

um
2026

Making Complexity Invisible: Accelerating Value Creation Across the Engineering Lifecycle

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SLB Enabling Technology Development



Agenda

SLB

100 years of innovation

1. Telemachus: M&S Engineer

Navigating complexity

2. Odysseus: Client – Project engineer

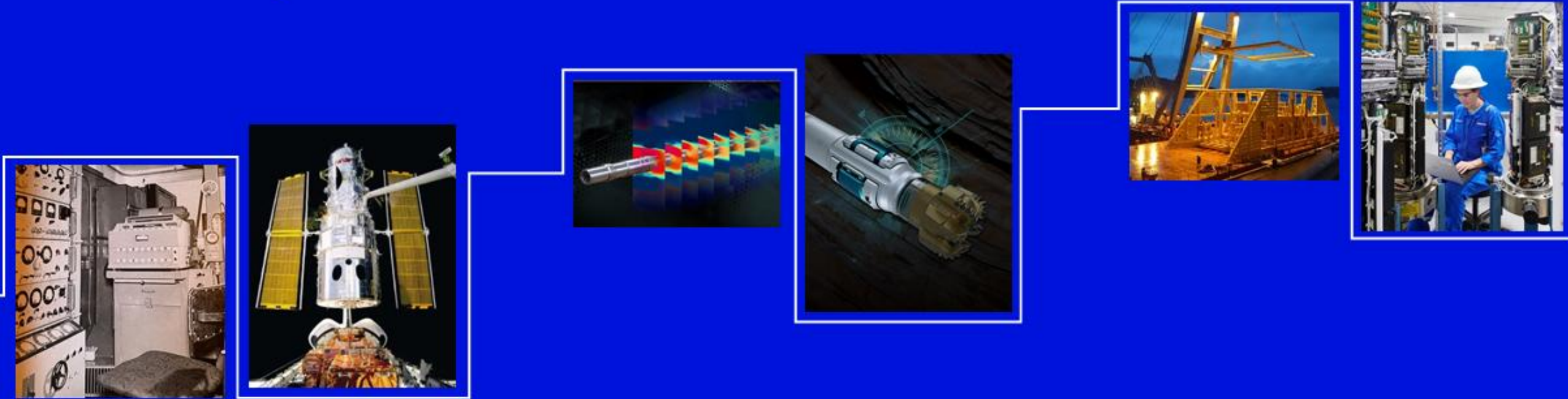
