MARITIME
IN THE NEW

BRINGING THE POWER AND CONNECTIVITY OF "INDUSTRY X.O" TO THE NAVAL SHIPBUILDING INDUSTRY
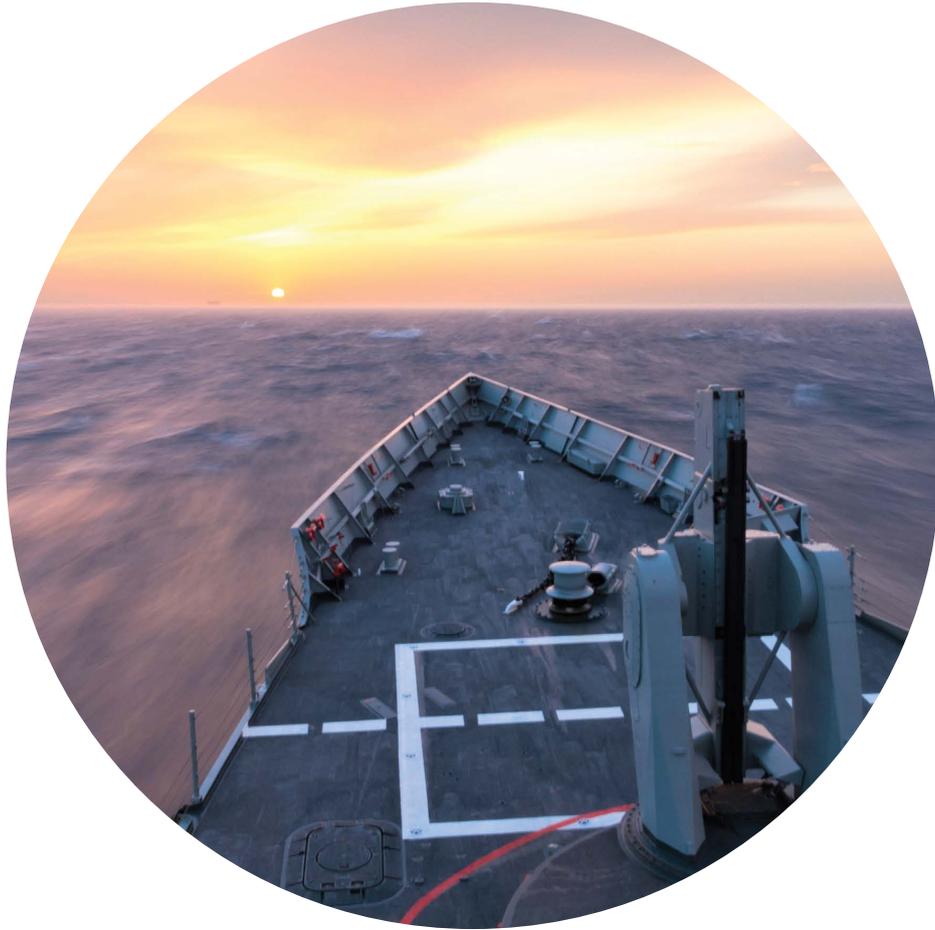
MARITIME
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EXECUTIVE SUMMARY

Today's naval shipbuilders must innovate to drive down costs, deal with increasing complexity and deliver new growth. Digital reinvention is their only option for achieving this and the best approach for shipbuilding is Industry X.0 – Accenture's next-generation industrial framework that leverages intelligent systems connected via the Industrial Internet of Things (IIoT) to create a fully digital value chain.

By combining Industry X.0 with an end-to-end view of the shipbuilding lifecycle, from design through to operational service, and from suppliers to navy users, a naval shipbuilder can advance towards becoming the digital leader of the future, and generate a rising stream of value throughout the life of each ship. This value is realized by collaborating with a digitally-connected ecosystem to improve operational efficiency, navy user experiences and ship availability while also developing new services.

To navigate this journey, a shipbuilder must take a practical, systematic approach based around six steps detailed in this paper. Those who take these steps successfully will be positioned to lead the industry as it transitions into the digital era and leave others trailing in their wake.

