Optimizing Oil & Gas Field Development with AI

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Why Optimize Field Development?

Rising costs and stricter regulations increase complexity

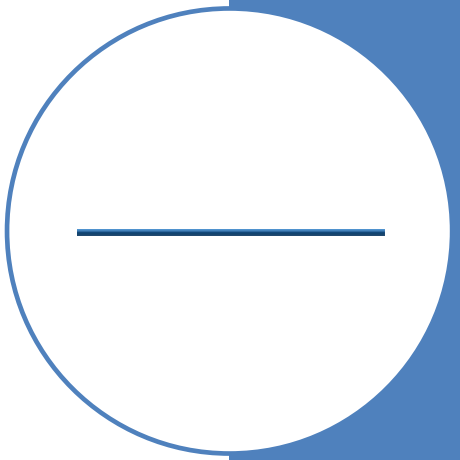
High CAPEX investments – drilling, subsea, infrastructure

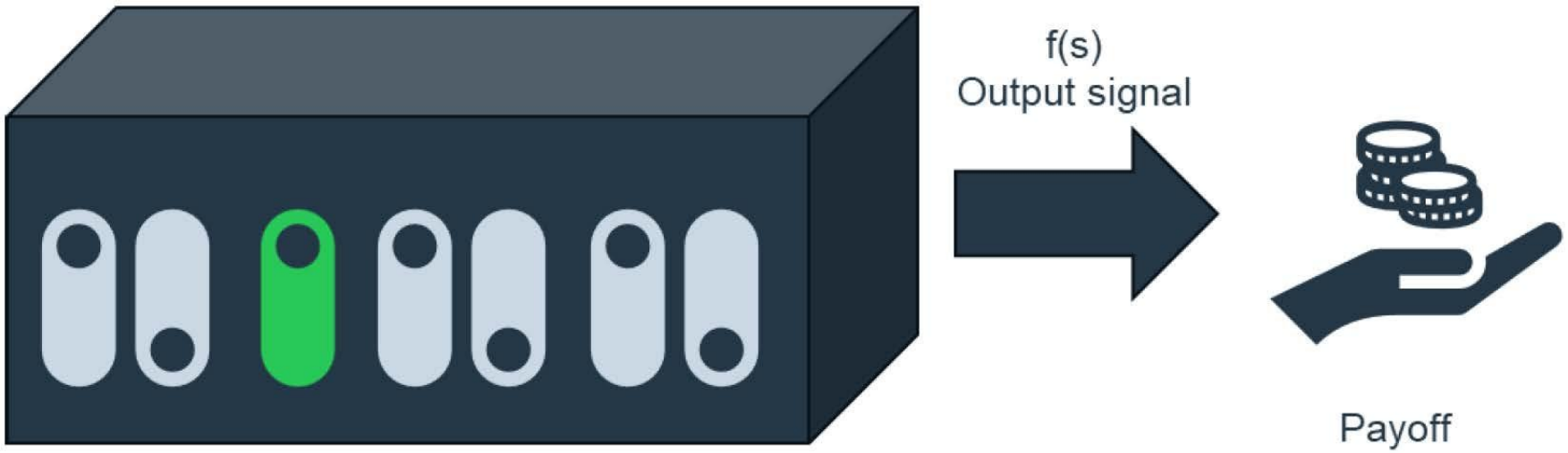
Manual planning methods are slow and siloed

Need for faster, data-driven decisions

What is the AIM Methodology?

- AI for Maturation (AIM) – Optimization Framework
- Uses AI & optimization to evaluate thousands of layouts
- Supports cross-disciplinary decision-making
- Human-in-the-loop ensures practical results