Accelerating value

3. Penelope: M&S Manager

Weaving coherence

SLB – 100 years of Driving Energy Innovation

Outstanding
History of Innovation

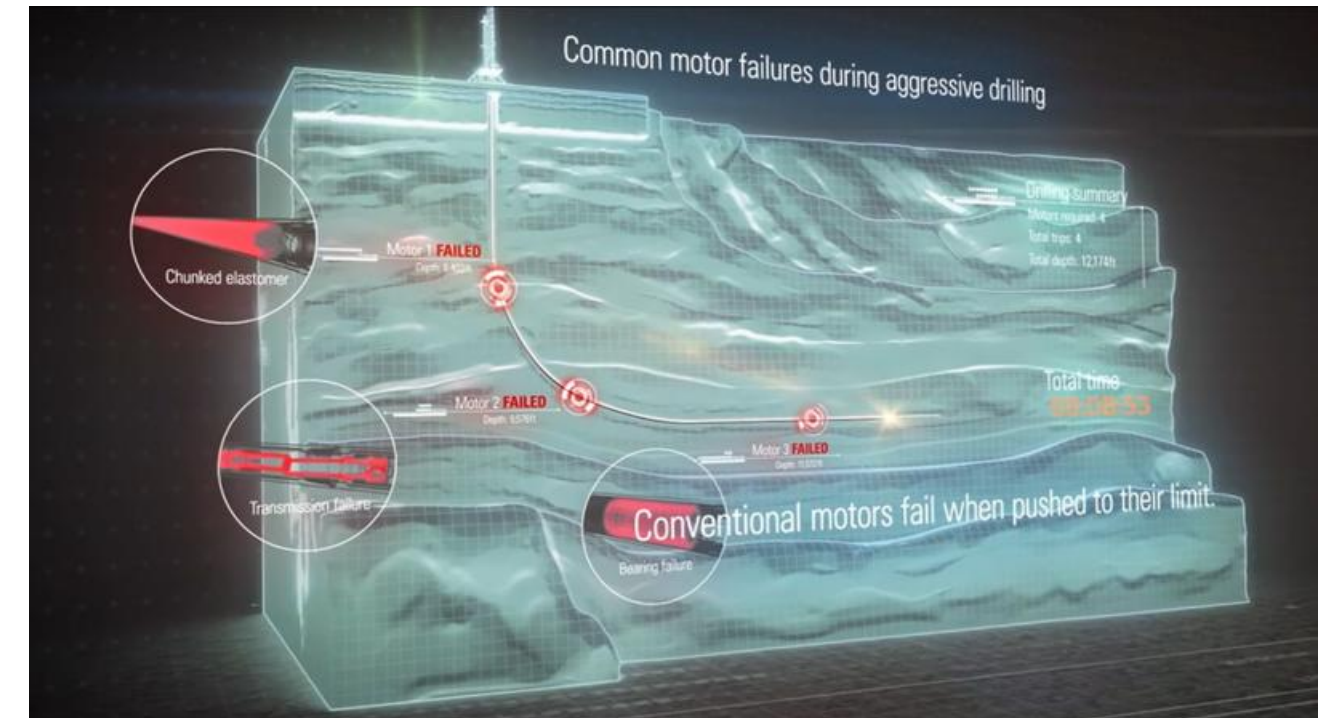
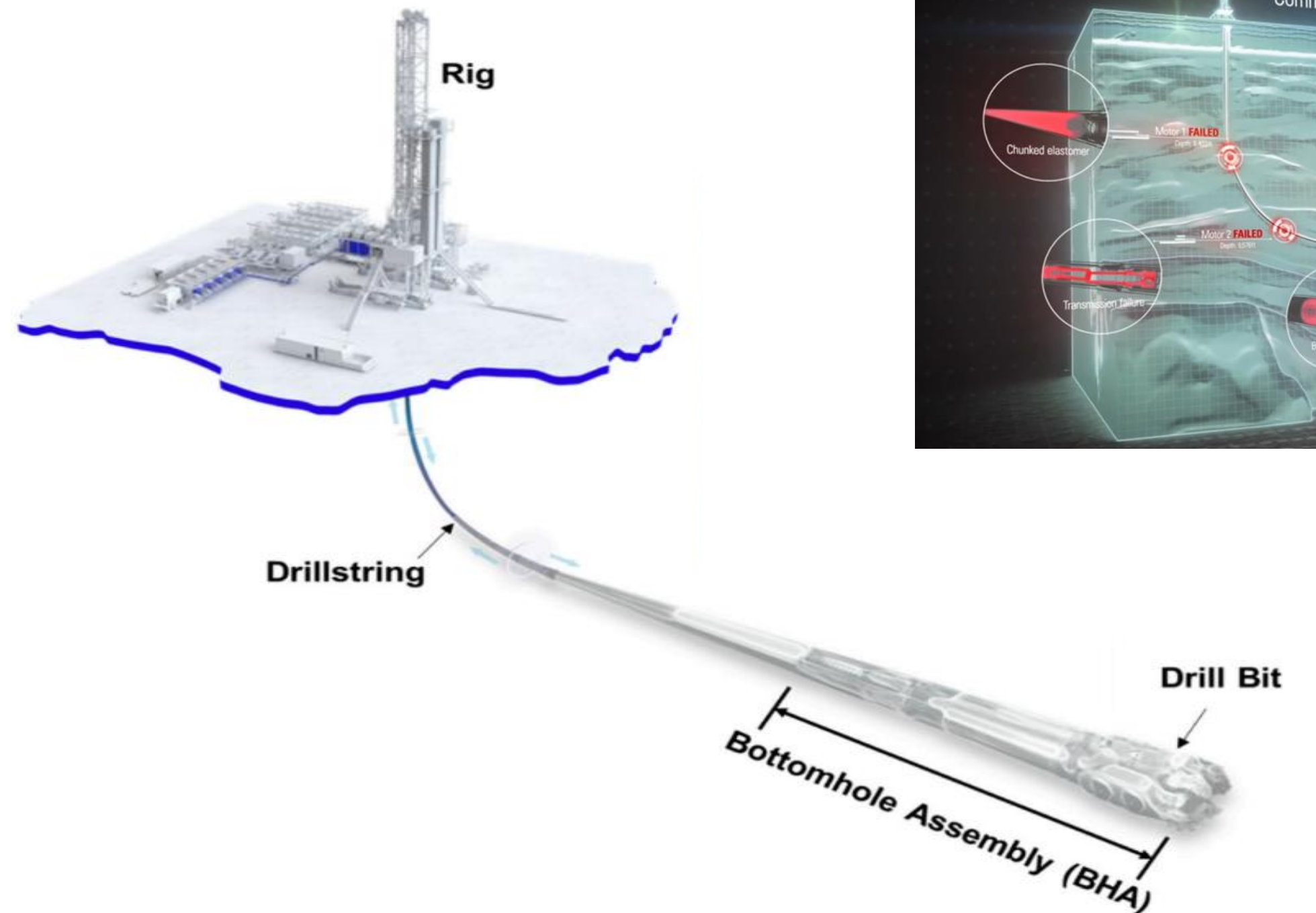


<https://investorcenter.slb.com/static-files/1d61acaf-5501-4778-bab5-3c9e29db72dd>

Why complexity?