POWERFUL FORCES ARE SHAPING THE FUTURE OF NAVAL SHIPBUILDING

The naval shipbuilding industry is seeing unprecedented change and disruption, under the impact of trends including rising program costs, expanding international opportunities, and rising pressure from government customers seeking value for money.

Together, these trends are creating four imperatives for today's shipbuilders:

1 Deliver and secure margin and time-to-market of complex shipbuilding programs

2 Drive down costs, lead time and quality issues in design, manufacturing and the supply chain

3 Drive innovation towards the creation of the connected ship and the connected fleet

4 Develop new services to increase ship availability and effectiveness in operations

As the pressure on budgets continues to intensify, naval shipbuilders must do all these things at pace if they are to become competitive internationally. In some markets, major naval procurement programs also require shipbuilders to invest in extra capacity and transformation to improve efficiency.

DIGITAL REINVENTION IS THE ONLY OPTION

There is only one way that shipbuilders can rise to all these challenges: by embracing digital reinvention. In Accenture's view, the way forward is to apply Industry X.0 to power their progress to be the digital leader in the industry. This paper describes how shipbuilders can navigate this journey and create the industry's digitally-enabled future.

SCOPING OUT THE DIGITAL OPPORTUNITY

Whilst the concept of digital in shipbuilding has been discussed for several years, many shipbuilders have struggled to grasp what it means. This is now changing, as global players begin to turn the vision into reality.

For example, in September 2017 BAE Systems announced plans to build Australia's first digital shipyard in Adelaide, if it is selected to build Future Frigates for the country.[1] More generally, ship manufacturers worldwide are

starting to look at more digitally-mature industries such as aviation and mining for successful approaches to adapt to their own operations.

EMBEDDED BARRIERS TO PROGRESS

However, research suggests that the aerospace & defense (A&D) industry's digital aspirations are still running ahead of the reality. Accenture's latest global survey of A&D executives[2] found that 97% are willing to digitally reinvent their business but only 9% are already using digital capabilities to drive operational efficiency and business growth. This is backed up by the UK's latest Industrial Digital Review.[3] In general, digital maturity is low in shipbuilding, and digital investments tend to be directed towards individual technologies and specific use cases.

Why has the industry's digital advance been so gradual? For several reasons. Often, enthusiasm for digital technology is undermined by a lack of clarity on the business outcomes and generating funds to invest in digital capability can be challenging. Cultural barriers are a further issue: the industry's largely traditional manufacturing mindset can conflict with new digitally-enabled ways of working and deter digital talent from joining.

In addition the shipbuilding industry's intrinsic characteristics, manufacturing bespoke products in low volumes on long production cycles, with high levels of change and customization, rugged industrial environments, and concerns over cyber security and the challenges to digital innovation become clear.

BARRIERS THAT CAN NOW BE OVERCOME

However, all of these barriers can be overcome. Across the industry, preconceptions and ways of working are being challenged by the ready availability of low-cost, commoditized digital products and connectivity. And the impacts of digital are being amplified by advances in big data and analytics, intelligent automation, and a more flexible workforce. Together, these trends mean digital reinvention is an increasingly realistic option for shipbuilders worldwide.

HYUNDAI'S "DIGITAL SHIP"

The connected digital ship created by Hyundai Heavy Industries illustrates the potential of digital in a maritime context. With real-time data collection and exchange across vessels, ports, cargo and land logistics, the digital ship enables Hyundai Heavy Industries to create new customer services and revenue streams across the lifecycle of ships and journeys, removing the traditional barriers between different elements of a ship's operation. The results include increased asset utilisation and reduced operating costs[4]. Some A&D companies are building on such innovations: examples including Rolls-Royce's project in partnership with Google Cloud to help make autonomous ships a reality.[5]

INDUSTRY X.0:
PROVIDING THE VISION FOR THE DIGITAL REINVENTION OF SHIPBUILDING

How can this transformation be achieved? Supported and enabled by the Industrial Internet of Things (IIoT), Industry X.0 goes beyond the core efficiencies in Industry 4.0. Applied in shipbuilding, Industry X.0 builds into a connected ecosystem of digital technologies that drive higher operational efficiency, faster growth, and an enhanced experience for both the customer and operational user.

