Business Agility 2018 NYC

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GE Stories

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GE – Introduction

➢ **Moving a 125 year old company ...to be a lean startup!**

➢ **Monetizing Industrial through Digital**

➢ **Leveraging Agile in non-traditional spaces with 2 stories:**

  ▪ **Oil & Gas: Subsea Controls**
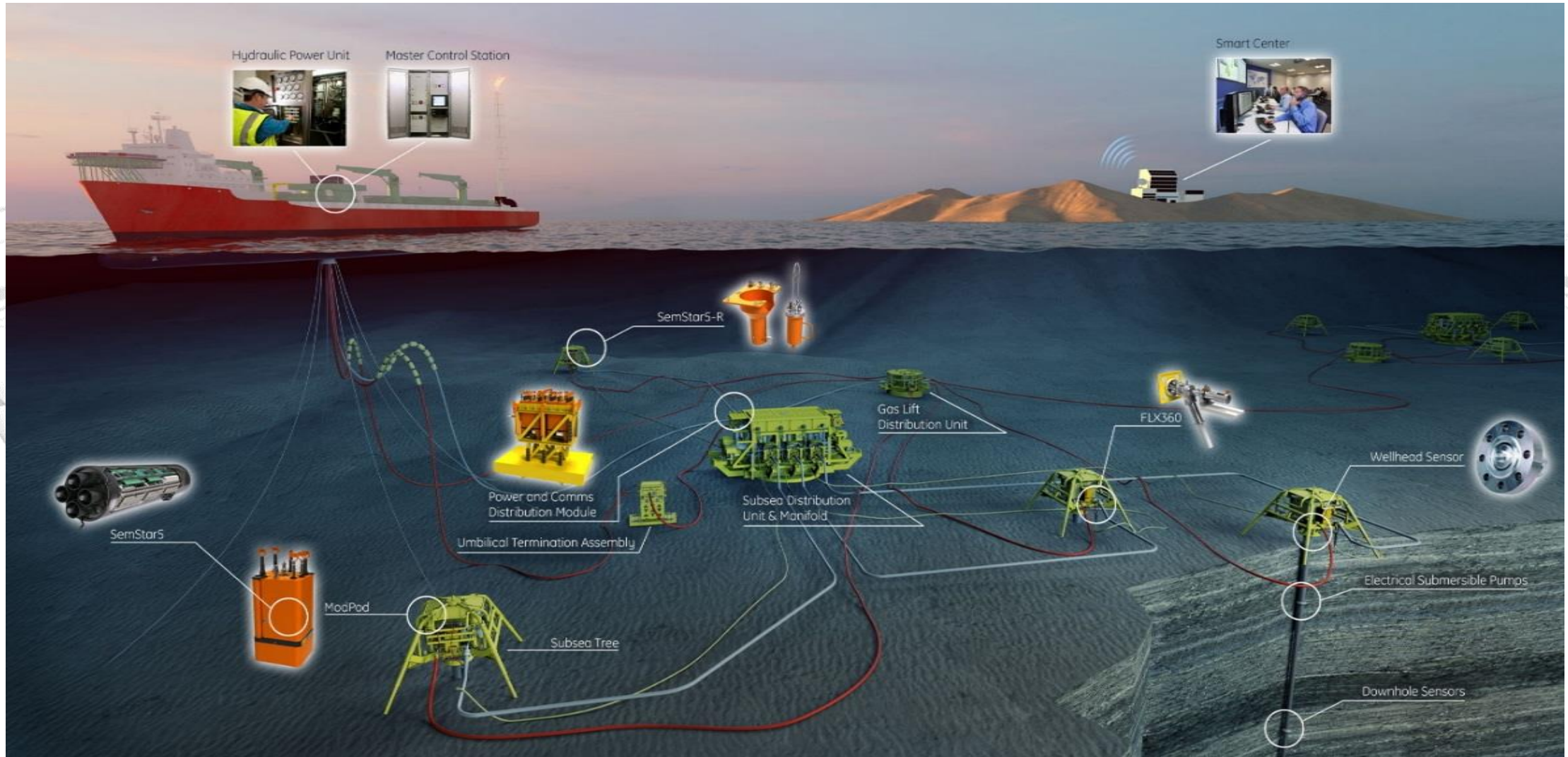
  ▪ **Additive Manufacturing**

