Newport News Shipbuilding Digital Journey:
Drawings to 4GD based Visual Instructions
NIST Conference April 2017

Jim Dorwart
Newport News Shipbuilding

• 131 year old company

• Virginia’s largest Industrial Employer (20,000+)

• 2.5 miles of waterfront (550 acres)

• 20+ different Shops (valve sheet metal, foundry, etc.)

• Primarily Navy Work
  – Complex Design
  – Construction
  – Overhaul
  – Maintenance/Modernization
  – Logistics
Where do I find the correct information?
Complex Paper Processes Ruled

Our Craftsmen Build the Most Complex Ships in the World
THIS NEEDED TO BE MORE EFFICIENT
What do we have to start from?

Our Business Trinity

Opportunity For Change

People

Process

Tools

Our Brownfield Infrastructure

Biggest Asset
People: End User Centered Product

- Start with the end user
- Develop Low res Prototypes
- Followed Through
- Make our Brown Field Work for Us

Think and Feel
- Safety and Quality very important
- Mistrust in the system
- This job is hot
- Material is missing
- Go faster for less budget
- Just fix it
- Why are you late?
- Your people are lazy
- You already have everything you need
- There is a better way to do this
- The Drawing is messed up
- None of this info helps me
- That is not your job

Hear
- Computer limitations to get info
- Time off Deck Plate
- Stacks of paper work
- Metrics that don't apply to the work
- Too many meetings
- Industrial Dangerous environment
- Only on Ship for few hours
- Many people working hard with little progress
- Useless info (dwgs, mat'l, plan, etc.)
- Others in the way of work
- Work the phones to coordinate work
- Works the phones to coordinate work

Say and Do
- Get job done on-time/on-budget
- Works too many hours
- Lack of useful info
- Pride in their Work
- Too Much to Track
- Frustrated Employees
- Flying by the seat of their pants
- Frustrated
- Overwhelmed
- Exhausted
- Pressure

Pain
- SAP GUI
- Constantly changing priorities
- Every job is hot
- No access to schedule
- Too much useless information
- Critics
- No real time actionable info
- Too many hours at work
- Clear Instructions (useless design info removed)
- Real Time Material Status
- Clear priorities across jobs
- Multiple Queues for support from value stream
- Slow to no response from the value stream
- Unskilled crew members
- Who should I call for what
- Others behind schedule
- Distance between Physical Work and Info
- Sign off parties
- Document and Problems Varibly
- Go-go-go attitude vs Screw it

Gain
- Just on time is never on time
- Little time on deck plate
- Rework
- A voice in the system
- Time with employees
- Real Time Material Status
- Real time comprehensive support status
- Mobile access to all information
- Sense of accomplishment
- Electronic OQE
- Automated Info Capture
- Real time status of work
- More time at home

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Tools: Brown Field or Scorched Earth

**2000**
Dassault PLM
Catia V4 AC – Shell Glob Models

**2015**
Teamcenter 9.0.x
NX 8.5 with 4GD

i. Lots of custom drawing only code
ii. All CAD Data was developed as Design Only usage
iii. All Design authored in 4GD not BVR
iv. NO MPP, NO EWI

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**1998**
4.0 execution

**2015**
UniCode Compliant

i. Work Packages
ii. Operations
iii. Material
iv. SAP VE (Right Hemisphere) embedded in our BOM process

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PLM, CAD

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ERP, MRP, MES

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Reports, Metrics, Business Management,

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Mobile Infrastructure

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Processes: New Philosophy for Development

Rules: Driving Philosophies for Data Provisioning and Processes

- **People Focused Only**
- **Author Master Data Once**
- **Digital String** (Config and Change Man)
- **Common** (Processes, Tools, etc.)

- **Reuse** (Hull, Across Hull, Across Platforms)
- **Allow People to Fail Fast**
- **Allow People to Test to break the systems** (find the Limits)

“Desired paths” by Jan-Dirk van der Burg http://www.olifantenpaadjes.nl/
Processes: High Level Construction Boundaries

Design & Engineering

Release Model & Disclosure

Planning

Develop Work Breakdown Structure ➔ Develop Supplemental Information ➔ Release Work Package

Operations

Prepare for Work ➔ Manufacture Parts ➔ Assemble Install Parts ➔ Closeout Work

Processes: High Level Construction Boundaries

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3 Core Product Group

VBM : Visual Build Management
- Management focused
- Work sequencing, coordinating work
- Marries visualization with critical-chain project management

SWiMS : Shipyard Work Integrated Management System
- Foremen-focused
- Single point-of-access to all necessary information

VWI : Visual Work Instructions
- Presentation Based
- Craftsmen-focused
- Digital, 3D interactive replacement for drawings
- Detailed, step-by-step instructions for production
Visual Build Management & Build Strategy
Visual Work Instructions
Visual Work Instructions

- Augmented Reality
- Siemens NX Product Model
- Digitized Drawings

- "How to" Videos
- Laser Scanning / Reality Capture

Visual Work Instructions
Visual Work Instructions in a Nut Shell…

Typical Install Drawing

Product Manufacturing Information

- Part Id Numbers
- Drawing views
- Field joints
- Weld information
- Details
- Compartment numbers
- Structural THKNS/MTL
- Hull Applicability
- Test Boundaries

Product Model

Visual representation of the technical instructions and product manufacturing information.

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Visual Work Instructions

Install Handwheel stowage components and stow on location. Clip and Hangers to be welded 1/8" all around.
Service Order VWI’s

Staging/Scaffolding
Visual Work Instruction Experiences

1000+ VWI's created

200+ Mobile Devices

0 Requests to Return to Drawings
Biggest Company Transitions

- “1930s” All Welded Construction
- “1950s” Nuclear Propulsion for Subs and Carriers
- “1980s” Modular Construction
- “2010s” Digital Shipbuilding