AN END-TO-END VIEW ACROSS THE LIFECYCLE

In combination with Industry X.0, a shipbuilder needs one further component to achieve successful digital transformation: an end-to-end view of the shipbuilding lifecycle. This means looking at the entire spectrum of activities in each naval program, all the way from design, through production and into operational service – not just for the shipbuilder, but for the customer and navy user as well. This end-to-end view is realized through a digital platform and an integrated flow of data running throughout the life of the ship, and across the ecosystem of ship designer, builder, suppliers, naval bases, operators, ships and more. This ecosystem generates a continuously rising stream of value powered by industrial analytics, playing back design updates, user feedback and at-sea performance data into the design of new ships.
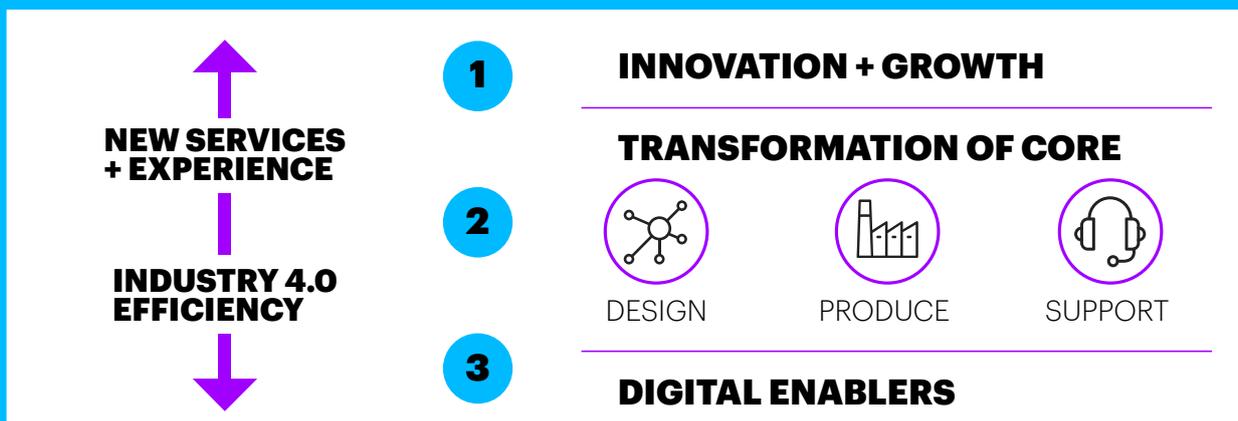
FOCUS ON FIVE KEY CAPABILITIES

With Industry X.0 applied and the digital ecosystem in place, the shipbuilder is equipped to generate increasing value in terms of operational efficiency, user experience and business growth. The focus should be on investing in five digital capabilities that are deployable across the ship lifecycle, rather than just in individual phases such as design or build.

Industry X.0 is a reinvented experience-led model for manufacturing and operations-based businesses. It is about reinventing the industry by leveraging the combinatorial powers of digital.

NEW SERVICES + EXPERIENCE

INDUSTRY 4.0 EFFICIENCY

1 INNOVATION + GROWTH

2 TRANSFORMATION OF CORE

DESIGN   PRODUCE   SUPPORT

3 DIGITAL ENABLERS

THESE SIX CAPABILITIES ARE:

1. DIGITAL SHIPYARD

• Combining advanced manufacturing, IIoT, data and analytics into an integrated production operation for the shipyard.

• Robotic process automation to streamline manual processes such as procurement, change management and engineering support tasks.

• 3D printing of parts in build, maintenance and on-board ships to reduce inventories and increase asset availability.

• Use of robots and cobots in the production of ships and in maintenance to enhance productivity.

