AVIATION WEEK NETWORK 2020 Program Excellence Awards

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Thank you for participating,

Gregory Hamilton
President
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Acknowledged, agreed, and submitted by

Nominee's Signature _____ Date 6/24/2020

Nominee's Name (please print): Timothy Sweitzer

Title (please print): Director of Business Transformation & Digital Shipbuilding

Company (please print): Newport News Shipbuilding

NOMINATION FORM

Name of Program: Newport News Shipbuilding Integrated Digital Shipyard

Name of Program Leader: Timothy Sweitzer, Director of Business Transformation & Digital Shipbuilding

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☐ Customer Approved ***Includes publically released information***

- Date: N/A
- Contact (name/title/organization/phone): N/A

☐ Supplier Approved (if named in this nomination form)

- Date: N/A
- Contact (name/title/organization/phone): N/A

CATEGORY ENTERED

Refer to definitions in the document "2020 Program Excellence Directions." You must choose one category that most accurately reflects the work described in this application**. The Evaluation Team reserves the right to move this program to a different category if your program better fits a different category.**

Check one

☒ Special Projects

☐ OEM/Prime Contractor Systems Design and Development

☐ OEM/Prime Contractor Production

☐ OEM/Prime Contractor Sustainment

☐ Supplier System Design and Development

☐ Supplier System Production

☐ Supplier System Sustainment

Point Distribution

Executive Summary: Make the Case for Excellence (15 pts)		
Metrics **10 pts** Predictive Metrics (10)	**Program Volatility/ Uncertainty/Complexity/ Ambiguity** **25 pts** Describe overall VUCA (10) Cite examples of team response (15)	**Organizational Best Practices & Team Leadership** **40 pts** Innovative Tools and Systems (15) Unique Innovative Processes for People Development/Knowledge Transfer (15) Unique Practice es for Customer Engagement (10)
Value Creation (10 pts)		

Shipbuilding Terms

Term	Definition
Deckplate/Waterfront	Synonymous terms that represent our collective manufacturing and assembly trades workforce; these are shipbuilders who perform work in our shops and on or ships throughout Newport News Shipbuilding.

Abstract

In 150 words or less, why is this program excellent in terms of execution?
(12 pt. Times Roman)

Integrated Digital Shipbuilding (iDS) is an initiative to transform Newport News Shipbuilding (NNS) for the digital age; the program replaces legacy processes/tools with an integrated suite of digitally-enabled information, available throughout the lifecycle of our ships. Execution is excellent because our program actively works to:

- ***Listen.*** Shipbuilders on the deckplate have a voice, allowing NNS to fully customize digital content and training relevant to job roles.
- ***Collaborate.*** We stopped working in silos and now work as OneTeam – a term coined for how teams across NNS come together for the common good of our nation.
- ***Communicate.*** Our Communications Team ensures value stream awareness by communicating across programs and with our Navy customer.
- ***Learn.*** A digital transformation of this magnitude comes with its own set of risks, but we continually apply lessons learned and remain agile in our approach. This enables NNS to innovate and transform the shipbuilding industry as a whole.

Purpose

Provide a 150-word description of the purpose of this program, spelling out all acronyms and correct acronyms
(12 pt. Times Roman)

Integrated Digital Shipbuilding (iDS) was born out of a realization that our workforce is growing and changing with the rapid evolution of today's digital landscape. Newport News Shipbuilding (NNS) needed a method for providing information to the deckplate, such that the purpose and technical requirements of complex jobs would be fully understood by even the least experienced craftsperson. NNS is aggressively leveraging digital capabilities that replace paper based tools/processes to better enable what we do best – building great ships.

We are successfully developing digital capabilities that fit the needs of our shipbuilders on the deckplate. Adapting the use of technology allows us to leverage program commonalities and enable execution efficiencies while partnering with our Navy counterparts to exercise the full value of the Digital Thread. The iDS program is a digital disruptor, garnering renewed interest in the shipbuilding industry; we are leading the way for our people, community, and customers.

Executive Summary: Make the Case for Excellence *(Value: 15 pts)*

What is the vision for this program/project? What unique characteristics and properties qualify this program for consideration?
(12 pt. Times New Roman)

The Integrated Digital Shipbuilding Vision

At its core, Integrated Digital Shipbuilding (iDS) is a huge investment in our country, our community and ourselves. We are establishing and leveraging a digital thread throughout the complete lifecycle of Navy vessels in an effort to reduce overall cost and increase mission availability. To achieve this vision, our foremost goal is to improve the quality of our engineered products while enhancing our tools and processes; the result of which is optimized deliverables and significantly reduced re-work. Furthermore, we had to think about how best to transform the delivery and consumption of these products on the deckplate. We accomplished this by creating user-friendly formats for our shipbuilders so they fully understand the scope of work and can access the specific information they need for their individual job role. This transformative approach also facilitated efficiency gains and a considerable increase in shipbuilder proficiency, as measured by our time to talent metric. All of these factors make for the greatest digital transformation NNS has seen since its inception 134 years ago. We build cities floating atop the ocean for the United States Navy, and we are proud that our vision is coming to fruition through the hard work and dedication of collaborative teams across the company.

