



# **Business Agility 2018**

## **NYC**

March 15<sup>th</sup> 2018

### ***GE Stories***

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*GE Global Research*

# 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**

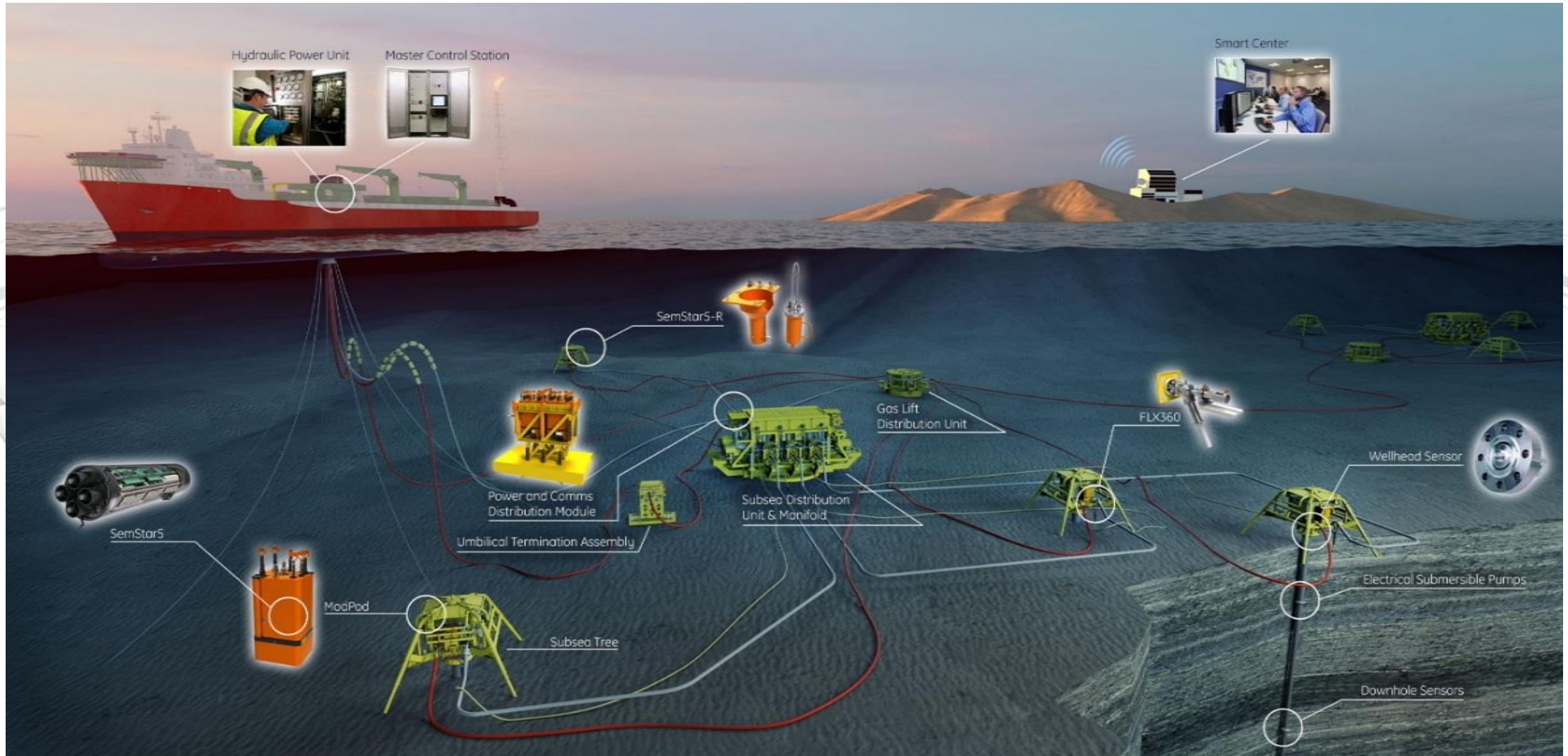


# Oil & Gas Subsea Controls Landscape

<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**

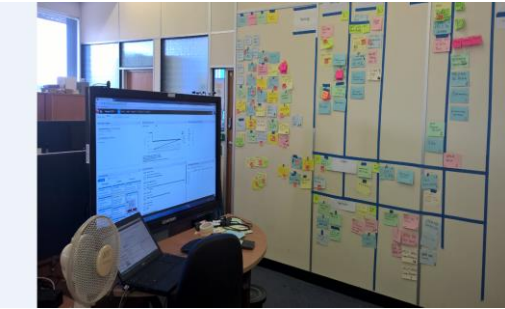




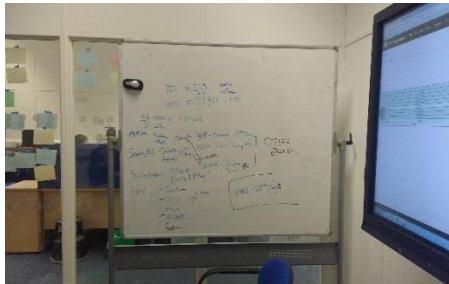
