



INDUSTRIAL AI THROUGH THE DDD LENS |

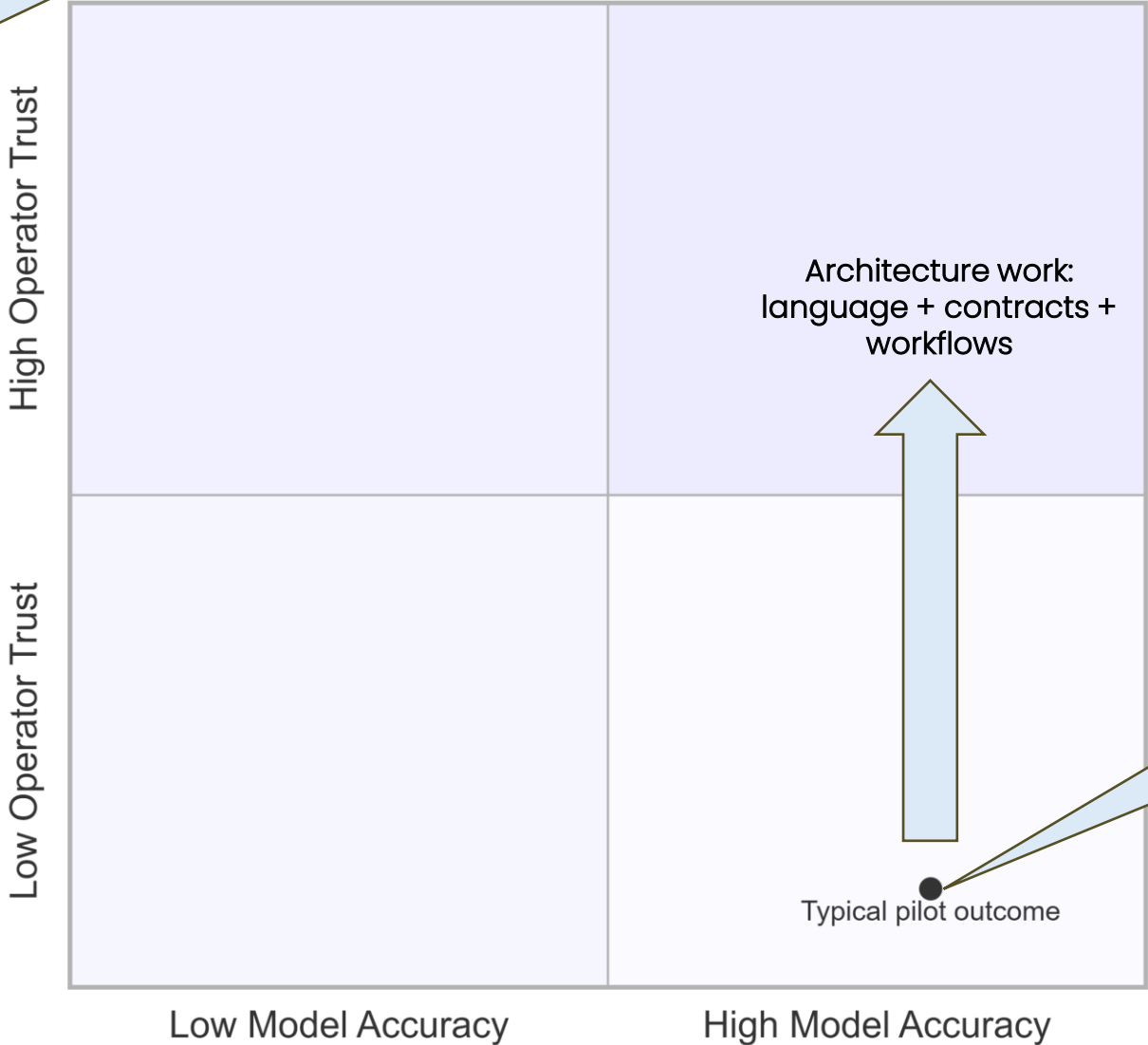
Turning Black-Box Models into Shopfloor-Ready Systems

by Dr. Nikita Golovko, Siemens AG.