Our Unique Characteristics

The scale, complexity, and importance of what we do here at NNS is unparalleled in our industry. We build ships every day to defend America's freedom, protecting and serving our great nation with each vessel. With approximately $5 billion in revenue, a historic $34.8 billion backlog, and more than 25,000 employees, NNS is the largest industrial employer in the state of Virginia and the largest shipbuilding company in the United States. The industry looks to NNS, and its iDS program, as the way forward in shipbuilding.

iDS Program Unique Qualities

- **Program Management Structure**
- **Technology & People**
- **Training & Awareness**
- **Collaboration**
- **Communication**
- **Customer Partnership**

There are many characteristics that render this program and our digital transformation journey unique. The list below is a small representation of the qualities our program embodies and the properties that we believe make our case for excellence.

Program Management Structure

NNS structured iDS similarly to how we manage complex ship programs, with a dedicated Program Management Office (PMO). We took this approach because NNS has typically operated in silos - built with a formalized structure to mimic the hierarchy of the Navy. In the instance of iDS, we made exceptionally fluid leadership structure adaptations. We accomplished this in a short period of time, and it led to an amazing culture shift which has proven to be a significant contributor to the program's success. Starting as a grass-roots effort, with little oversight and only top-down support, we carved out space, time, and resources to innovate and re-think how we build our nation's greatest ships by leveraging digital technologies. We embraced empathy, design-thinking, and won our merit from the natural influencers who were using legacy tools by developing products that provided them the most value. The effort took hold and evolved, which prompted additional company investment and a more formalized leadership structure. Key leaders from within functional areas took ownership of the digital transformation in their respective areas of the value stream. Finally, the effort grew to match the same level of leadership and formality as a Navy Program, and iDS established a Program Management Office (PMO) to function similarly as other government-funded programs. iDS always had top-down support, but the leadership model continually evolved to appropriately match the phase of the effort. It found key leaders within whatever structure was in place at that time to foster credibility and adoption. Managing iDS as a stand-alone program and giving it the same merit as one fully funded by the government is uniquely progressive and directly related to our program's overall success.

Technology & People

Shipbuilding is not assembly-line/repetitive manufacturing, which makes our unique integration of technology one of the most compelling aspects of the iDS program. With the help of cutting edge software development from our partners, NNS has propelled forward in the industry, leveraging digital tools to assemble information more efficiently and effectively. Where other industry representatives may have concentrated on robotics and automation, NNS is focused on our people and processes. By putting tablets in the hands of our craftsmen and women, we are replacing traditional 2D drawings with step-by-step 3D Visual Work Instructions (VWI). When coupled with our critical chain project management tool, Visual Build Management (VBM), we are revolutionizing complex assembly work to address lessons learned while reacting to schedule and resource constraints. Another advantage to using model based engineering is that we have been able to leverage our existing product model data to build a digital twin for in-service vessels. The digital twin is a computerized parallel of the physical ship that represents near real-time status, working condition, and position. It enables us to collaborate with our Navy partner for customizable solutions to complex problems in a timely manner. That said, our digital transformation would not be possible without the willingness of our people to embrace technology in new and innovative ways.

Training & Awareness

NNS shipbuilders are vital to our organization, so it is important that we ensure they have the training they need to be successful on the deckplate. With a large percentage of our workforce being eligible for retirement in the near term, we need to ensure adequate knowledge transfer to the eager young shipbuilders who are just starting their careers with NNS. These new shipbuilders are digital natives, technologically savvy, and ready to adapt to our new tools and processes, so we have also worked to adapt to the needs of this incoming generation – recognizing their desire to become proficient at a rapid pace. When the iDS program was established, it was important to engage with our shipbuilders empathetically. We stepped into the shoes of our skillful craftsmen and women, working backwards to ensure we fully understood their day-to-day processes and requirements. Their needs were met with customized digital solutions and relevant end-user training – something we take very seriously at NNS. We use innovative platforms to educate our workforce and Navy customer, who often train alongside our

shipbuilders. All of these factors have led to a training atmosphere that fosters open communication, where shipbuilders and customers of all skill levels get the training they need when they need it.

Collaboration

"Teamwork makes the dream work" is a common saying in the workplace, and it is an ideal NNS has fully embraced as part of the iDS program. Collaboration can sometimes be difficult in a company of our size or a project of this magnitude; however, our sense of community across the value stream is profound. Prior to beginning our digital transformation, NNS often worked in silos – disparate departments working to resolve programmatic needs. Establishment of the iDS PMO has been a catalyst for cross-functional collaboration, where representatives from every program are contributing and being held accountable to more streamlined solutions. Shipbuilders across the company are working toward common methods that move us forward in the digital age. While competing priorities can be challenging to navigate, our shared consciousness fosters an environment of open communication, trust, and mutual respect. Our "iDS: OneTeam" culture enables us to truly understand the collective vision of our program and has significantly contributed to its overall success.