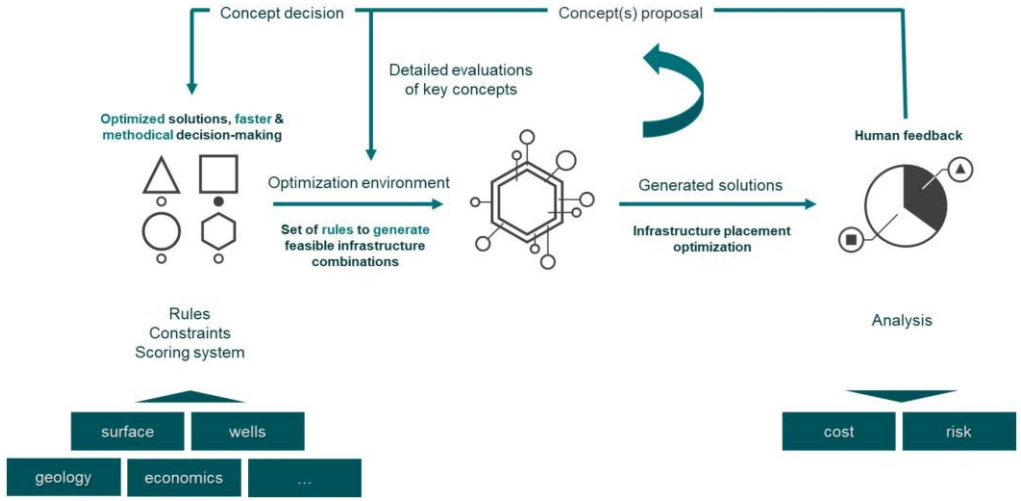


How AIM Works

- 1. Input field data, rules, constraints
- 2. Generate well trajectories using Evolutionary Algorithms
- 3. Optimize seabed infrastructure with MILP
- 4. Evaluate cost-risk trade-offs using Pareto fronts

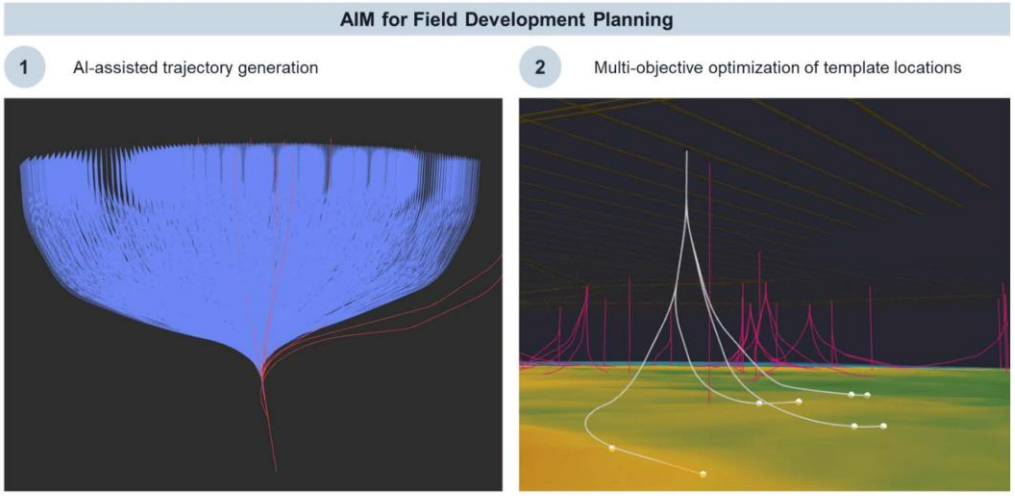
AI-Driven Trajectory Design

- Uses Genetic Algorithms (GA) for well path generation
- Considers constraints like geology, anti-collision, inclination
- Refines solutions over generations for optimal results



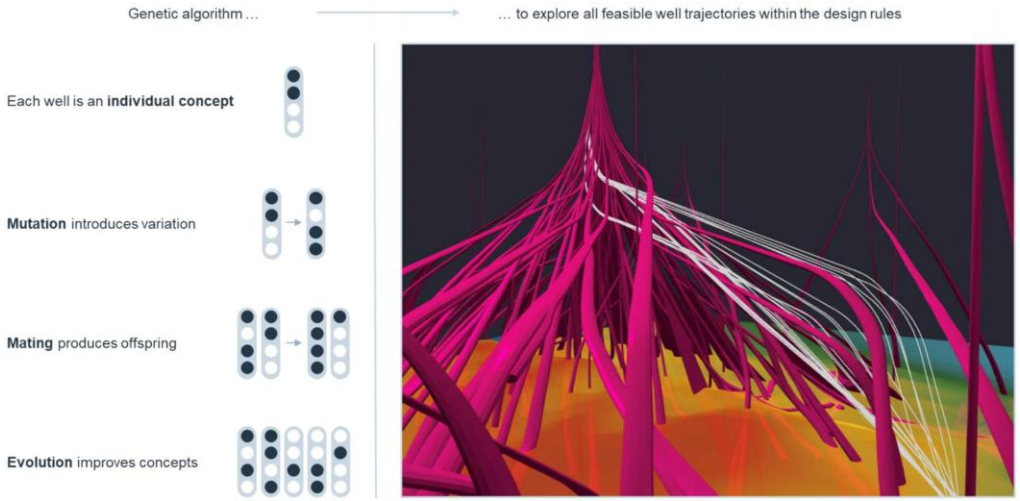
Optimizing Seabed Infrastructure

- MILP used to place templates and pipelines
- Balances template cost vs. well complexity
- Avoids seabed hazards, routing constraints
- Presents cost-risk Pareto optimal options