THE ACCURACY-TRUST GAP

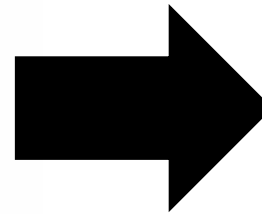
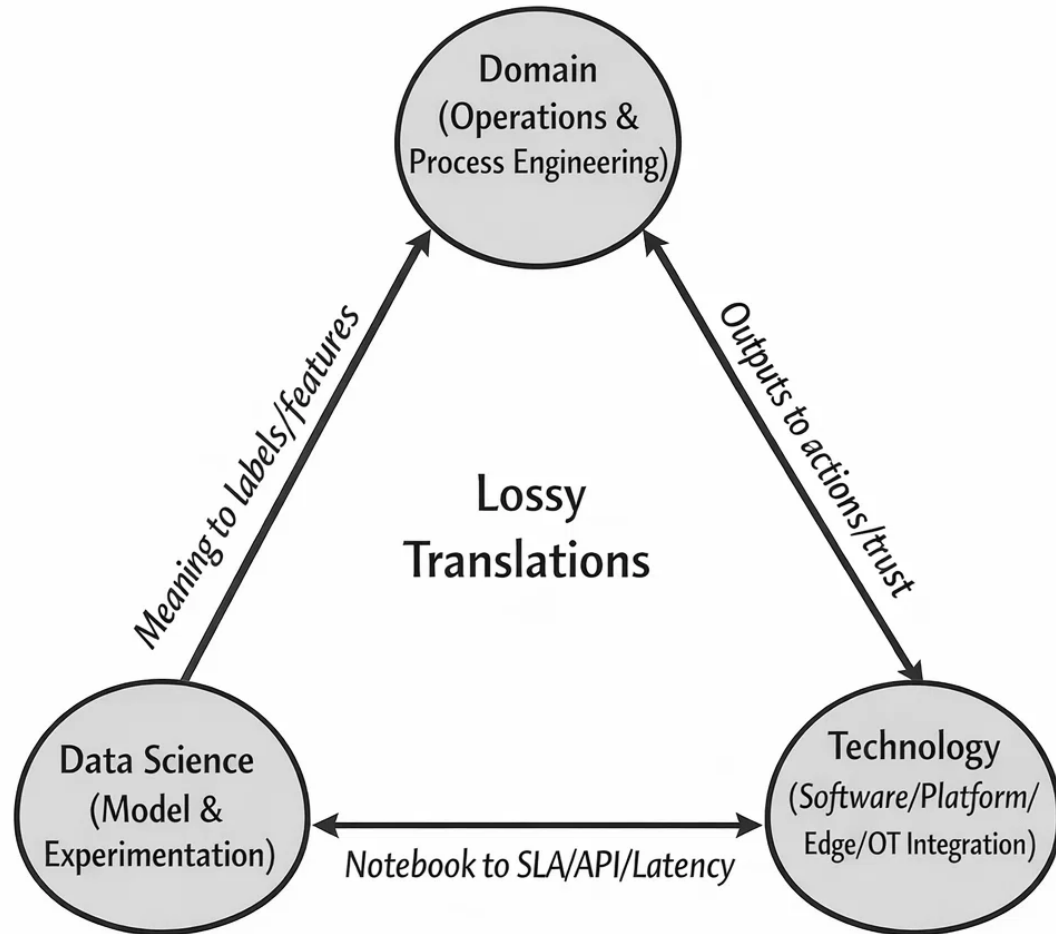
Accuracy vs Trust (Production Adoption)

Accuracy is a model metric. Trust is a system property...
And factories run on trust.



