Digital Transformation of the Shipyard

IT integration is an essential step to unlocking further improvements

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Executive Summary:

Although times are still tough in the Marine industry, the latest economic cycles have been weathered well. Some companies have survived by consolidating, creating prime shipyards who dominate the market. These companies see digital transformation as a key competitive advantage that can differentiate them from other large yards in the eyes of ship owners, who want ever more complex vessels delivered more quickly, cheaply and efficiently to an ever-higher digital spec. Discover how both ships and shipyards can benefit from a digital transformation journey, bringing the marine industry in line with Industry 4.0.

Charting a course to a more efficient future

While the top of the market remains dominated by a handful of major players, so a growing number of specialist yards are finding successful niches in specialist areas of marine manufacture. And for these specialized companies, project economics is of critical importance. For them to be successful, they must harness digital technology effectively to increase operational efficiency and drive profit.

Digital Transformation is a journey

The key objective shared by all shipyards, be they large or small, is the need to differentiate themselves in a competitive market. When the price of building a ship in a particular region is well-established, this means yards are turning to digital tools to boost efficiency and enable them to tackle diverse projects.

Much of the core work of a shipyard lies in effectively reacting to changes, be that in the owners' requirements, regulations or of course in the handling, control and distribution of digital information. Greater accuracy, expedient reaction to change, a global workforce collaborating effectively, improved safety – these are just some of the benefits that digital processes and tools can bring to a shipyard. Digital transformation is a step-by-step journey, and care must be taken to take the right steps at the right time.

The purpose of this white paper is to discuss one of the first phases in the digital transformation of the industry to become a smart, connected ecosystem industry. Through the creation of an accurate digital twin – namely, integration. The integration of tools, data, and processes is critical across all aspects of the shipbuilding process; it is the fundamental pillar that supports business agility through effective information sharing and workflow management, from initial order enquiry to the final handover.

Ultimately, integration allows shipbuilding organizations to work smarter. When digital transformation is adopted strategically, it will mean shipyards will not just survive economic storms, but they will be able to thrive despite them.

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It may not be broken, but it does need fixing

The technology life cycle

When the industry goes through transformative changes, significant investment is made to redefine how the business works, and to energize its processes and its people. New opportunities emerge from this investment, but there comes a point when these changes become the new norm, and innovation gets replaced by a sense that things are as good as they can be. This feeling is further intensified by the size of the recent investment.

All this initially took place in the early 1970-80s in shipbuilding, when computer-aided design (CAD) became the new norm for the shipbuilding design and lofting process.

CAD revolutionized shipbuilding. It accelerated the design process and drove unprecedented improvements in accuracy at the production stage. Wastage was virtually eliminated since the production process, guided by computer-aided manufacturing (CAM) was informed by specifications that were not just richly precise but could be visualized.

It became easier to manage change during the design phase and there was no longer any need for large lofting rooms.

It may not be broken, but it does need fixing (cont'd)

There has been something of a malaise in many shipbuilding organizations over the last decade or so. Many businesses go through such periods in between the major leaps forward in how their industry operates, usually triggered by evolving customer expectations or accelerated – and sometimes unanticipated – improvements in technology, or both.

A change of focus needs the corresponding IT support

CAD/CAM is a standard part of the IT tool set in all shipyards. Even 3D CAD/CAM is standard in most medium to large shipyards as the variety and range of solutions available on the market ensures there is an offering for all budgets.

Given that the challenge of delivering accurate work instructions to the production floor has been largely solved as a result of these applications and workflows, however, the focus of the IT department in today's shipyard has changed.

Most of the cost of today's complex vessels is subcontracted turnkey work and material cost. This has resulted in an increased focus on the IT tool set required to manage subcontractors, plan work and manage the procurement and logistics of just-in-time logistics at the manufacturing stage.

The respective shift in focus from CAD/CAM to ERP-like software in the shipyard has resulted in a two-pillar IT support system for how shipbuilders work: one focussed purely on design through to manufacturing processes, the other focussed on the management and business disciplines that need to surround them; materials management, planning and cost forecasting, document management systems, and cost control systems.