Case Study: Johan Sverdrup - Phase 3

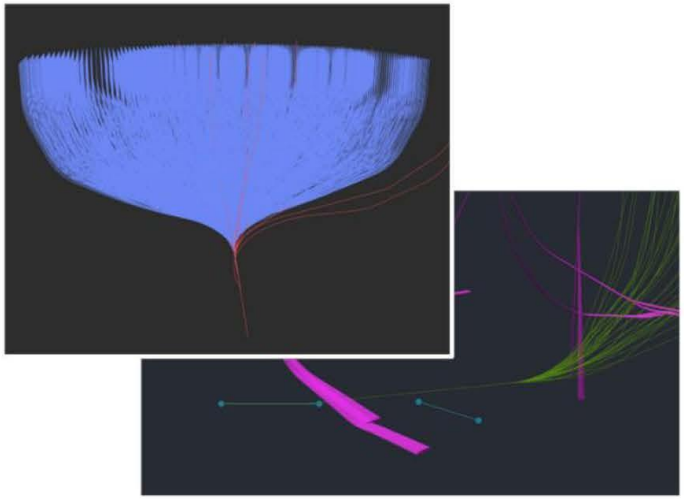
- Applied AIM to optimize Phase 3 development plan
- Inputs from previous phases, physical models, constraints
- Rapid concept screening under tight timelines
- Generated multiple layouts for evaluation

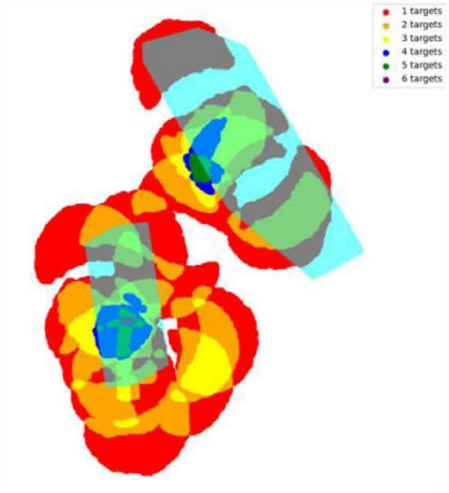


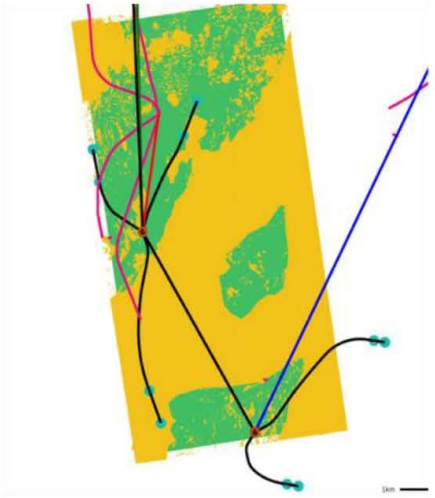
For each target, the algorithm in AIM generates all possible well paths within the engineering and anti-collision rules while avoiding subsurface anomalies

Multiple targets are combined from a single template where the "seabed spreads" of the trajectories overlap

Following the optimization of template locations using the MILP solver, Pareto-optimal cases are identified within the cost-risk space