Not because the model is "bad", but because the **system around the model** is missing what the shop floor needs

THE REAL PROBLEM: THREE WORLDS, NO SHARED LANGUAGE

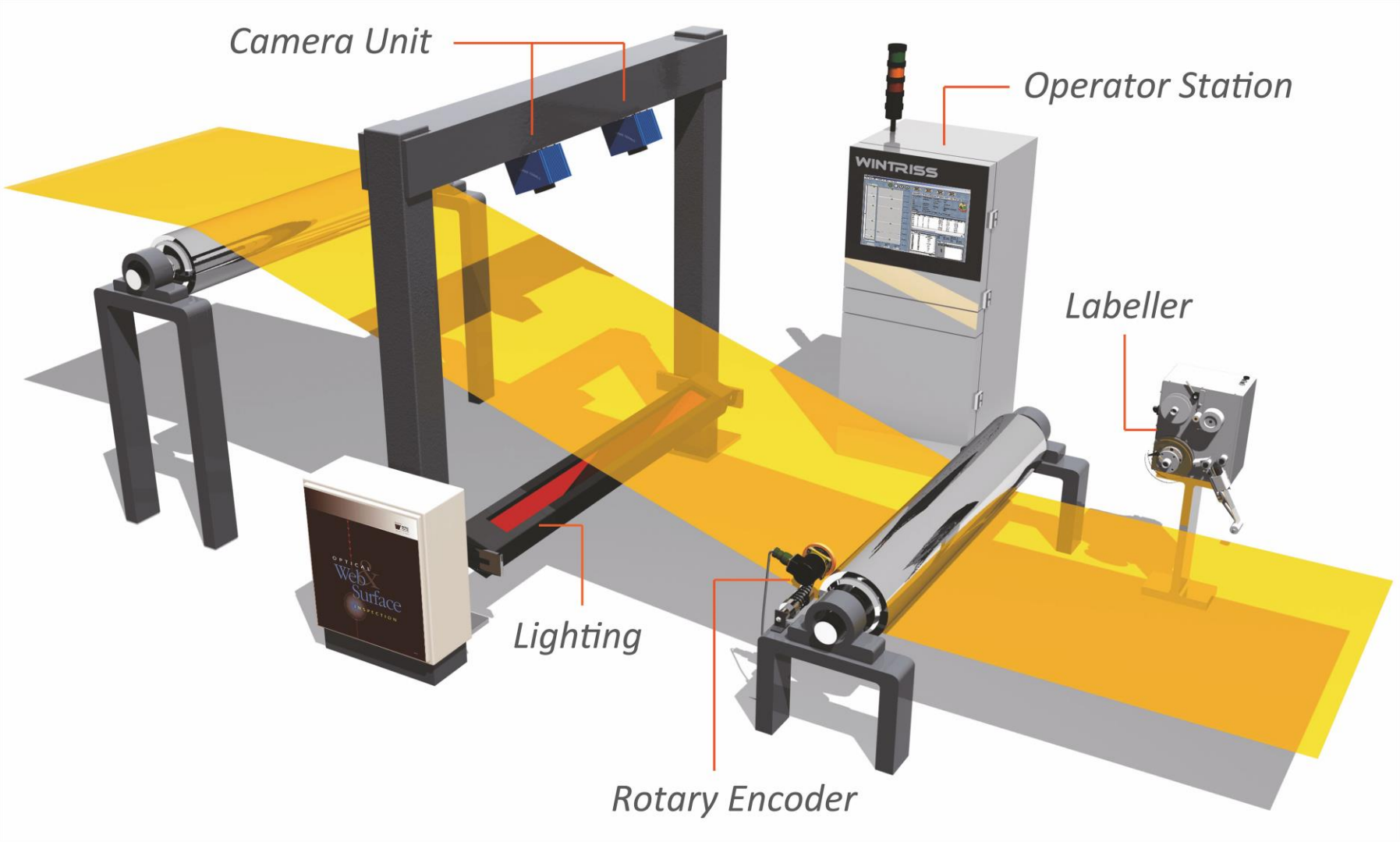


shelfware

[ˈʃɛl.fwɛr] *noun*

1. Software or hardware that has been purchased but remains unused, often sitting on a shelf due to lack of need, complexity, or poor implementation.
 2. A product that fails to deliver value after acquisition, typically due to misalignment with user requirements or organizational adoption challenges.
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AI WAS BLAMED FOR NON-AI PROBLEMS



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TYPICAL FAILURE PATTERNS

1. Semantic Misalignment Between AI and Domain Context

AI model outputs fail to map meaningfully to real-world domain/business concepts and operational terminology.