For some organizations these systems are not well integrated due to their having been deployed at different times, as the organization's IT strategy has matured. In the worst cases, rather than saving time and streamlining processes, they occasionally slow everything back down again due to the inability of varying systems to talk to each other and share data.

Arguably having so many systems is becoming a problem in itself as management expect the system to do all the work and communication between departments breaks down.

A capable toolset is no longer enough

> Tools must be integrated, affordable to run and acceptable to the latest generation of engineers.
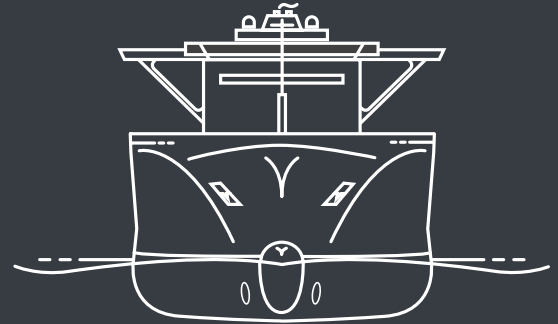
Today's IT management have a wide range of software solutions to choose from.

Generic tools such as enterprise resource planning (ERP), CAD and Product Data Management (PDM), perform a valuable role in the general business management arena but often do not address the operational core of the shipbuilding function.

It could further be considered that such tools, best of breed though they may be, are crammed with features that have little relevance to shipbuilding. Whilst they offer reassurance by virtue of their proven track record with high profile organizations around the world, they may also represent something of an over-investment for the average shipyard.

Moreover, in order to align to the requirements of shipbuilding they would have to be significantly customized; taking owners into unchartered IT territories and incurring high development costs. Only 64% of IT projects meet their goals, according to the Project Management Institute; and organizations lose $109 million for every $1 billion invested in projects and programmes.

This raises the question: what truly defines the ultimate fit-for-purpose shipbuilding software that won't break the bank, won't take years to create, and will equip today's beleaguered shipbuilding industry with greater agility to formulate new and relevant operational models?

US Legal defines modern shipbuilding technology as: A technology to be introduced into the shipyard that is comprized of the best available proven technology, techniques, and processes appropriate to advancing the state-of-the-art of the applicant shipyard, or exceeds the best available processes of American shipbuilding, and that will enhance its productivity and make it more competitive internationally."[1]

'Best available proven technology' has also to meet stringent requirements from the perspective both of an IT professional when assembling a business plan for such technology and the key decision makers and stakeholders in the company when evaluating the plan: does it make sense for the business and does it constitute a valid step towards greater competitiveness in a potentially dwindling market?

As commercial off-the-shelf software continues to improve, and software vendors evolve their business models, the IT strategies in shipyards around the world have evolved too. Where many shipyards once maintained their own in-house developed tools with armies of developers, today's trend is towards increased outsourcing and reliance on the software vendor.

The competitive environment is different

This is a market dominated by the top three shipbuilding countries: China, South Korea, and Japan. (In 2017, shipbuilding production across these three countries represented 86% of all CGT delivered: 35% China, 31% South Korea, 20% Japan).[2]

To invest the business plan with the best chance of acceptability, three core parameters must be met:

- Total Cost of Ownership (TCO) of the IT environment; balanced with best and worst-case scenario ROI projections

- Highly interoperable with other software

- The roadmap: Effectiveness and business value of the proposed solution – does it align the organization's systems to new highly digitized business models?

Whilst these points address the leading agenda issues for IT and senior management, the latest generation of engineers is looking for something altogether more game-changing.

In the digital world we now live in, the next generation of engineers will expect a lot from the tools they use every day. Not only must they be easy to use, they must also be integrated with the other IT tools they use and connected to their colleagues and other stakeholders working on the project.

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We've reached the new horizon

Shipyards that can rapidly repurpose their workforce, core capabilities, and Intellectual Property, are most likely to succeed and survive future downturns. Ultimately, shipyards today must be able to adapt rapidly to changing market conditions; being able to adapt not only the products they offer but how they generate a sustainable revenue stream from them once they have left the yard. This is about agility.

