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DIGITAL MODEL
Product Data
+
DIGITAL THREAD
Traceability
+
DIGITAL TWIN
Configuration
=



Strategic PLM (AI?) Implementation – How to Avoid the Typical Ten Mistakes

PLM Road Map™ & PDT EMEA 2026
AI in PLM: A Disruptive Opportunity and Challenge
Turning AI disruption into enterprise value:
Strategic insights for the PLM professional
CIMdata
4-5 November 2026
www.CIMdata.com

Prof. Dr.-Ing. Martin Eigner
EIGNER ENGINEERING CONSULT
Baden-Baden





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Context

Strategic PLM (AI?) Implementation – How to Avoid the Typical Ten Mistakes

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Introduction

- PLM-Systems promise a lot of benefits for companies (time, quality, collaboration, compliance)
- About 60-75% of all PLM-Projects fail to achieve their original goals or achieve them only partially.
- Industry surveys and case studies consistently reveal that the root causes often based on organizational, process, human, cultural, and strategic misalignments, that are too often overlooked in PLM initiatives
- This presentation synthesizes insights from industry research, expert commentary, and real-world case studies to identify and explain the ten most common reasons why PLM projects fail in industrial settings. (See attached literature)



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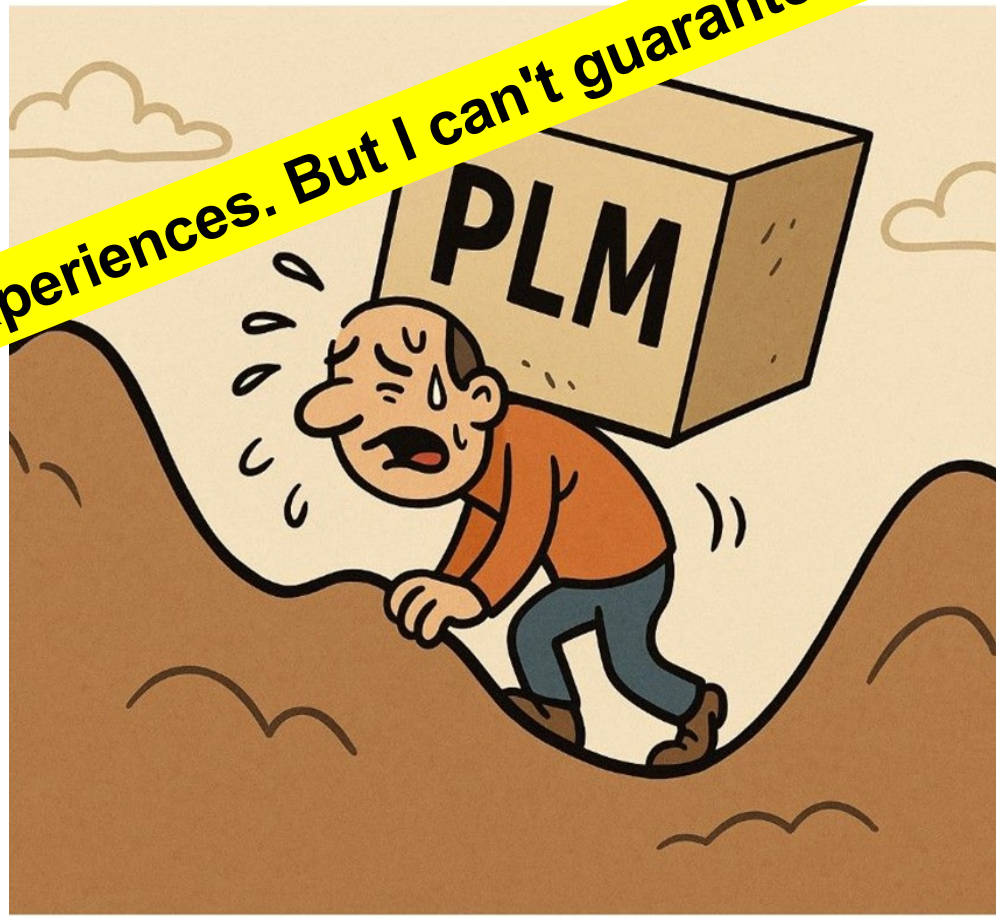
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Introduction

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I hope you will not have any déjà vu experiences. But I can't guarantee that.



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WHY ARE SO MANY EXPEDITIONS UNSUCCESSFUL?
LEARNING FROM MISTAKES
PLM SUMMIT
(Legacy Hell Below)
Mythical Single Source of Truth
Integration Tightrope
Data Silo Abyss
1 NO LEADERSHIP
2 NO STRATEGY
3 UNCLEAR SCOPE, NO ARCHITECTURE
4 NO CHANGE MGMT. & CULTURAL UNDERSTANDING
5 NO GOVERNANCE AND DATA OWNERSHIP
6 NO PROCESS UNDERSTANDING
7 PLM isn't a IT PROJECT
8 SHADOW IT and EXCEL
9 WRONG SOLUTION and OVERCUSTOMIZATION
10 NO TECHNOLOGY EXPERTISE

1 Lack of Executive Sponsorship and Leadership Alignment

PLM initiatives fail when they lack strong, visible, and sustained executive and cross-functional leadership

- Inconsistent or weak executive commitment
- Shifting business priorities
- Loss of momentum of the PLM Initiative
- Stakeholder disengagement over time
- Absence of a clear executive champion
- Missing alignment to strategic projects at the corporate level (digitalization, innovation, AI, cost reduction, …)?
- What are content, milestones and risk of a Cybertronic Digital Transformation?