Temperature
Pressure
Dogleg Severity
Torque
Shock & Vibrations
ROP
Flow rate

Data channel
Remaining life



Reference: slb.com

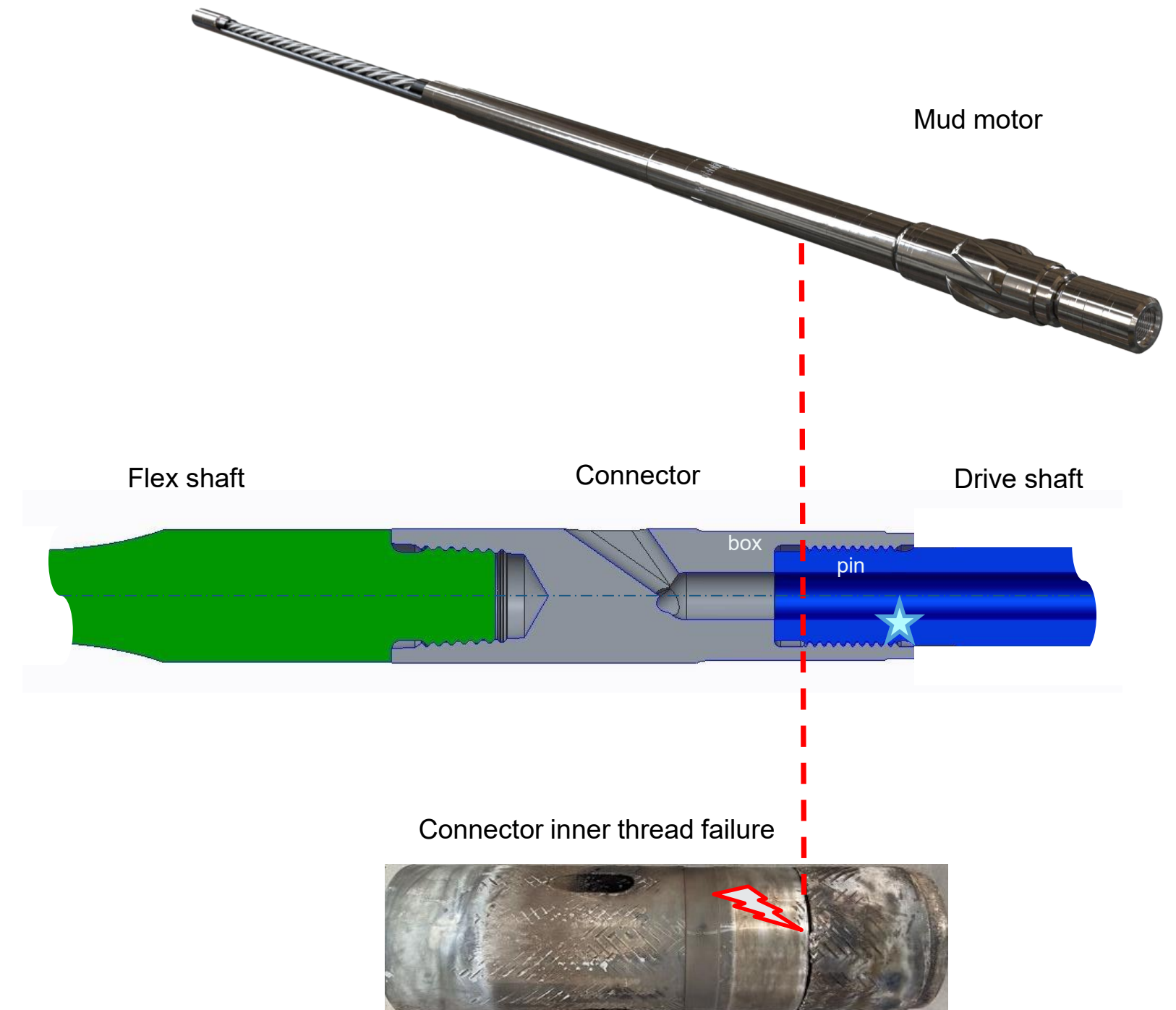
Telemachus – Navigating complexity

Context:

- SLB is known for outstanding reliability.
- Clients push SLB tools beyond specifications.

Use case:

- Couple mud motors experienced fatigue failures at the connector flex shaft – drive shaft.
- Discrepancies between 2D simulations (pin) and field failures (box)