2. Hidden Logic in Integration Layer

Critical transformations and decisions are contained within fragile, non-transparent (“black box”), and hard-to-debug scripts and configuration files

3. Silent Performance Degradation

The system continues producing confident predictions even as underlying conditions change—such as data drift, sensor degradation, or system reconfigurations.

4. Delayed or Disconnected Feedback Loops

Ground truth corrections and validation data arrive too late (weeks or months after predictions) or lack sufficient context to be actionable.

5. Conflicting Optimization Objectives Across Teams

Different stakeholders optimize for incompatible goals

**DDD TRANSFORMS AI FROM A SMART
PIPELINE INTO A RELIABLE SOCIO-
TECHNICAL SYSTEM — ONE THAT
OPERATORS CAN TRUST.**

FROM DDD CANVAS TO AI CANVAS

WHAT IS CANVAS

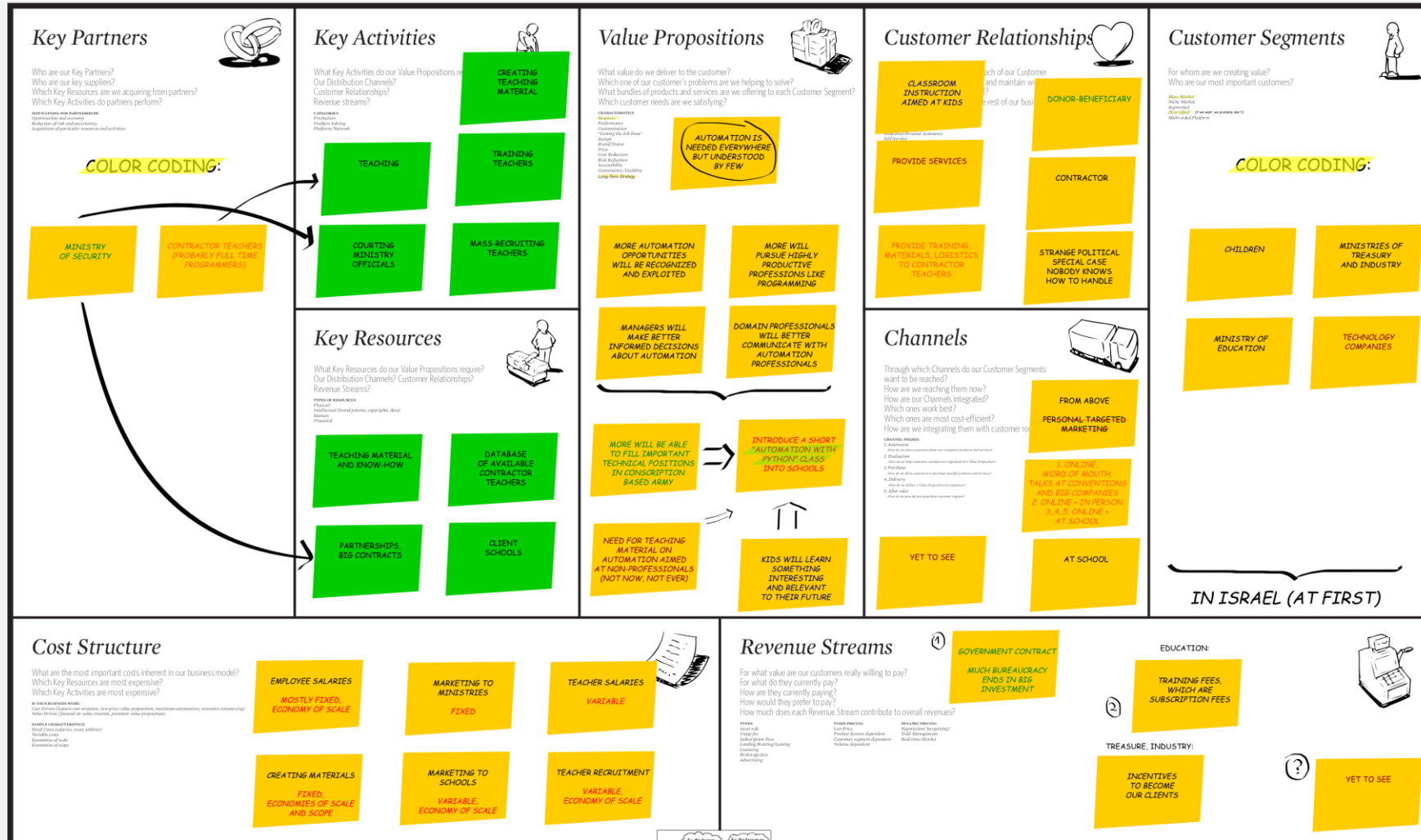
The Business Model Canvas

Designed for: TEACHING KIDS AUTOMATION

Designed by: AUR SARAF

On: 9 11 2012

Iteration: 1





WHY WE NEEDED NEW AI CANVASES

1. Existing canvases are designed for deterministic systems

They assume stable, predictable behavior, whereas AI systems introduce inherent uncertainty, model drift, and continuous evolution that are not explicitly addressed by traditional DDD or architectural tools.

2. They do not distinguish between prediction and decision-making

AI models generate probabilistic outputs, while business outcomes depend on policies, thresholds, governance rules, and human judgment—concerns that existing canvases do not adequately represent.