Communication

The iDS PMO established a dedicated Communications Team to keep the broader community well-informed about all aspects of the program, including tool/process changes, added/upgraded digital functionality, project and program-wide progress, individual and team highlights, as well as changes in leadership. Communication is vital to any organization, but especially in a program like iDS where we are completely changing the tools and processes we have used for the last 130+ years. A company-wide change of this magnitude is a cultural shock, and it is this team's responsibility to help alleviate confusion by communicating regular and relevant messages using various forms of digital media. Communication itself is not innovative, but assigning a dedicated Communications Team for the program is a novel approach. The team's efforts have strengthened our sense of community across the value stream and furthered our program's motto of "iDS: OneTeam" through programmatic transparency and accountability.

Customer Partnership

Our iDS program recognizes the importance of a digital transformation for our business, but we also seek to understand our impact on the Navy's digital endeavors – to accelerate business process modernization and reduce total ownership cost. NNS has established open communication with our Navy customer around the risks and rewards of such a transformation. We invite them, as partners, to our working sessions so we can better understand their challenges and they can better prepare for the deliverables we plan to provide. Our Model Based Engineering (MBE) organization actively works to corral participation from multiple NAVSEA commands, public shipyards, Supervisor of Shipbuilding (SOS) representatives and the Washington Navy Yard (WNY), both locally and virtually, to enhance collaboration with our Navy customer. This relationship of shared trust helps the industrial complex work for the greater good of the Navy, resulting in mutually beneficial products and processes. Leveraging our digital solutions also contributes toward de-risking some of the Navy's digital initiatives. NNS is fully transparent about our digital transformation, while engaging in a lead-follow partnership with the Navy, which ensures their readiness for adoption of our digital deliverables and enables continued lifecycle sustainment.

The iDS program is progressing on a journey to change the way we do business, and it is all because of our dedicated workforce. Collectively we are not only changing our company; we are changing an industry. Our success in the program so far is excellent not just because of what we have accomplished, but also because of how we are doing it. This is not easy. It requires a great deal of perseverance, which is one of the iDS program's core values. It is often frustrating. Yet, almost every day we meet shipbuilders

who were attracted to the iDS program because they want to be part of something bigger than themselves – from our "early adopters" who are refining imperfect tools and processes on the deckplate, to the planners who are fighting every day to stay ahead of the production curve, to the designers and engineers who are getting the right information into the product model in the right way, to the IT teams who are advancing our core tool capabilities at a tremendous rate, to the innovators everywhere who are coming up with new ideas daily to change the way we do business. All of us are essential to making this program come to fruition. We did not sign up for this because it is easy, but rather because it is meaningful. That is the difference between program mediocrity and program excellence. The iDS program has and continues to achieve the latter.

(Do not exceed 10 pages in responding to the following four descriptions; allocate those 10 pages as you deem appropriate, but it is important that you respond to all four sections.)

VALUE CREATION *(Value: 10 pts)*
Please respond to the following prompt:

- **Clearly define the value of this program/project for the corporation beyond profit and revenue**
- **Clearly define the value of this program/project to your customer**
- **Clearly define the value of this program/project to members of your team**
- **Clearly define the contribution of this program/project to the greater good (society, security, etc.)**

(12 pt. Times Roman)

Integrated Digital Shipbuilding (iDS) is causing every part of our business to reevaluate what factors are necessary to complete a job and why. We are challenging ourselves by seeking out ways to improve the shipbuilding industry - ultimately building ships safer, cheaper, and faster. The defense industry as a whole is looking to NNS, and our use of technology, as an industry influencer…a trailblazer. The iDS program is leveraging this digital opportunity and, in turn, has created value for our corporation, Navy customer, shipbuilding team, and the greater good.

Corporate Value
The iDS program brings enormous value to NNS. Our initial investment in new technology is the catalyst for our continued digital transformation, and it has really pushed the entire value stream to think differently about the vast possibilities of shipbuilding in a digital age. We are reinventing our business processes to keep up with the challenges that we face today. Culturally speaking, the iDS program has allowed us to bridge the generational gap between legacy shipbuilders and the less experienced workforce entering our gates. Making that shift is not easy in any corporation, but we continue to recognize and act upon the value it brings for NNS and our iDS program goals.

Customer Value
Our Navy customer sees the value in NNS' digital transformation too, so much so that all of our newest carrier and submarine products are being developed in a digital environment. Standardizing the tools and processes we use to construct ships across our product lines has a propagating future benefit to ship alterations and overhauls, which is advantageous for maintaining an operational Navy fleet. We are providing the Navy with a benchmark platform that they can use for the entire lifecycle of a ship – a major value add for the customer, because it means these assets spend less time in maintenance, more time in operation, and are built at a reduced execution cost. The iDS program is paving the way forward for the entire Navy infrastructure, which exponentially adds value aimed at our customer year after year.

Another example of how the iDS program is bringing value to our customer is through the award of a two-ship buy in 2019. For the first time in more than three decades, NNS was awarded a multi-ship

contract from the Navy to build two aircraft carriers. We received a contract modification valued at $15.2 billion for the detail design and construction of the Gerald R. Ford-class aircraft carriers Enterprise (CVN 80) and Doris Miller (CVN 81). The Navy's decision to partner with NNS to create the best acquisition approach will save more than $4 billion across the program, making it a significant step toward the company designing and building the next generation of aircraft carriers – using digital products – at the best value for the nation. Buying two aircraft carriers will stimulate NNS' aircraft carrier supplier base of more than 2,000 suppliers in 46 states, allowing businesses to phase in work more efficiently. These benefits will help accelerate production, enabling the company to build aircraft carriers every three to four years (instead of seven to 10), which is a huge value for our customer. This strategy comes as a result of extensive collaboration with the Navy to reduce cost and drive efficiencies, many of which were enabled by our commitment to iDS digital transformation initiatives.