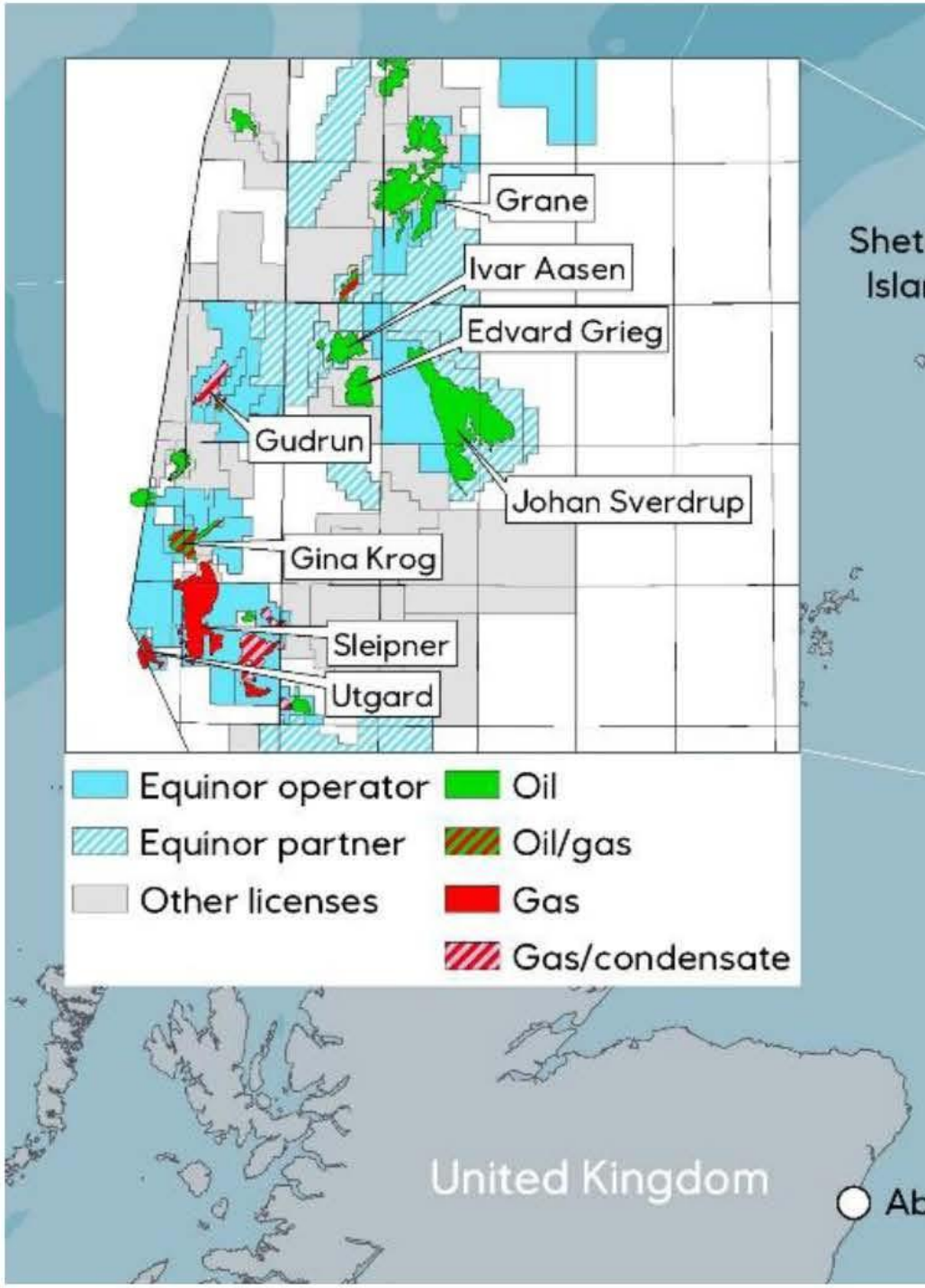


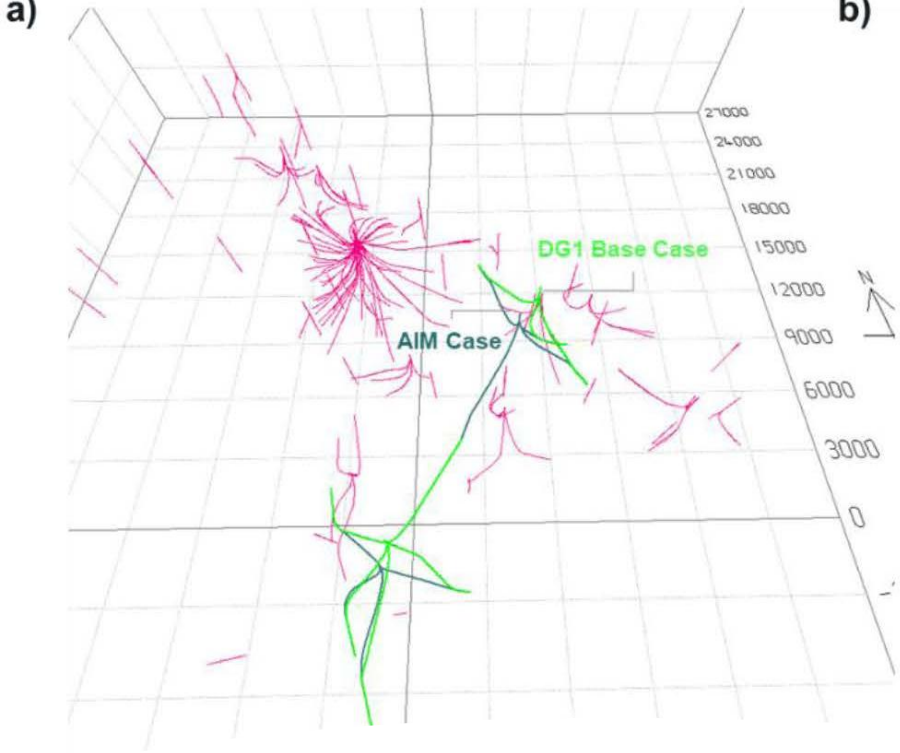
Insights from Data Analysis

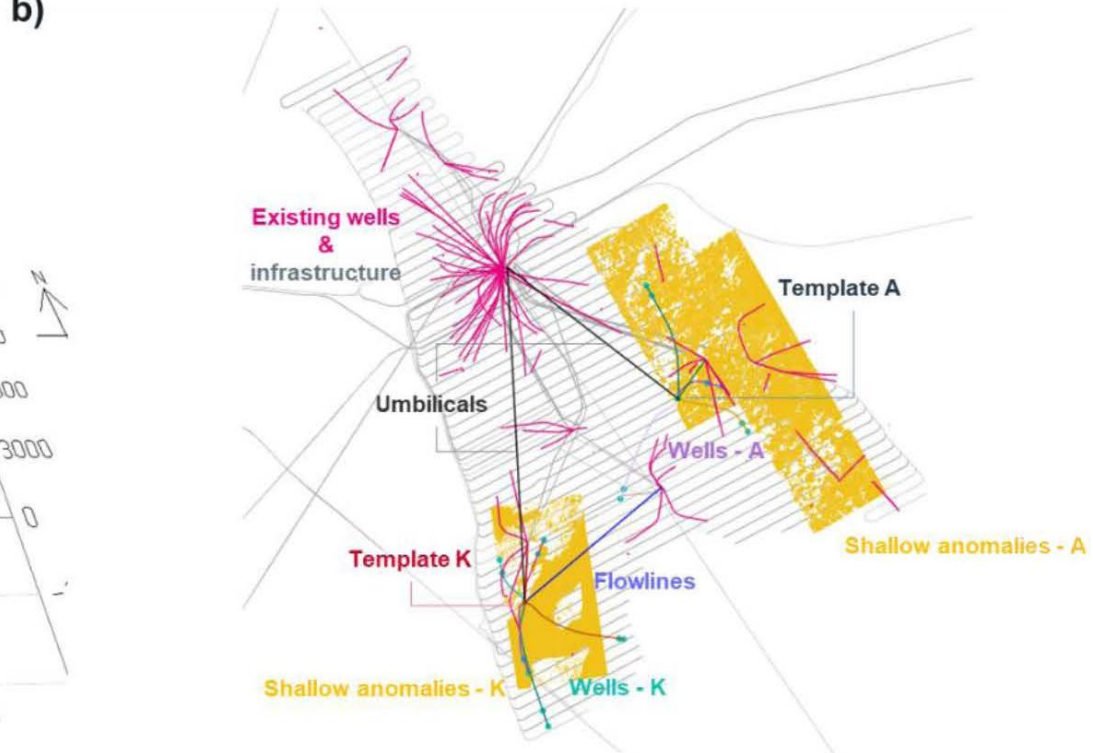
- Fewer, larger templates = lower CAPEX
- Long step-out wells reduced need for templates
- SURF cost more influential than well cost
- Enabled fast comparison across scenarios

Before vs. After AIM

- Manual layout: 5 templates, higher SURF cost
- AIM layout: 2 templates, longer wells, cost savings
- Identified new template position for better recovery
- Enhanced flowline capacity and reduced rig moves







Benefits of AI in FDP

- Faster scenario evaluation and feedback
- Reduced engineering hours
- Data-backed decision making
- Cross-functional alignment on design options

Future Directions

Conclusion

AIM enables smarter, faster field development decisions

Improves collaboration and concept robustness

Proven to enhance value in Johan Sverdrup Phase 3

Replicable for other offshore field developments