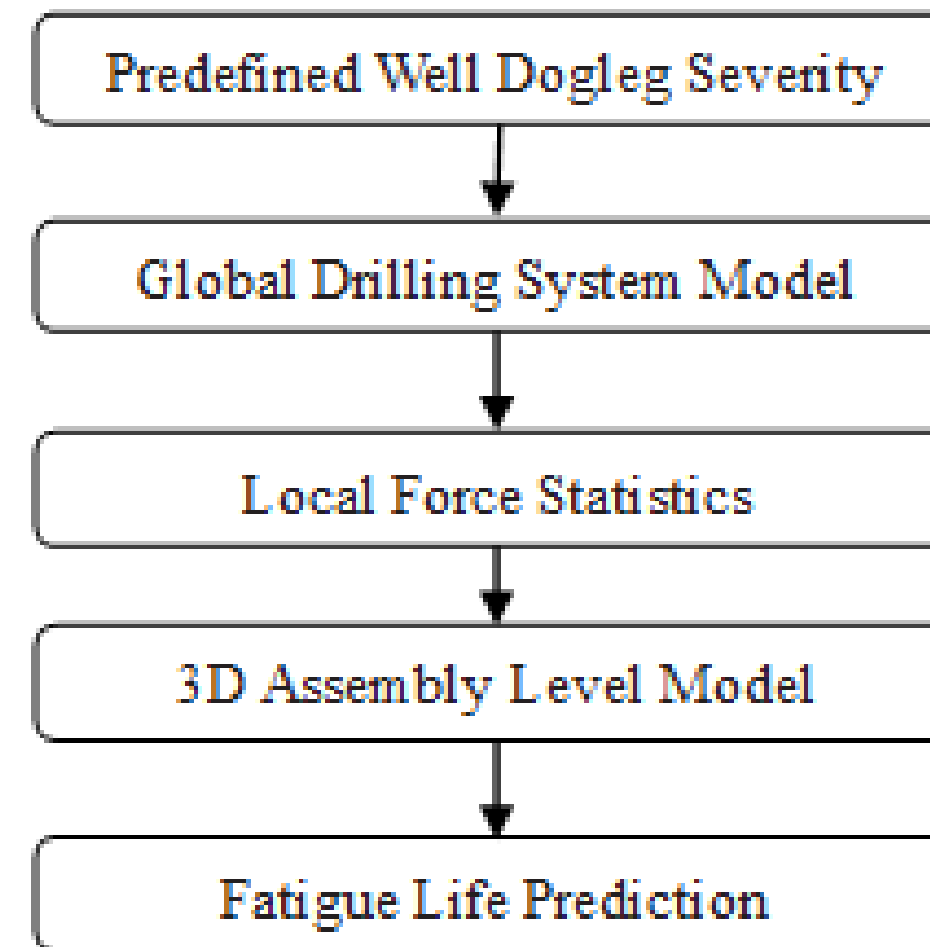
Telemachus – Navigating complexity

Cause:

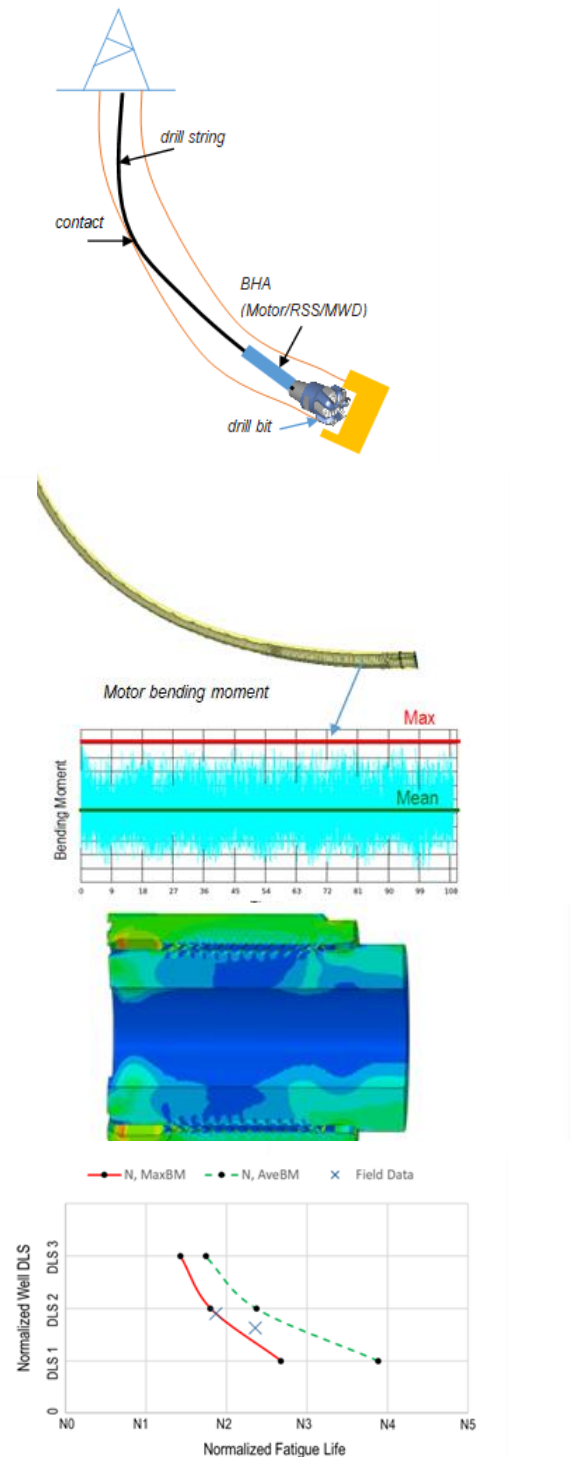
- Over-simplification in first pass simulation