Team Member Value
Our iDS team is an extensive network, consisting of several organizations across the company - Business Transformation & Technology, Engineering & Design, Integrated Planning & Production Control, Operations Integration, and all facets of our Manufacturing & Assembly trades. We truly are a team of teams. The team value created by the iDS program is really about cross-functional areas working toward a common purpose. It is about decreasing inefficiencies, leveraging a lean process flow when developing digital products, and giving the workforce accessible/easily digested information so they can spend more time on the job. The digital products we are developing as our new standard also support the ever-changing workforce. New shipbuilders at NNS will have the benefit of learning from our experienced craftsmen while also sharing what they know about technology. Doing so decreases our time-to-talent metric, by putting shipbuilders to work much faster than would have been possible using legacy paper processes. This adds value not only for the team, but for the corporation as a whole.

Greater Good Value
The iDS team is fortunate to work for a company with such a prolific and extensive 130+ year history within the community. NNS adds societal value because it is the massive economic engine that provides over 25,000 jobs for families across the region. A hard truth we face today is that if we do not push ourselves to evolve with technology, we risk losing the opportunity to gain efficiencies and attract new talent – both of which could put us out of business. Because the iDS program is actively working to transform shipbuilding industry, NNS has the honor of providing continued value for the greater good of our community and our nation – so we can be around for the next 130 years.

The foundation that the iDS program is putting in place for NNS, our Navy customer, and our workforce is best represented in our company's motto: "Hard Stuff Done Right." Not every step of our iDS journey has been easy, but no transformation of this magnitude is expected to be that way. Putting in the hard work up front generates significant value today and ensures our collective success tomorrow, all for the greater good of our nation.

METRICS *(Value: 10 pts)*
Please respond to the following prompt:
- **How do your predictive metrics drive action toward program excellence?**

(12 pt. Times Roman)

Metrics allow team members to put their finger on the pulse of a project, program, or organization – to understand the bigger picture and visualize a path forward. The Integrated Digital Shipbuilding (iDS) program is providing a tool that utilizes various metrics to assess where we are and adjust (if needed). Visual Build Management (VBM), leveraging Critical Chain Project Management (CCPM), is a form of

project management that uses unique philosophies and predictive metrics to help our deckplate teams realize the full value of the iDS program. More specifically, we can account for project variability and analyze current conditions to predict project performance using a Decreasing Size Buffer Management (DSBM) tool.

CCPM is a relatively new form of project management – a method of planning and managing projects that emphasizes the importance of resources (people, equipment, skillsets, and physical space) required to execute project tasks. The critical chain is the longest path in the schedule, when evaluated for task and resource dependencies. In CCPM, we remove the "safety" from each task by scheduling to an aggressive date that can only be met ~30% of the time. Then, we aggregate it in a buffer at the end of the project. This differs from critical path project management where each task includes safety in its duration. Removing the safety in each task allows us to combat student syndrome (planned procrastination) and Parkinson's Law (tasks expanded to fill available time).

Our application of CCPM is unique, giving us an improved ability to measure and manage variability within complex projects. By measuring and reacting to the difference between our aggressive and safety based durations for each task, we can manage task and project variability. This allows limited resources to be deployed to the most critical need and ensures we are working items that directly support progress on a project. The VBM toolset as a whole is improving our ability to proactively and successfully manage project execution.

VBM combines our existing 3D product model with the CCPM-based solution mentioned above to better plan, communicate, and manage complex projects. This complete solution is especially valuable in multi-project environments where resources are limited and project managers must make quick, impactful decisions. In addition to being a tool for the project manager, VBM provides resource managers with proven CCPM concepts and tools to combat multitasking, by prioritizing resources on the most appropriate tasks and providing earlier signals/metrics for obstacles within and across projects. VBM tools and processes allow the creation of: more informed construction plans, clearer methods to coordinate work, metrics that encourage positive project management behaviors, and the ability to actively manage/predict progress with consideration of project schedule risk.

This toolset, and its predictive metrics, are directly linked to more effective decision-making, and they trigger earlier feedback loops from our workforce on the deckplate. This is vitally important for our business, and we rely on it to determine where it makes sense to pivot versus where we should stay the course.

Sometimes our predictive metrics show us that we are not going to meet our goals, and that is OK. There is great value in what we learn from the things that do not go well, which is why our iDS team is known for embracing those opportunities and "leans in" even more when this happens. Our metrics hold us all accountable for programmatic pitfalls, and are what drives us to make those necessary and appropriate changes that continue to propel our program. The lessons learned from the metrics we harvest are some of our most valuable assets. We utilize every opportunity to take advantage of these tools while also seeking out new and innovative ways to expand their reach for even greater value. VBM and CCPM have provided us with enhanced predictive visibility, and they play a substantial role in the continued success of our iDS program, our company, our customer, and our nation.