# Oil & Gas Subsea Controls: Agile as an Execution Engine



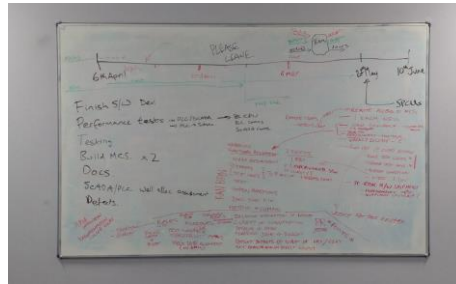
Scrum wall @ sprint 1



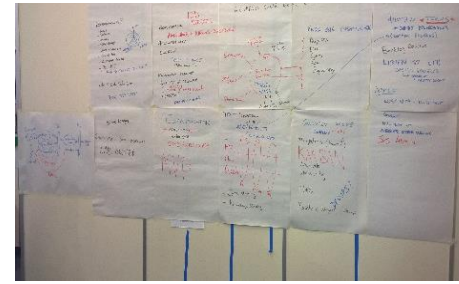
Scrum Area



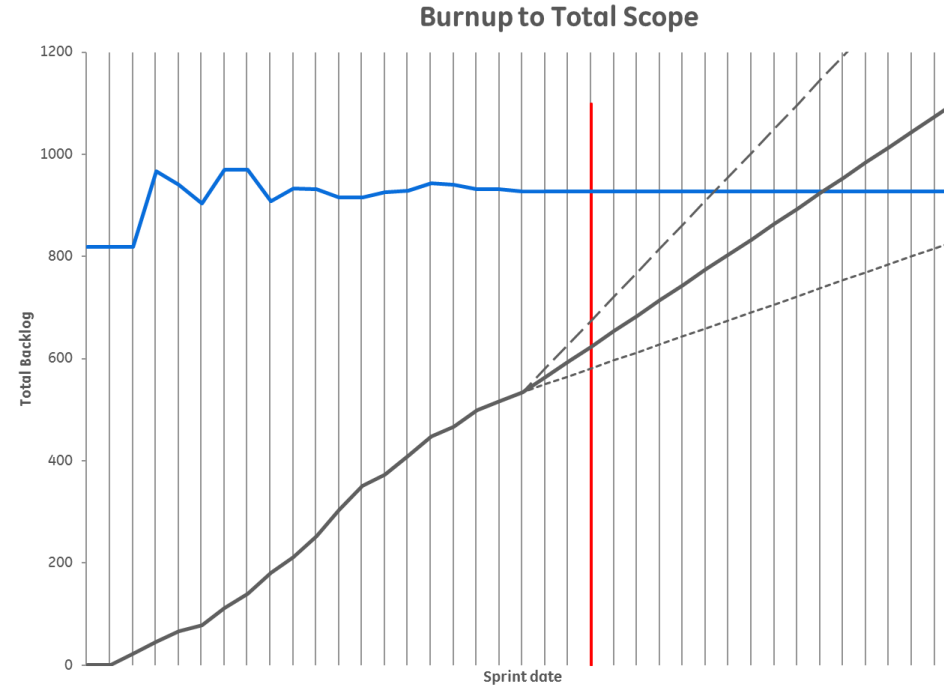
Scrum Area



Improvement Ideas by Team



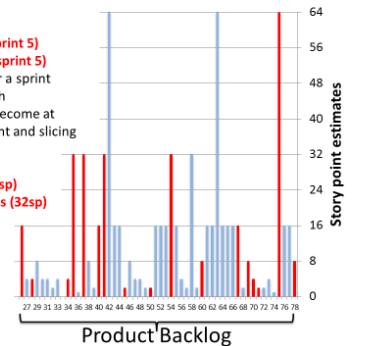
Team Brainstorming



Transparency!

## 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 win the war (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)