3. They fail to align cross-disciplinary teams around shared meaning and accountability

Differences in interpretation between Domain Experts, Data Scientists, and Engineering teams remain implicit, leading to unclear responsibilities and latent failure modes that typically surface only in production.



AI BOUNDED CONTEXT

1. The AI Bounded Context Canvas **establishes** clear **ownership** and **responsibility boundaries** for AI capabilities within a system.
2. This canvas is used to **distinguish** domain **decision-making**, AI-driven **predictions**, and technical infrastructure **concerns**.
3. It makes **explicit** how the system **behaves** when AI **confidence degrades**, data **quality deteriorates**, or model **outputs fall** outside acceptable limits.
4. It supports **governance**, operational **resilience**, and cross-team **accountability**, particularly in safety-critical or regulated domains. By defining **escalation paths**, fallback **strategies**, and “stop automation” rules.



UBIQUITOUS LANGUAGE ALIGNMENT

1. The Ubiquitous Language Alignment Canvas creates a **shared, authoritative vocabulary** across Domain Experts, Data Scientists, and Engineers.
2. This canvas explicitly maps domain terms to machine learning concepts and technical representations, making semantic assumptions visible and testable.
3. By **documenting** how terms **evolve** over time and identifying which concepts are stable versus volatile, this canvas **prevents** silent semantic **drift** and provides a durable **reference** for onboarding, **audits**, and long-term system **maintenance**.