DEALING WITH PROGRAM CHALLENGES (VOLATILITY, UNCERTAINTY, COMPLEXITY, AMBIGUITY, OR VUCA)
(Value: 25 pts)
Please respond to the following prompts:

- *10 pts:* **Describe overall VUCA faced by your project/program.**
- *15 pts:* **Cite specific example(s) and how your team responded.**

(12 pt. Times Roman)

Every program has its challenges and, at Newport News Shipbuilding (NNS), the Integrated Digital Shipbuilding (iDS) program is no exception. As iDS has progressed over the last few years, its volatility, uncertainty, complexity, and ambiguity, or VUCA, has been a constant presence. When the iDS program was first established, we used to compare it to a bridge in fog. Although we did not have all the small details worked out ahead of time and the fog on the bridge only allowed us to see a short distance in front of us, we trusted that the bridge would still take us to the other side. The very challenges identified by evaluating our VUCA are what has pushed our program into a forward-thinking, solution-driven mindset that really sets iDS apart – ultimately leading us across the bridge to overarching programmatic success.

Overall VUCA

Below, you will find several areas within the iDS program that encompass elements of volatility, uncertainty, complexity, and ambiguity. Although these items resulted in various challenges for our team, the iDS program faced them with profound optimism and laser-focused determination.

Scale

Tens of millions of man-hours – that is how long manufacturing and assembly takes when building carriers and submarines at NNS. Even before the company established iDS to pursue this digital transformation, we successfully designed, constructed, overhauled, and repaired more than 800 ships for the U.S. Navy and commercial customers. The scale of what we do has always been monumental and the volatility, uncertainty, complexity, and ambiguity of this work is more prominent than ever. The decision to embrace digital shipbuilding did not change that. If anything, those challenges grew.

Translating legacy processes that have sustained our company for more than 130 years into new digital versions – and at the scale we build ships – was a huge risk. It made every team within the iDS program uncertain. How could we take what we knew to be working and completely flip it on its head? Why should we transform the tried and true methods that have been our platform of success for so long? The answer is simple: it was necessary to evolve with the current digital landscape if we wanted to remain relevant in an industry whose incoming workforce expects innovation. Building nuclear powered aircraft carriers and nuclear powered submarines is a scale of manufacturing like no other. Transforming our business would be equally complex, but we knew that and *deliberately* planned for the challenges in volatility, uncertainty, complexity, and ambiguity that we would face. Our program scope and requirements are always changing; sometimes the path forward is not as clear as we would like it to be. Knowing this, however, allowed us to embrace this change head on and turn it into a learning experience. We recognize large scale shipbuilding will continually face various factors of VUCA, but the iDS program is enabling us to approach those challenges through a differentiating lens.

Technology

Technology is ever-evolving, which raises the VUCA ante in our iDS program. Not only are we going through a digital transformation, where we are developing new tools and processes to build ships safer, cheaper, and faster, but we also have to keep up with all the changes and upgrades to the software we utilize. CVN80, the first ship being constructed with a full suite of iDS tools/processes, will be delivered to our Navy customer in 2028. The breadth of technological advances that will undoubtedly occur within that time period puts us in an extremely volatile, uncertain, complex, and ambiguous position. Another programmatic challenge we face is that because of the significant investment we have already made in our software and tools, the iDS program will need to carefully evaluate which future capabilities provide

continued, sustainable value. We must now be as creative as possible to avoid the need for massive reinvestment costs; we must maintain our current suite of digital products such that they continue to provide the necessary usefulness for future carrier and submarine builds. What we are doing today is setting the foundation to enable iDS to better keep up with digital capabilities and adapt to future technological changes without a complete overhaul to our program infrastructure.

Budget & Schedule

Our iDS program is leading the way forward, but that does not make us immune to the typical budget and schedule challenges faced by most other programs. Our digital transformation requires us to make informed decisions about when and how to implement change – especially when those changes can impact the construction of carriers and submarines with fixed constraints. Deploying a software update or tool automation that disrupts the construction schedule at the wrong time could have catastrophic impacts to production performance. As pioneers in our industry, we have the burden of proving what is possible while assuming the associated risks. The presence of volatility, uncertainty, complexity, and ambiguity makes that increasingly difficult and equally rewarding.

Cross-Collaboration & Culture

Cross-functional teams have been used at NNS in the past but never to this magnitude. Identifying that we spent too much of our time working separately – in silos – and not enough time collaborating with other teams and departments, iDS had to embrace and emulate a collaborative mindset very early in the establishment of the program. As we persist on this digital transformation journey, we continue to recognize the impact that culture change and teamwork can have with regard to volatility, uncertainty, complexity, and ambiguity – both positive and negative. There are still so many unknowns as we make this very important transition: utilization of core software vs. custom software, fluctuation of scope and requirements, alignment of architecture, and shifting of long-standing culture. The only way to ensure success is to maintain our focus on the bigger picture, and that is why the iDS team works cross-functionally to support our collective goals and minimize VUCA within the program.

Cited Specific VUCA Examples

There are many challenges within the iDS program that represent volatility, uncertainty, complexity, and ambiguity. Below are a few specific examples of programmatic challenges (VUCA) we have faced and the actions that were taken to respond to them fairly and appropriately.