Solution: Multiscale System Modeling

1. Baseline (2D, partial physics)
2. 3D Modeling with Housing
3. Boundary Condition Sensitivity (eccentric + fatigue loading)
4. Fully Integrated Workflow (Global DSM + FEA)
 - Global DSM drilling dynamics outputs (Dogleg severity / bending moment along the assembly)
 - High-fidelity FEA models (Abaqus)
 - Fatigue life prediction (Coffin-Manson approach)



Fully integrated workflow
of the multiscale method.



Telemachus – Navigating complexity

Impact:

Cost reduction:

- Fewer repeated studies (4 reports consolidated into 1 workflow)
- Reduced modeling and post-processing effort (**50% reduction** of model preparation efforts)

Faster decision-making:

- Direct mapping from field conditions (DLS) to fatigue life
- Rapid sensitivity studies (spacer, loads, boundary conditions)

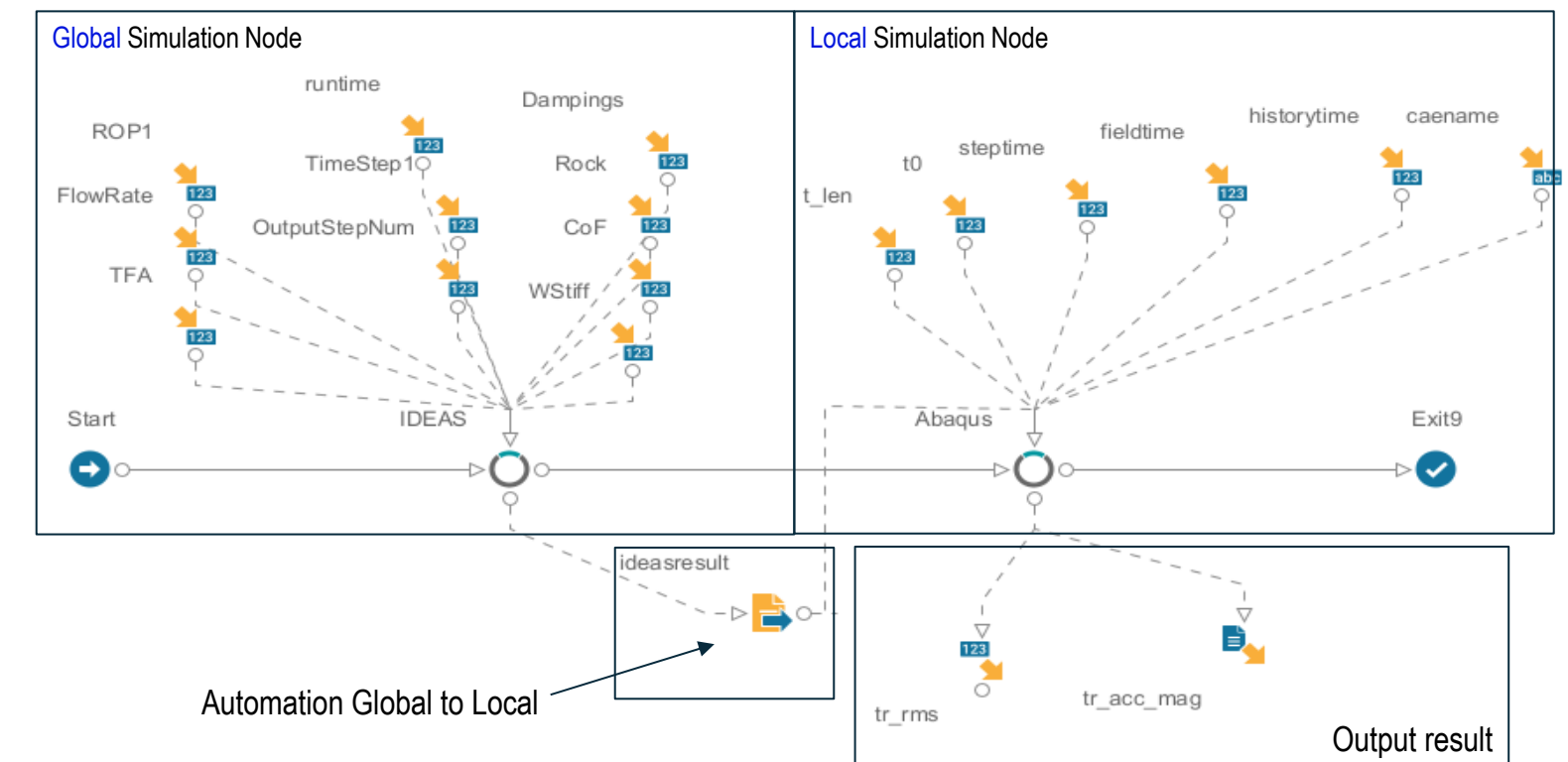
Improved prediction accuracy:

- Alignment with field failure trends
- Better identification of true failure drivers

Scalability:

- Method reusable for other tools, components, and system configurations

Improve prediction accuracy while enabling automation and model reuse across analyses



Create opportunity for reuse of validated models across projects

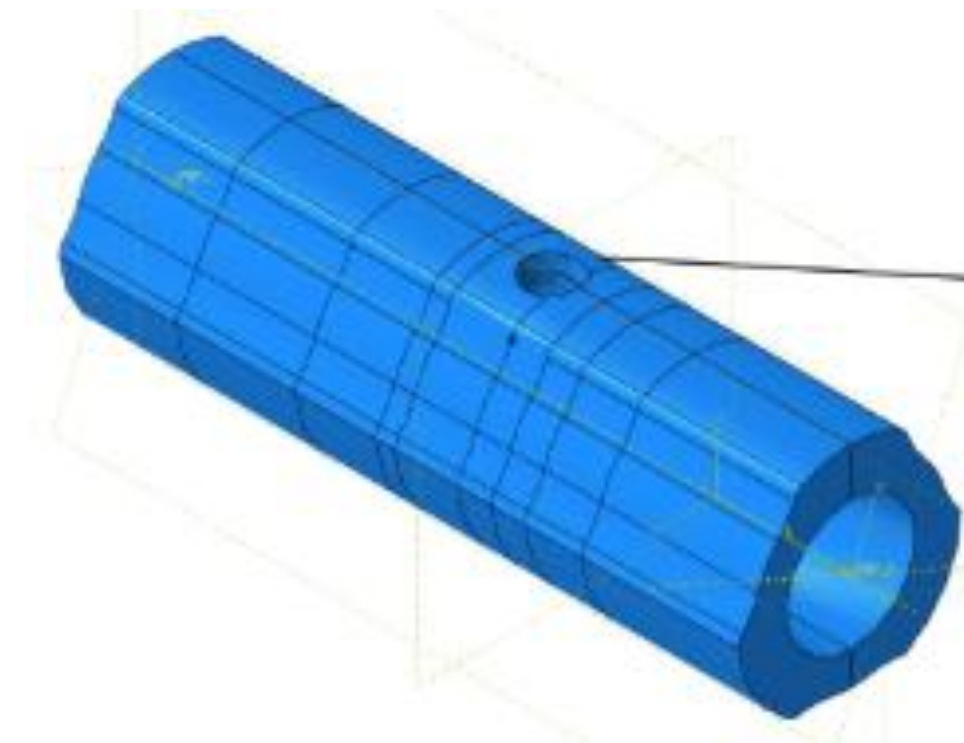
Odysseus - Accelerating value

Context:

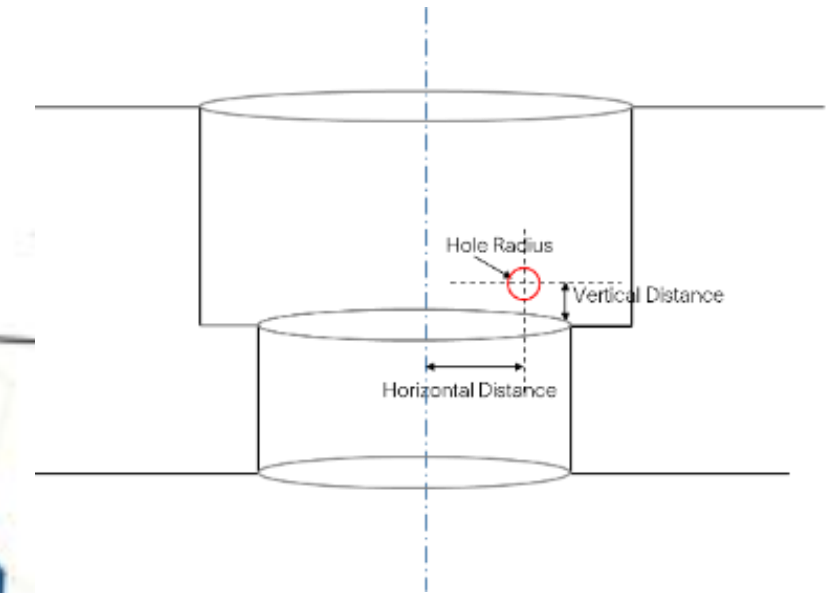
- Cross-drilled ports in drill collars are used for measurement and are major fatigue-critical features.