• Autonomous surveys – using drones, underwater vehicle (AUVs) and spider robots to compile a material state picture – reducing emergent work during overhauls.

2. DIGITAL TWIN AND THREAD

• A "digital twin" of the ship design, created with collaborative design and simulation tools, to drive product competitiveness, better integrate the supply chain and enable effective manufacturing ramp up.

• A "digital thread" containing all configured produce and service information throughout the ship's lifecycle and across the ecosystem, providing access to latest information for every task.

3. DIGITAL PROJECT CONTROL ACROSS A CONNECTED SUPPLY CHAIN

• Proactive project controls throughout the Programme, including multi-tier supply chain, providing better certainty of project outcomes throughintegrated planning, trusted data and exploiting advanced analytics.

• An "always-on" surveillance solution for monitoring program performance and helping leadership optimize the program for schedule compression, reduced costs and risk mitigation.

4. CONNECTED WORKFORCE

• Immersive technologies, using virtual and augmented reality (VR/AR) to enhance the design and simulate the fitting of complex build procedures.

• Connected workers using wearables to disseminate digitized production and maintenance information across a more integrated workforce.

• Augmented reality for assisting workers with training, build and maintenance procedures, dramatically increasing effectiveness and worker productivity.

5. CONNECTED CONTROL TOWER

• A "control tower" of networked intelligent systems – providing oversight of vessel performance at sea and using analytics to drive predictive maintenance, optimise maintenance activity and enhance ship and fleet availability for operations.

6. SECURE, OPEN DATA PLATFORM

• Exploiting big data and analytics to drive Operational efficiency and availability requires traditionally siloed 'cross enterprise' data sets to be shared in a collaborative but secure way. Establishing an open data platform is key to extracting new levels of value.

• A "virtual shipbuilding" ecosystem with flexible production processes to build modules and ships at home and abroad – driving industrialization and international growth.

All of these capabilities are underpinned by a scalable and flexible digital platform, with the use of cyber-security, secure cloud and blockchain to ensureconnectivity and security across the ecosystem. To succeed, the digital shipbuilder also needs a digital workforce with the right skills, governance and organization.

DELIVERING UNPRECEDENTED VALUE IN EFFICIENCY AND GROWTH.

This lifecycle-based and multi-stakeholder view of digital value transforms the perspective from that of a shipbuilder focusing on operational improvements, to a connected and living Maritime Digital Ecosystem exploiting digital capability throughout the life cycle.

In combination, these six capabilities not only enhance operational efficiency, but also deliver new experiences for the user and new services for growth. Examples include providing fleet management of "connected ships" to naval customers, and leveraging the digital platform to offer integrated after-sales services for third party Original Equipment Manufactures (OEMs) and other users.

AUGMENTED REALITY IN MANUFACTURING: **AIRBUS**

Airbus is using the latest generation of wearable technology augmented reality glasses to help its technicians position and fit seats into new airliners. The application uses the wearable technology to overlay an augmented reality picture of a digital twin, with lasers marking the optimal position on the deck and precise voice-activated fitting instructions. This capability has led to near-perfect right-first-time quality, and a six-times reduction in average cabin fit time – in turn resulting in major improvements in production costs and airline customer satisfaction[6].
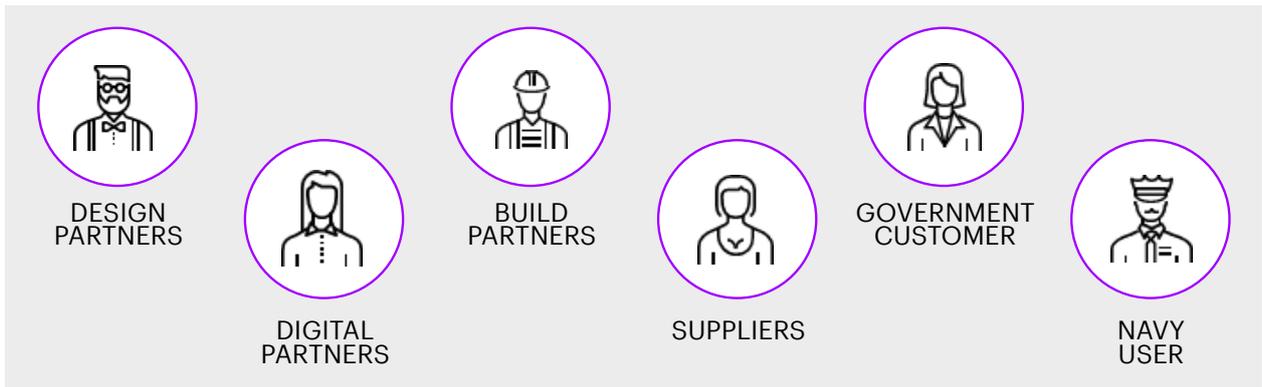
PULLING IT ALL TOGETHER: **CONNECTED OPERATIONS IN MINING**