Accelerated Solutions Environment (ASE) Workshop – Volatility, Uncertainty, Complexity & Ambiguity

Within iDS, there were many differing opinions about the path required to successfully achieve the full digital planning process of a ship – so much so that it was causing notable volatility and uncertainty among the team. In January 2020, the iDS program hired an outside consultant to facilitate a dedicated workshop aimed at coming through some difficult architectural decisions that had previously eluded the iDS team. The goal of the workshop was: Together, leveraging an enterprising view, our team will align on a unified direction for the tools and processes required for build strategy, build authority, and scheduling to enable NNS to deliver on our iDS and programmatic commitments to the Navy.

The rigorous multi-day off-site event included key subject matter experts and decision makers from across the value stream in an unplugged, collaborative workspace. The detailed discussions and solution-based activities led to many promising outcomes, but the most important of which regarded toolsets NNS will use in each step of the planning process. This experience was unique in that participants truly listened and learned from one another; all who shared in this experience demonstrated forethought and mutual respect, even while they pushed through numerous disagreements along the way. It was the first

time in years that the iDS team felt a workshop was so effective in mitigating VUCA. All 34 participants signed a declaration of alignment and were able to debrief those alignment decisions with the entire iDS community upon their return. Overall, the ASE workshop was a success, but it was the volatility, uncertainty, complexity, and ambiguity leading up to this event that pushed our iDS program toward a successful to-be architecture.

The Accelerated Solutions Enterprise workshop attendees came through some hard architectural decisions for the greater good of the iDS program.

The workshop addressed the team's volatility and uncertainty, and the outcome led to a promising future planning process.

Visual Build Management – Uncertainty & Complexity

Visual Build Management (VBM) is a planning and project management tool that the iDS program specially developed because no other software company had an off-the-shelf solution that provided the holistic capability we needed to execute our project and programmatic goals.

Our two biggest challenges specific to VBM:

- Adopting and working to Critical Chain methodologies is a monumental shift in perspective and can be counterintuitive for people/organizations strongly rooted in a critical path mentality.
- We have never planned or managed work at a level required to support Critical Chain Project Management (CCPM).

Migrating our workforce to embrace these philosophies, while also establishing a solution that fits into our higher level critical path and supports traditional Earned Value Management (EVM) reporting, is a significant undertaking. Building the competency and proficiency to do this in an effective and efficient manner is a challenge, but VBM provides a means to mitigate that uncertainty and complexity.

VBM combines the use of our digital 3D product model and critical chain project management (CCPM) methodology. It uses proven concepts to combat multitasking, focus resources on the most appropriate tasks, and provide earlier signals/metrics for obstacles within and across projects. VBM tools and processes allow for the creation of a more informed construction plan, a clearer method to coordinate work, metrics that encourage positive project management behaviors, and the ability to actively manage progress and project schedule risk.

VBM is a meaningful and effective response to various project hurdles that have the potential to be uncertain and complex for our program.

Culture – Volatility & Ambiguity

Any time a major change takes place within a company, there will automatically be cultural challenges. For more than 130 years, the ships built at NNS, like the American shipbuilders who build them, have served our nation in peace and war, in times of adversity and in times of abundance. Our legacy of

"Always Good Ships," is a proud one. What happens when the same company makes a major investment in a digital transformation like iDS and prideful shipbuilders must change the way they have always done their jobs? It is a culture shock – a big one – and can bring about major volatility and ambiguity in the ranks. The iDS program is developing digital tools and processes that allow a novice craftsperson to walk through our doors and excel at a job that a seasoned shipbuilder has spent years learning, practicing, and honing. That alone can have a deep psychological effect for the experienced craftsperson on the deckplate.

The iDS program empathizes with these challenges and has taken several steps to combat VUCA in our shipbuilding culture, to include training every individual on the waterfront, both new and experienced. Training comes in many forms, ranging from basic digital device skills all the way up to more advanced and specific on-the-job training. The program has also done its very best to show veteran shipbuilders the value of all new digital devices, tools, and processes utilizing targeted communication techniques in every shop across the yard. By doing so, NNS is able to drive home the point that iDS digital capabilities are a valuable addition to their jobs.

Overcoming challenges and getting to the bottom of program-wide volatility, uncertainty, complexity, and ambiguity is a must in any program. The iDS program at NNS has demonstrated, through the pointed and specific examples above, how we have been able to overcome adversity and lessen our VUCA across the value stream.

ORGANIZATIONAL BEST PRACTICES AND TEAM LEADERSHIP *(Value: 40 pts)*
Please respond to the following prompts:

- *15 pts:* **In executing the program, what unique and innovative practices, tools and systems frame your program and help you achieve program excellence**?
- *15 pts:* **What unique and innovative processes and practices are you using to develop people and transfer knowledge and how do you know they are working?**
- *10 pts:* **What unique practices are you using to engage customers and how do you know?**

(12 pt. Times Roman)

Organizational best practices and team leadership is the foundation of any high-performing program. Through the use of unique and innovative practices, tools, and systems; developing our people and sharing knowledge; and engaging our internal and external Navy customer, the iDS program has achieved program excellence.