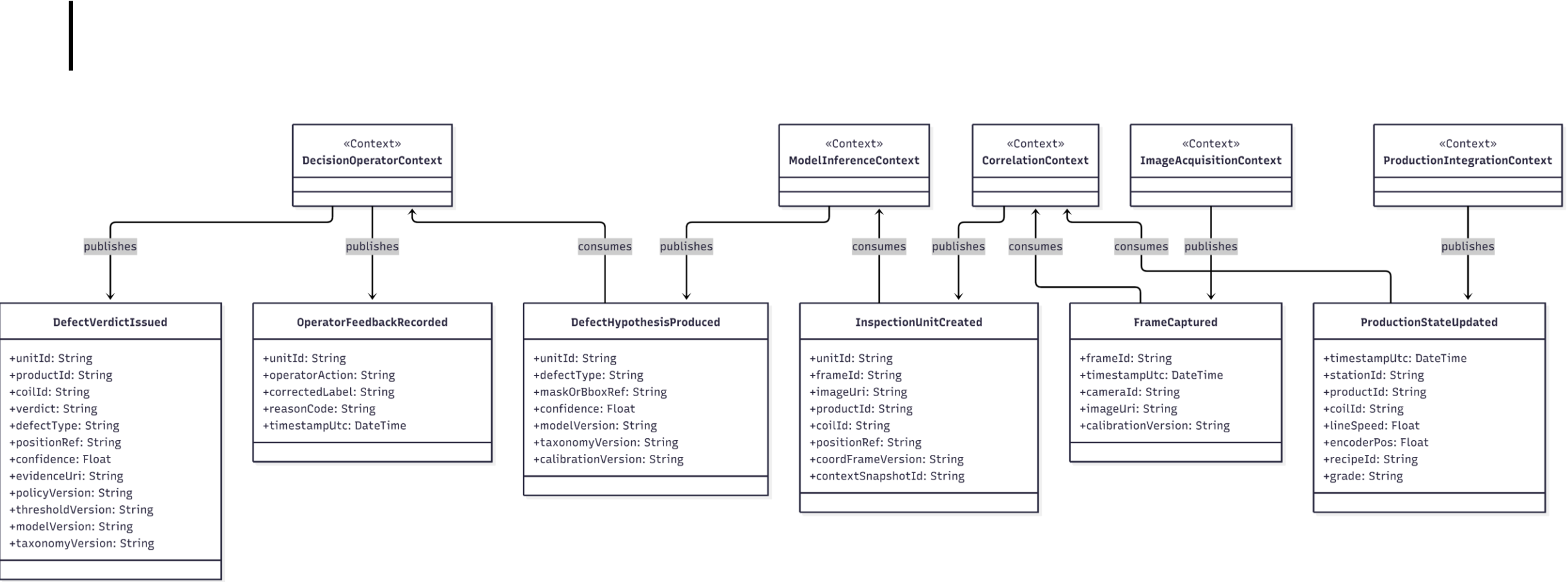
1. It defines **robust integration agreements** between AI and non-AI components in the presence of uncertainty and continuous change.
2. This canvas formalizes how AI outputs are consumed, how downstream systems should interpret confidence and uncertainty, and how the system responds when assumptions are violated.
3. By **making failure handling, fallback mechanisms, and change governance explicit**, this canvas **enables safe evolution** of AI systems, **reduces operational risk**, and **protects business continuity** as AI capabilities mature over time.

CONTRACT & INTERFACE

DEMO 😊

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INTERACTIONS BETWEEN CONTEXTS



RESULTS & SUMMARY

BEFORE...

- AI embedded in pipelines with unclear boundaries
- Different meanings for the same terms (confidence, position, defect)
- Implicit assumptions about time, identity, and quality
- Model updates changed behavior silently
- Operators distrusted results, and overrides were ad hoc
- Problems framed as: "the AI is wrong."



Result: High operational risk, slow diagnosis, low trust

AFTER...

- Explicit bounded contexts with clear ownership
- Shared ubiquitous language across Domain, ML, and OT/IT
- Contracts define meaning, failure modes, and evolution
- Clear separation of prediction (AI) and decision (policy + humans)
- Graceful degradation and governed change



Result: Predictable behavior, faster change, higher trust

**AI SUCCEEDS WHEN THE SOCIO-
TECHNICAL SYSTEM IS COHERENT:
RESPONSIBILITIES, LANGUAGE, AND
CONTRACTS.**



<https://github.com/nikgolovko/ai-ddd-canvas>



[HTTPS://WWW.LINKEDIN.COM/IN/DR-NIKITA-GOLOVKO/](https://www.linkedin.com/in/dr-nikita-golovko/)

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