Interdependence and the shipbuilding ecosystem

A key driver for agility is collaboration; being able to call upon suppliers and partners to deliver to new specifications, new timelines and working with them to create innovative solutions that will strike the right note with customers and ignite business potential for partners across the value chain.

Such approaches represent 'business as usual' in the aerospace and automotive industries, but the shipbuilding industry still has some way to go in terms of delivering a business model that fits this paradigm.

The shipbuilding environment is changing, however. A combination of regulation and new ways of doing business are driving a cradle-to-grave philosophy in shipbuilding and operation. This philosophy sees shipyards, equipment vendors, class societies and operators working together to find new ways to build and operate more efficient, safer and longer-lasting vessels.

Information is critical to many of these initiatives, providing a basis for decision making in a variety of scenarios throughout the project lifecycle. It therefore begins to make business sense to make the effort to maintain a digital version of an asset acting as a repository for information and capturing a virtual history of interactions with the physical asset.

Ready for a streamlined operation

Shipbuilding is shifting its focus away from deriving value purely from the design and manufacture of ships towards other areas of revenue generation.

Naval shipbuilders have historically been involved in the operation and maintenance of the fleets they build, and today sees a greater need for them to increase profitability from after-sales services or, indeed, to offer new services altogether. At the same time, many commercial shipbuilders have adopted the modular or configurable approach to their product offerings in order to optimize production efficiencies and generate new opportunities for after-sales services.

A popular approach for IT management is to aim for a platform of tools to execute projects, where applications are tightly integrated or have high degrees of interoperability, therefore reducing data re-entry and increasing overall project data quality.

Increased data quality in turn is expected to continue to allow incremental improvements to production efficiency and is seen as a key component of building future business models based on the digital asset or 'digital twin' (the computerized version of a physical asset).

Although shipbuilders often see their industry as conservative and old fashioned a new generation of management is coming up through the ranks looking at technologies that relate directly to the Industrial Internet or Industry 4.0 trend.

Final Thoughts

Integrated shipyard

A key trend in the Shipbuilding industry over the past few years is the use of digital transformation to enable Shipyards to deliver new digital services. From training crews, to monitoring and control, both major and specialized Shipyards are embracing their digital future to build work practices that are effective, data-driven, and collaborative. When implemented effectively, digital transformation gives them a competitive advantage, the ability to differentiate, and to remain or become the best in a particular market.

Effective implementation requires integration. There will be no competitive advantage if an organization moves forward with systems and processes that have been haphazardly put together over long time periods – ones that do not integrate, and – above all – were not purpose designed for the shipbuilder. Integration is critical across all aspects of the shipbuilding process. It is the fundamental pillar that supports effective information sharing, workflow management and controls change, from initial order enquiry to final handover. By creating an accurate and trusted Digital Asset, AVEVA's solution for shipyards delivers maximum capability and efficiency across your entire business.

AVEVA offers the world's best, most proven shipbuilding platform with best-in-class ship planning, engineering, design, material management, fabrication and production applications; offering one view of entire processes.

It enables tight control and visibility of change, throughout the iterative design and manufacturing spiral.

AVEVA's solution for shipbuilders enables effective collaboration with global partners and project resources. Information generated in one application can be shared across teams around the world, rather than remaining isolated in disconnected 'silos'. It achieves this through the information-centric Digital Asset approach that enables the sharing and management of project information regardless of application, discipline or location.

Implementing AVEVA's solution helps shipbuilders to:

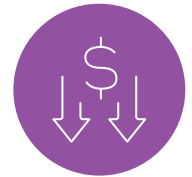| Increase project quality, reducing rework caused by inaccurate information	Increase validation level, resolving information inconsistencies and knowledge gaps	Mitigate financial and schedule risks through improved decision support	Reduce time to delivery and commission	Reduce cost of ongoing operations, unplanned rework, and downtime.

To chart your course towards a more efficient future for shipbuilding, contact us or visit **www.aveva.com** to learn more.

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