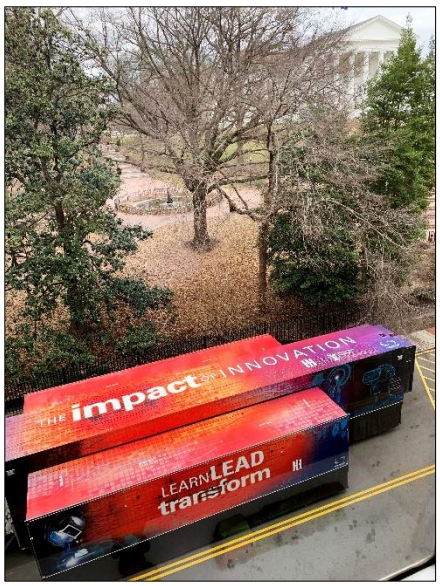
Unique and Innovative Practices, Tools, and Systems
The Integrated Digital Shipbuilding (iDS) program at Newport News Shipbuilding (NNS) has been successful in large part to several unique and innovative practices, tools, and systems. Below is a summary of a few areas we want to highlight that we feel demonstrate our best practices and team leadership across the program.

Centralized Program Management Office (PMO)
The reason the iDS PMO is unique at NNS is because it was given project budget, schedule, and program oversight, to manage all aspects of technology development - from digital product creation to deployment to manufacturing - across multiple product lines. Establishing a dedicated program office has helped to develop a consistent approach across our carrier and submarine programs - driving such standardization ensures we get the most out of the monetary investments made by NNS and the Navy, as well as the technology investments made by our software suppliers. Newport News Shipbuilding's digital

transformation would not be the success it is today without the innovative idea to run iDS as a stand-alone program. This approach has certainly contributed to our overall program excellence.

M*obile e*X*perience *(MX) Trailer

The iDS *M*obile e*X*perience (MX) is a 53' trailer providing 1,000 square feet of mobile training space. This flexible platform offers the ability to provide customized, immersive experiences for every audience, including NNS shipbuilders, our Navy customer, commercial enterprises, schools, career fairs, trade expos, and STEM events. The trailer has even traveled to the Virginia state capital, the Washington Navy Yard, and Capitol Hill for tours of the iDS digital transformation! The focus of experiential content at our seven demonstration stations within the trailer provides an educational overview of NNS's iDS transformation. As employees, customers, and the general public are immersed in our transformational journey, the digital tools and processes currently being implemented come to life. The MX trailer is shaping the limits of innovation by allowing the iDS program to reach a broader audience as we share our digital transformation inside and outside the NNS gates. Our audiences get hands-on experiences that are only second to actually working at the shipyard. Since the MX was delivered in April 2017, approximately 34,000 people have toured the trailer, with 7,500 of those participants touring in 2019. The iDS MX trailer is innovative, unique, and positively showcases what makes NNS one of the greatest industrial employers in Virginia.



In January 2020, the MX Trailer had the privilege of being a part of a Manufacturing Day event for the third consecutive year at the Virginia State Assembly in Richmond, Va.

Regular Communication

Keeping the lines of communication open during a monumental digital transformation like iDS is paramount and one of the contributing factors to our program's overall excellence. The iDS PMO established a dedicated Communications team solely responsible for pushing out messages to the broader community about overall program status, project success stories, quick and relevant news highlights, software-related announcements, progress reports of one-time initiatives – like our previously mentioned Accelerated Solutions Enterprise (ASE) workshop – and any changes in program leadership or job roles. The PMO feels it is important to release these types of communications and ensure complete programmatic transparency (one of our program's five core values). It is also important to receive feedback. One way the program has established a feedback loop is to hold standing meetings with engaged leadership from across the program who actively listen to project challenges and risks. These leaders solicit feedback from everyone – the craftsperson on the deckplate, the individual contributor in the office, middle management, their peers, and high-level executives. It takes an open mind and a willingness to listen to all viewpoints to achieve program success. That is what we have done here at NNS within the iDS program, and it is what has directly led to an understanding of our program's goal of complete digital transformation.

Unique and Innovative Processes and Practices Used to Develop People and Transfer Knowledge

While navigating through digitally transforming our entire shipyard, NNS quickly realized the importance of developing our people and transferring knowledge. The digital tools developed within the iDS program have a steep learning curve, so we had to design them in such a way that they would alleviate some of that burden.

End-user Training

A unique way we decrease the learning curve on our products is through training. Our robust training organization has developed a unique process for new shipbuilders that includes a digital literacy survey. This survey determines comfortability level with digital devices and tools. The results of the survey ascertain what training courses the new shipbuilders needs to complete before they begin working. Current shipbuilders receive specialized training relevant to their specific job role (to include computer user basic training for those who are more inexperienced with digital devices, tools, and processes). We have been able to capture metrics on the time it takes shipbuilders to accomplish their work using the digital capabilities. These metrics provide significant feedback and alert us if more or other specific training is still needed. We are always looking for ways to ensure our digital tools and processes are end-user friendly and the metrics we have been able to capture thus far have helped us to do just that. Our iDS training team and the unique process they have developed that includes a digital literacy survey contributes to the overall success of our program.