Oil & Gas Subsea Controls Landscape

https://www.youtube.com/watch?v=uvL2lVtf2bs

Oil & Gas Subsea Controls Landscape

Typical Subsea Field – GE scope of supply

Oil & Gas Subsea Controls: Before Agile

- ➢ Waterfall execution: 2-10 year projects

- ➢ **Critical path** to "First Oil" revenue milestone

- ➢ Major issues discovered at Factory Acceptance Test (FAT/EFAT)

- ➢ HW and Device/SW integration late in the cycle @ EFAT – **many delays**

- ➢ Lack of visibility for software progress and quality

- ➢ **Guarded customer interactions**

Oil & Gas Subsea Controls: Agile as a Learning Engine

➢ Deployed Agile as a learning, execution & continuous improvement engine

➢ Coached **110+ people and 360 degrees** around SW teams on Agile

➢ Coached the customer team on Agile for feedback

➢ Created and invested in **DevOps environment** and procedures

➢ Focused on developing and testing stories in **vertical slivers**

➢ Regular **customer touchpoints** with demos of software

➢ Persisted through executive leadership changes and challenges

HMI

Topside PLC, Surface Modem &
Subsea Gateway Test Setup

Subsea Electronics

Rotary Valve

Choke

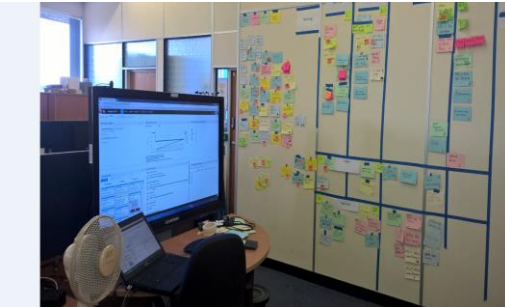Multi Phase Flow Meter (MPFM)

Acoustic Sand Detectors (ASD)

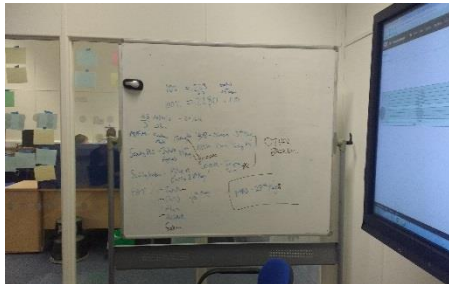**End to End Vertical Testing**

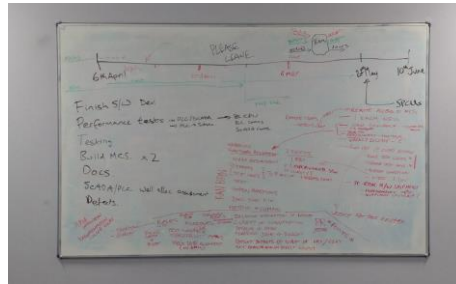# Oil & Gas Subsea Controls: Agile as an Execution Engine
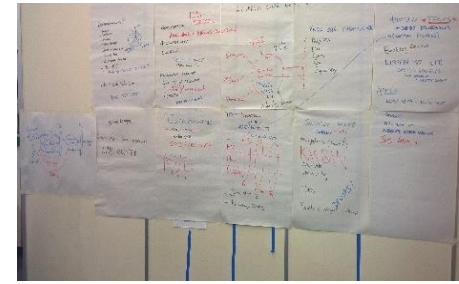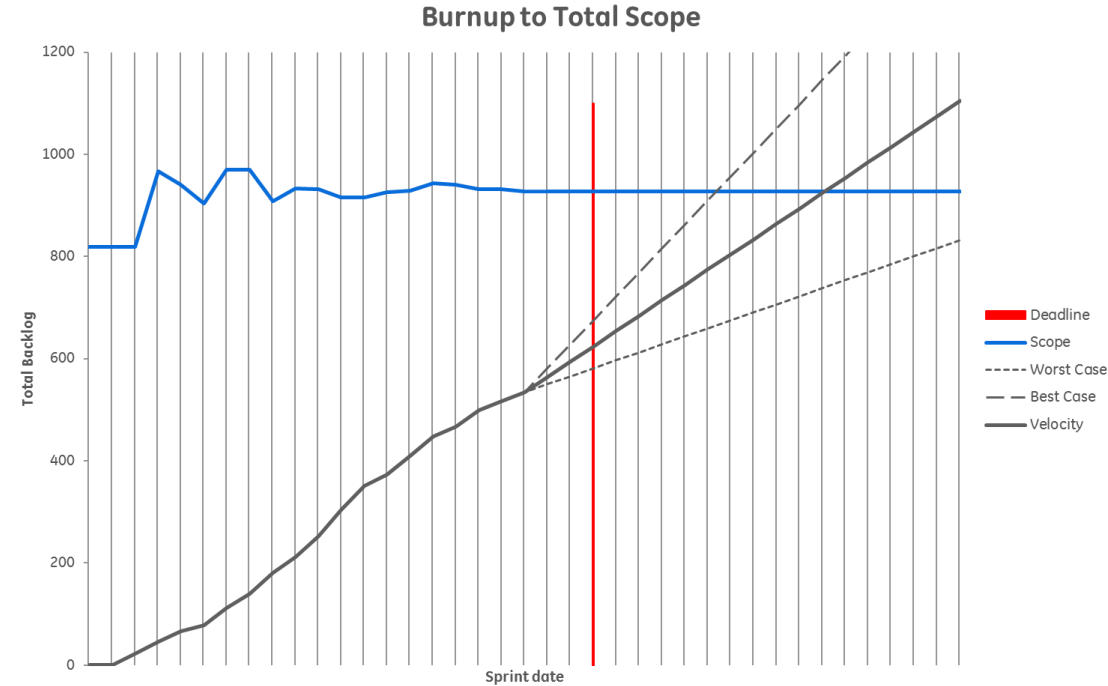

