it comes to creating and managing the data for the digital twin and driving digital twin projects forward.

Shipyards see the creation of digital deliverables for customers as an aspect of the digital twin that will become increasingly important in the future. The use of models to simulate the overall system that is a ‘vessel’, on the other hand, is of secondary importance to them – unlike owners and suppliers, who consider realistic models for behavioral simulation an integral part of the digital twin. Owners expect this to enhance technical and operational performance. Suppliers see it as the basis for new product-as-a-service offerings. Improved planning and remote support for maintenance and inspection tasks as well as the optimization of operating parameters are key drivers for digital twin projects in the operating phase. The digital twin must therefore be able to map the current system configuration.

Although Industry 4.0 and digital manufacturing are not the main drivers for digital twin projects in the shipbuilding industry, there are companies that are using digital twins for the virtual acceptance of work and the early training of personnel in the construction phase of a vessel. The optimization of manufacturing processes also provides motivation for corresponding initiatives.

On the whole, it appears that respondents from the supplier segment have somewhat of a head start over other segments of the industry when it comes to the level of maturity of digital twin projects. Many are in the pilot stage or are already being used productively. It is also the suppliers who are calling the loudest for standards that will enable them to integrate their digital representations with other systems in the overall system that is a ‘vessel’ and exploit the potential that the digital twin offers. “I ask that our industry work together on developing an industry standard that is framed and maintained by an independent body,” said one supplier.



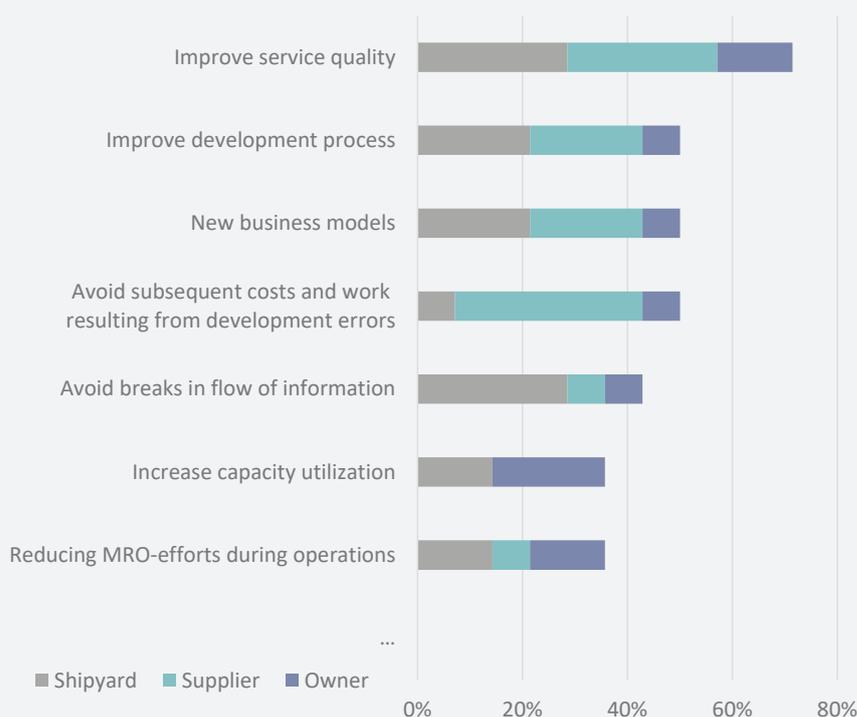
Potential and challenges

For the majority (over 70 percent) of the companies surveyed, improving service quality is the most important potential offered by the digital twin; this is followed by supporting new business models and improving the development process. As far as suppliers in particular are concerned, the main benefit is the ability to avoid subsequent costs and work resulting from development errors. For owners, on the other hand, the digital twin offers significant potential for increasing capacity utilization, reducing operating costs and improving sustainability, e.g. by reducing emissions.

Although shipyards and suppliers in particular expect the digital twin to improve service quality, manufacturers appear to pay little attention to the owners' specific (service-related) requirements when it comes to the digital twin. There is a lack of willingness or ability to think about the digital twin at cross-enterprise level. "The digital twin has a lot of potential but only makes sense if it is standardized to a certain extent. Intellectual property must be safeguarded vis-à-vis the shipyards and suppliers," said a shipyard representative.