Digital Cafes & Support Offices

In an effort to support our shipbuilders in every way possible, the iDS program has provided digital cafes and support offices yard-wide to help our craftsmen and women with any technical help they need regarding digital devices. These cafes and offices provide significant advantages, including some basic training. When digital devices were first introduced to the deckplate as a result of many different iDS pilots, there was very little in the way of training users how to operate the devices. Sometimes there was no way to charge them, and there was not much device support in general. Since opening the digital cafes and support offices, there is now a way for the deckplate to receive help with things like anti-virus software issues and resetting passwords, which indirectly results in shipbuilders receiving basic training, thus empowering them to help themselves in the future. We regularly open new cafes and support offices across the yard due to the highly positive feedback we have received from our workforce.

Reverse Mentoring

An innovative technique that evolved from our craftsmen and women is reverse mentoring. This was not a planned activity to support iDS, but it has grown organically and greatly supports the successful implementation of digital shipbuilding. New shipbuilders have an advantage as soon as they walk through the NNS gates – most of them are technologically savvy…the YouTube generation. The digital tools and processes being developed within our iDS program are extremely visual and something the younger generation gravitates toward. The new shipbuilders tend to pick up on the digital aspects of the program far more quickly than veteran shipbuilders. That is where reverse mentoring comes into play. Our more experienced shipbuilders are some of the best and are highly skilled and very proficient in our legacy processes, which were primarily paper-based. As a result of this reverse mentoring practice, the veteran shipbuilders are becoming more comfortable with and are embracing the digital iDS tools and processes while the new workforce are learning the skilled trades faster. The impact of this shipbuilder partnership encourages knowledge transfer and sharing among our entire workforce, and, more importantly, it builds trust, which is another core value of the iDS program. This innovative and unique idea of reverse mentoring has contributed greatly to the program's success.

Unique Practices to Engage Customers

The term "customers" is multi-faceted within the iDS program. It is indicative of anyone who will receive new digital products as a result of this effort, to include the Navy, various suppliers, and our fellow shipbuilders – the men and women who proudly build our ships every day to defend America's freedom. NNS and the iDS program would not be where they are today if not for our customers! Below are several key aspects of the program that we feel best represent the unique ways in which we engage with them.

Transparency

As one of the principle values of the iDS program, transparency is something we strive for every day. From day one of the program, we have engaged in open dialogue regarding our intentions and challenges within iDS. We have particularly detailed internal conversations in front of our Navy customer to ensure a shared consciousness. This philosophy fully engages the Navy in the discussion so they understand how hard this digital transformation really is. Being open and honest provides context and gives the customer the full breadth of all the different variables that require balancing in order to meet our programmatic goals. The Navy reviews all the same metrics we do, they are involved in every weekly management meeting, and they hear our challenges and approach to solving those issues. We are trying to keep the Navy involved as much as possible so they can leverage our digital products. The customer is also actively involved in process development and embedded within the iDS program as we develop our digital tools. We really do encourage the Navy to be as hands on as possible, and we believe this is a unique approach in our program.

iDS Center of Excellence (iCOE)

The iDS program has always been, and will always be, iDS: OneTeam. Although we spoke earlier of collaboration across the value stream as a program challenge, we also recognize the importance of overcoming such challenges quickly. Our shipbuilders are fiercely loyal to NNS and the work of defending our great nation. It is with that determination that the first iCOE was established. The goal of any iCOE in the shipyard is to create an area in the yard where shipbuilders have iDS devices in hand and are actively using them. The iCOE is also there to teach craftspeople how to use the new digital devices and tools. We interact daily with our customer on the ground, standing shoulder-to-shoulder with them as the company goes on this digital transformation journey together. The iCOEs represent the voice of the deckplate and are a unique and innovative way we have been able to support our customer's digital literacy needs. At the end of the day, all anyone in the iDS program wants is to be able to set our workforce up for success.

Pilot Programs

Before iDS ever implements a brand new project/program with our customers on the deckplate, we first roll out a pilot. The pilots allow us to test new digital tools and processes in order to receive quick feedback on our deliverables – what worked and what needs improvement. This innovative approach aids in our ability to be adaptable, which is another one of our iDS core values. We swiftly identify, evaluate, and incorporate their input so we are able to better develop and deploy products to our workforce on the ground. Being flexible in this way allows us to pivot when needed, which is extremely important in a digital environment. Developing pilot programs is something NNS has not utilized heavily in the past, but they have been a priority in the iDS program. Pilots allow us to involve our customers earlier in the development process and take full advantage of their valuable contributions. They also lend themselves to autonomous thinking, ownership and an ability to fail-fast/learn-fast. The pilot programs have been a major success for iDS thus far, and we will continue utilizing this practice as the program progresses.

The iDS program's organizational best practices and team leadership, as showcased above, demonstrate the unique and innovative practices we use to develop our people, transfer knowledge, engage our customers – internally and externally – and help us achieve program excellence. Our successful execution of the program is a testament not only to our best practices and team leadership, but also to our people, Navy customer, and the innovative tools and processes that bring our digital transformation to life. We still have a long journey ahead of us, but the iDS program is dedicated to pioneering our way forward for the defense industry and leveraging new digital capabilities to deliver the greatest ships in the world.