Use case:

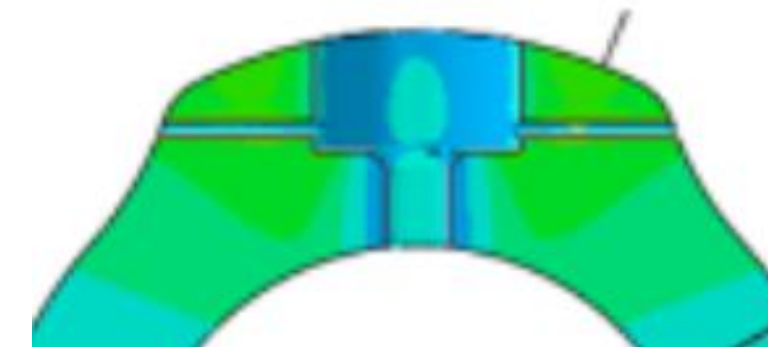
- Design engineer needs quick trade off insights for location and size, while ensuring fatigue survival.



Drill collar



Representation of geometric parameters for cross-drilled port optimization



Cross section of drill collar

Odysseus - Accelerating value

Cause:

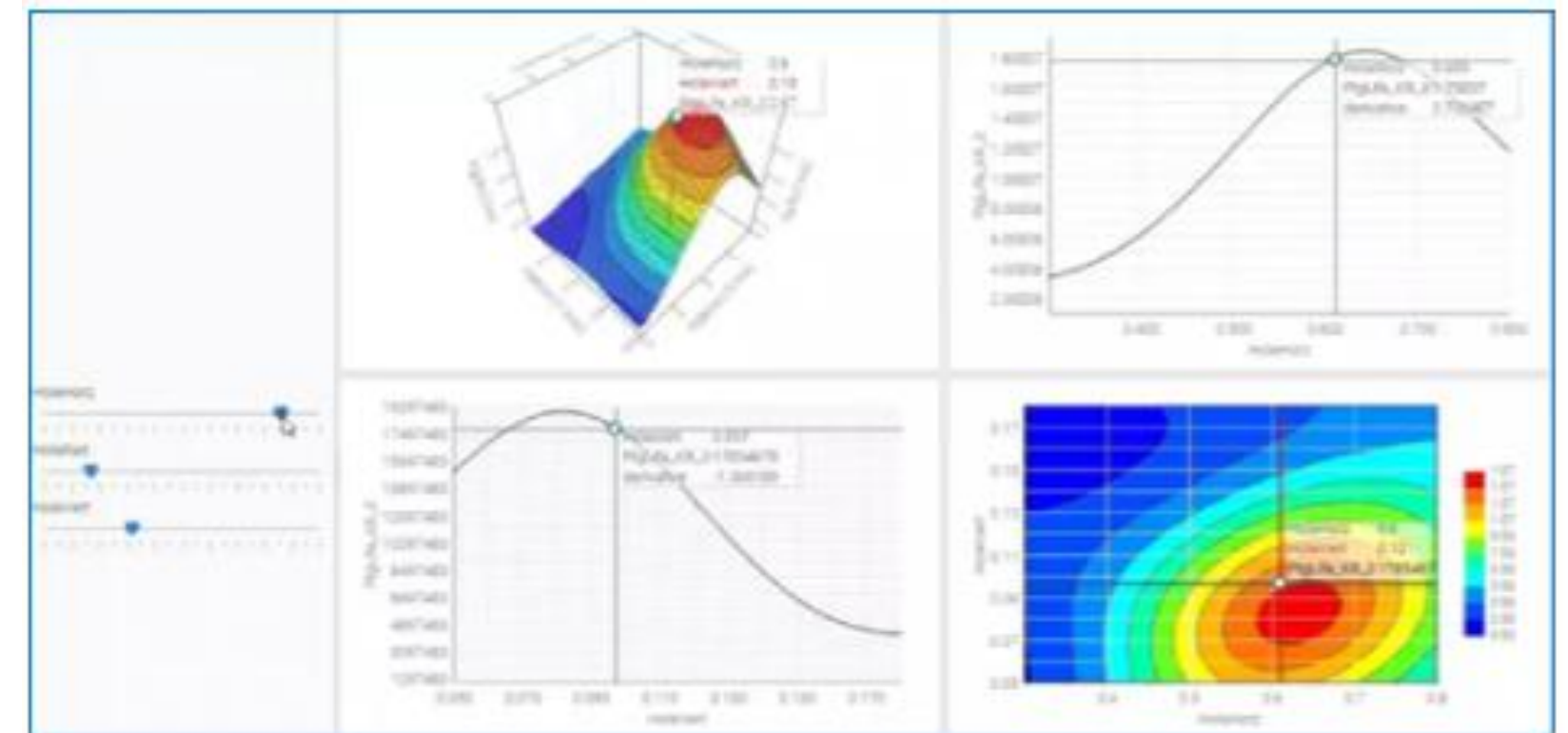
- Response time too long with “Analyst in the loop”

Solution:

- Analyst combines high-fidelity FEA,
- Surrogate modeling (RSM)
- multiaxial fatigue verification.
- Set up self service interface with optimization variables: hole radius, vertical offset, and horizontal offset

Impact:

- Workflow improves tool reliability and survivability by guiding project engineer selection.