Expanding collaboration in the context of implementing and using digital twins is seen throughout the industry as posing the greatest challenge – along with a lack of standards and the availability of appropriate models, which are of concern to suppliers in particular. Numerous respondents also find it difficult to assess the relevance of the digital twin in business terms. Suppliers and owners also cite communication between hardware and software components as a major hurdle. In addition, environmental conditions in maritime shipping make it difficult to use the digital twin in the context of vessel operation. However, the challenges can be overcome, as one of the owners surveyed stated: "We should put more energy into finding solutions for implementing the digital twin than into arguing why it won't work."

Shared digital enterprise services not only allow the end-to-end digitalization of business processes and the creation of networked process chains but also new, data-driven business models. They provide the basis for implementing a sustainable and scalable digital twin concept that can support different use cases.

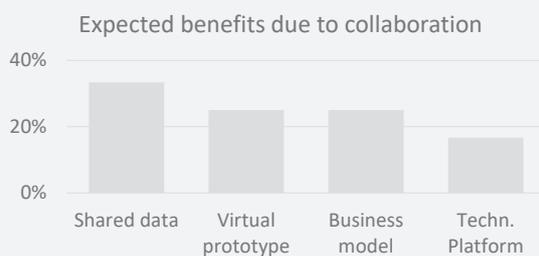
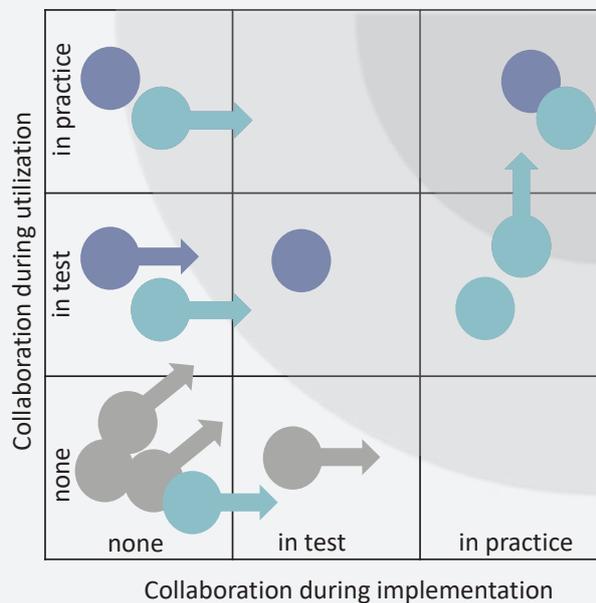


Collaboration in the context of the digital twin

“Digitalization is economically crucial and requires uniform structures, greater collaboration and more open standards,” said one of the suppliers surveyed. But what about collaboration when it comes to implementing and using the digital twin? With the exception of a few suppliers, the vast majority of the manufacturing companies surveyed do not collaborate with partners on digital twin projects at all or do so only rarely. Most owners, on the other hand, already use digital representations of their ships to optimize operation of the vessels together with partners and customers. They also access digital maintenance and servicing offerings provided by partners. As one of the owners surveyed said: “If we want to create a win-win situation, better collaboration between the parties involved would be desirable, especially when it comes to operating vessels, instead of ‘gag orders’ imposed for competitive reasons.”

In principle, all the companies are in favor of a higher level of collaboration when it comes to implementing and using the digital twin. Shipyards and suppliers in particular see considerable potential for expanding collaboration beyond the development phase. They expect to benefit from a shared database as well as from virtual prototypes and joint business models. Many companies, however, have reservations when it comes to protecting their intellectual property and see contractual ambiguities with regard to digital content.

This means that every company is trying to exploit the potential of the digital twin with their own benefit in mind. There is also no uniform approach to dealing with this topic in the individual segments of the industry, and a different approach is taken for each use case. There is a risk that the digital twin projects will lead to the creation of new data silos instead of avoiding breaks in the flow of information as hoped.





There will never be ONE digital twin.



Companies are already implementing a variety of different digital twin projects.



There is currently no standard for the digital twin.



Better collaboration in digital twin projects is both desirable and beneficial.

Our recommendations

The results of the survey provide a basis for recommending action that can be taken by companies in the maritime industry. Perhaps the most important is collaborating with other companies when it comes to implementing and using digital twins. Companies that actively collaborate with partners are usually able to implement their projects faster.

We recommend that companies avoid spending a lot of time defining terms and instead tackle concrete projects that offer economic value added. Collect the data that you need for the project at hand but avoid creating new data silos by linking the collected data according to clearly defined rules.

The digital components for the digital twin are available in most companies in the form of models, data and IT systems. You just need to clarify how you can best exploit this potential to meet your business challenges. Our many years of experience with digitalization initiatives in the shipbuilding industry means that we are in a position to help you do this.





PDF version of the white paper:
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Do you have any comments or questions?

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