Scrum wall @ sprint 1


Scrum Area

Scrum Area

Improvement Ideas by Team

Team Brainstorming

Burnup to Total Scope

Transparency!

Legend:
- Deadline
- Scope
- Worst Case
- Best Case
- Velocity

Product Backlog

- Plan: +722 Story Points (+53 Items)
  - μ: 13.6 Story Points (~ 7x of sprint 5)
  - σ: 15.4 Story Points (~ 11x of sprint 5)
  - Average item is > 3x too big for a sprint
  - Only 23 items are small enough
  - The other 30 items will likely become at least 158 items after refinement and slicing
- Blocked:
  - 39% of backlog (282/722sp)
  - Includes 1/3 biggest items (64sp)
  - Includes 4/5 next biggest items (32sp)
  - Some may already be past "last responsible moment"
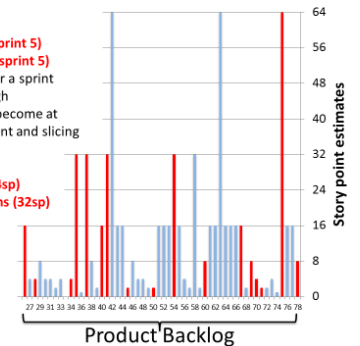
Analysis of Backlog

Oil & Gas Subsea Controls: Outcomes

> **Delivered on "First Oil" milestone"…+ revenue!**

> Great grassroots acceptance of Agile in SW (and even HW groups!)

> **Decreased defects during dev cycle**

> De-risked E-FAT project schedule by **6 months on** Multi Phase Flow Meter

> Lost a few battles to <u>win the war</u> (first oil) in the end

Test Setup Toside

Test Setup Subsea

GE Additive

Example: 3D Printed Nozzle (GE Aviation)
- Novel design rules
- Major part consolidation
- Stronger & 25+% lighter
- Just-in-time manufacturing
- Supply chain simplification

GE Additive

https://www.youtube.com/watch?v=ugRZhFZLm1c

About GE & Additive Manufacturing

> **450 global factories**

> **Personas in Additive:**
> ...as a user
> ...as a manufacturer
> ...as a vendor

> **Great freedom of design vs. limitations of subtractive manufacturing**

> **Significant compute required for modeling, simulation, & analytics**

Additive's Engineering Disciplines

Technical Engineering Disciplines/Capabilities:	
Aerodynamics	Thermodynamics
Mechanical	Structural
Chemical	Physical Materials
Embedded controls	Computer Vision & Image Analytics
Optical and Laser	Computer & Data Science

... & many more

Vrinda & Tyler

Sprint Planning
Standups
Sprint Reviews
Retrospectives

Micromanagement
Lots of meetings
Every 9 days?
Psychology sessions

Experimenting with Scrum: Flashworks & Spikes

Next steps: Scaling across 6+ Additive research teams

Agile in the Digital Industrial Space: Summary

Successes

- Leverage 'Agilistas' at all levels

- Teach (Learn) by doing....grassroots

- Train & pair across disciplines

- **Experiment**...even with HOW you work

Improvement Opportunities

- Train executive leadership in the 'why'

- Prevent leaders from becoming the Velocity Police

- Creating an organization around Agile in traditional domains

- **Recognize & celebrate** Agile's successes even when others perceive negativity (e.g., issue transparency)