To stay competitive in the face of challenges including volatile commodity prices and declining grades, many mining companies need to adapt their strategies and business models. They are doing this by using digital innovation to drive operational excellence.
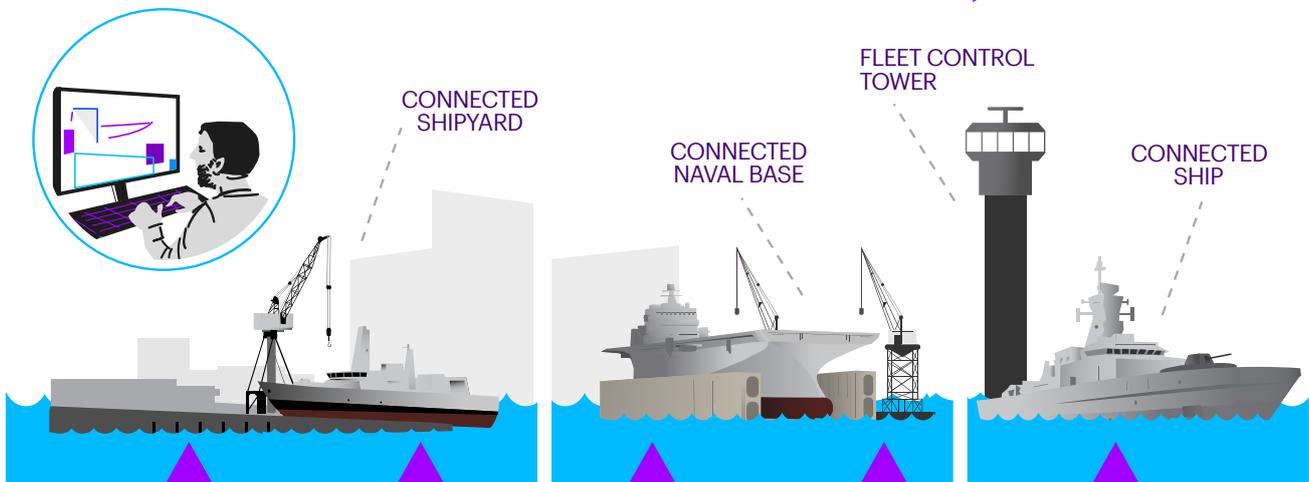
One global mining corporation has implemented a digitally-enabled end-to-end value chain for its mining operations to create the "connected mine". This is built around an integrated digital core, leveraging data and analytics to deliver capabilities such as automated operations, connectivity for mine workers via mobile devices, and predictive maintenance for mining vehicles and equipment. This approach has transformed the value chain and driven significant improvements in asset utilisation, safety and operational efficiency. All of this has been done in a rugged and unforgiving industrial environment not previously regarded as conducive to digital reinvention.[7]