Optimizing remaining life - fct (hole radius, vertical, horizontal)

Penelope - Weaving coherence

Cost reduction:

- Telemachus work led to 5 more analysis
- Reduced cost by **10X**

Faster decision-making:

- Work led to creation of ROM with **1s response time**

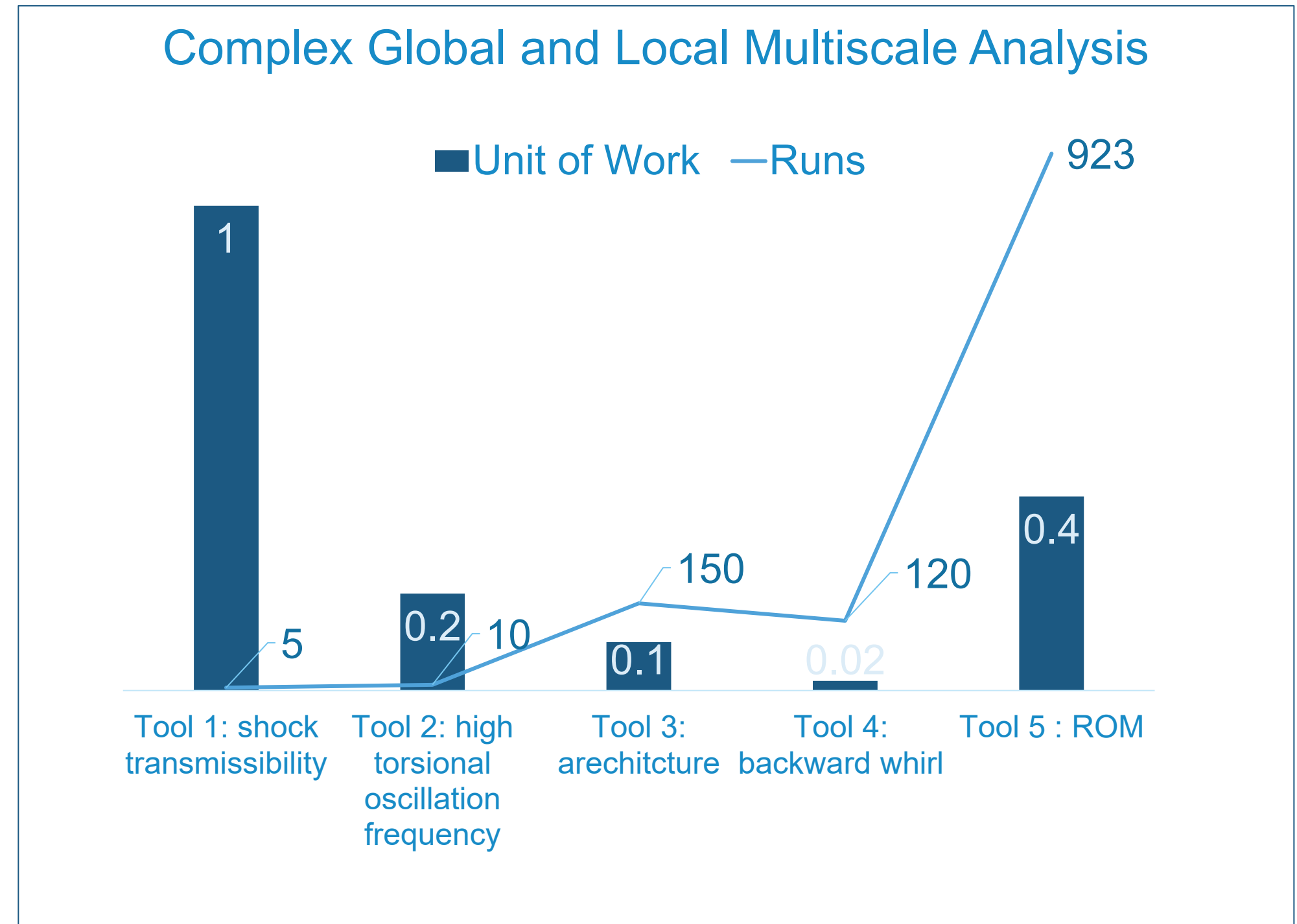
Improved prediction accuracy:

- RMS Error reduced

Scalability and democratization:

- 30% of Model Reusable by M&S Engineers
- >600 Runbox usage in 2026-H1 of different ROMs

runbox



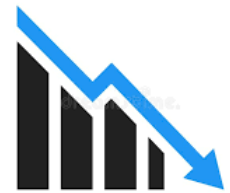
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Reduce Simulations
Turn Around Time



Decrease Cost



Remove Human
Error



Improve
Quality

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Thank you

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