MARITIME DIGITAL ECOSYSTEM

DESIGN PARTNERS

DIGITAL PARTNERS

BUILD PARTNERS

SUPPLIERS

GOVERNMENT CUSTOMER

NAVY USER

DESIGN ➤ **BUILD** ➤ **MAINTAIN** ➤ **OPERATE**

CONNECTED SHIPYARD

CONNECTED NAVAL BASE

FLEET CONTROL TOWER

CONNECTED SHIP

DIGITAL SHIPYARD

DIGITAL TWIN AND THREAD

DIGITAL PROJECT CONTROL ACROSS A CONNECTED SUPPLY CHAIN

CONNECTED WORKFORCE

CONNECTED CONTROL TOWER

SECURE, OPEN DATA PLATFROM

DIGITAL TECHNOLOGY PLATFORM, INFORMATION + INFRASTRUTURE

CYBER SECURITY

DIGITAL SKILLS & ORGANISATION

Based on the experience of other digital value chains (see the "connected mine" page 8) and Accenture analysis, a digitally-reinvented shipbuilder could reduce its operating costs by **15%** to **20%** in five years, and increase its revenues by **10%** to **15%** in a similar timeframe. Continuous and accelerated improvement will deliver further benefits on top of these.

KEYS FOR SUCCESS
TO DELIVER
DIGITAL REINVENTION

Even when a shipbuilder is equipped with the right technologies and senior-level commitment, digital transformation will not be easy. The difficulties will be compounded by factors including the shipyards' physical environment, industrial workplace culture, tight budgets and security concerns. To overcome these hurdles, a practical, systematic six step approach is needed:

1 Transform the core – by building a digital foundation for the end-to-end shipbuilding value chain.

2 Innovate in new business models – such as using virtual shipbuilding models and connected ship/ connected fleet management to drive value from the new digital capability.

3 Focus on outcomes – targeting improvements in high-value areas such as operational efficiency program delivery and user experience.

4 Rebuild the workforce – by driving the adoption of digital across the workforce and acquiring next-generation talent. View your shipyard workforce as customers of transformations – eliminate their frustrations to unlock the biggest bottlenecks.

5 Build the new ecosystem – by assembling the right grouping of international and domestic partners and suppliers in a collaborative and secure ecosystem.

6 Manage the transition to the new digital reality by carefully balancing investment in legacy and the new digital capabilities. Accenture calls this the "wise pivot to the New."

By taking these six steps, shipbuilders will be able to achieve the digital transformation that is vital to their future survival and success.

ENDNOTES
1 Source: BAE Systems press release, 21 Sept 2017 - http://www.baesystems.com/en-aus/article/adelaide-to-have-australia-s-first-digital-shipyard
2 Source: Accenture research
3 Industrial Digital Review for UK government, managed by Accenture. Made Smarter http://industrialdigitalisation.org.uk/
4 Source: https://newsroom.accenture.com/news/hyundai-heavy-industries-and-accenture-to-build-connected-smart-ships.htm
5 https://www.rolls-royce.com/media/press-releases/yr-2017/03-10-2017-rr-joins-forces-with-google-cloud-to-help-make-autonomous-ships-a-reality.aspx
6 Source: https://www.accenture.com/gb-en/success-airbus-wearable-technology
7 Source: https://www.accenture.com/us-en/service-connected-mine-solution

CONCLUSION: DIGITAL IN SHIPBUILDING – NOT A MATTER OF "IF", BUT "WHEN"

Advances in digital technologies and the emergence of Industry X.0 herald a new era of opportunity for shipbuilders. However, to succeed amid today's unprecedented disruptive change, indigenous shipbuilders will need to innovate, reduce costs and grow internationally.

Digital is the way to achieve these goals – by deploying a new generation of capabilities to overcome traditional barriers and transform operational efficiency, growth and user experience. Many A&D companies and commercial shipbuilders across the world are already on this path. Those who hold back now will face a struggle to catch up in years to come.

Put simply, digital will happen in shipbuilding, and the only question is who will take the lead by being among the first to "pivot to the New". For shipbuilders starting this voyage of discovery, Industry X.0 offers an integrated vision for the future of shipbuilding, together with a practical and experienced-based approach for navigating the route. It's time to embark on the journey.

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