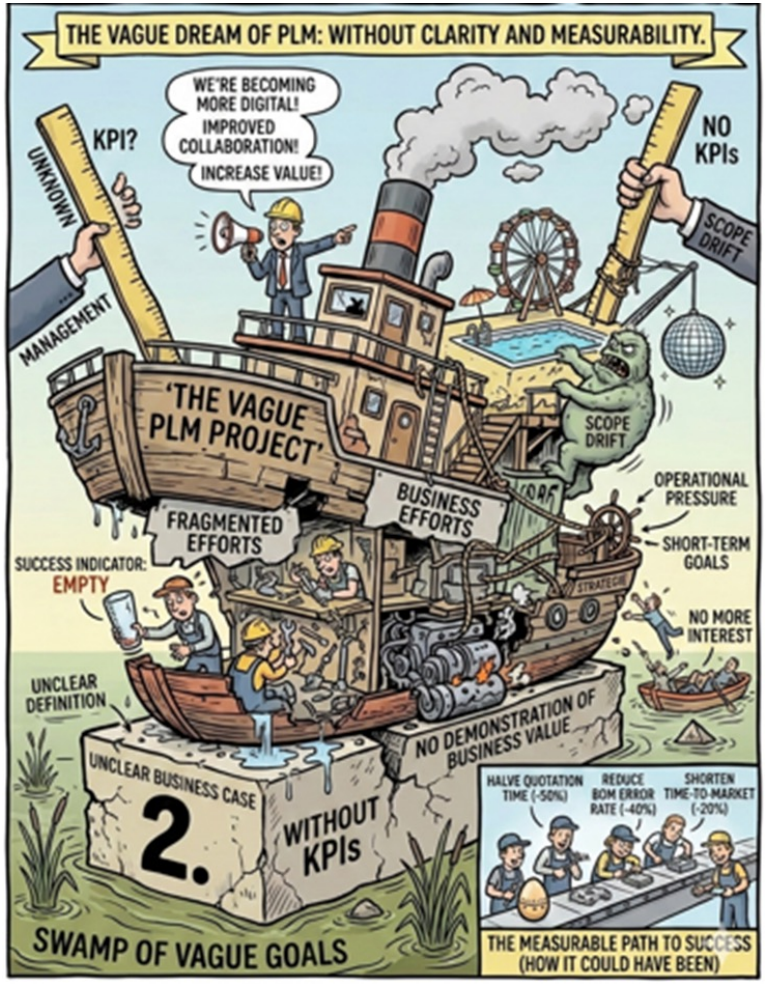


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2 Unclear Strategy and Absence of Measurable KPIs

Without a strategy and clear business case, PLM projects struggle to demonstrate value.

- Vague objectives such as “becoming more digital”
- Unclear definition of the business case
- What exactly needs to be improved at the process level (time, costs, quality, compliance, interdisciplinarity, …)?
- No quantified business outcomes defined upfront, missing or poorly defined KPIs. KPIs could be:
  - Reduction quotation lead time by 30%
  - Cutting BOM error rate by 20%
  - Shorter time to market by 20%
- Without KPIs no basis for resource allocation and post-implementation benefit validation

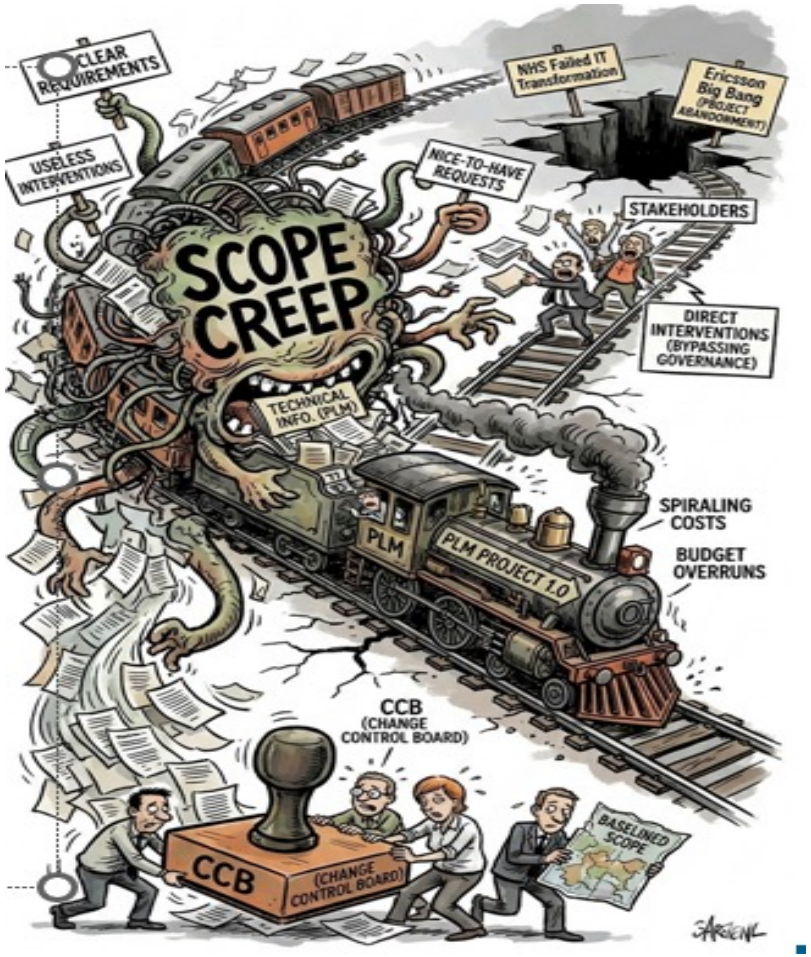


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3 Unclear Scope Definition and Rampant Scope Creep

Unclear scope and uncontrolled scope expansion is a major cause of PLM project failure.

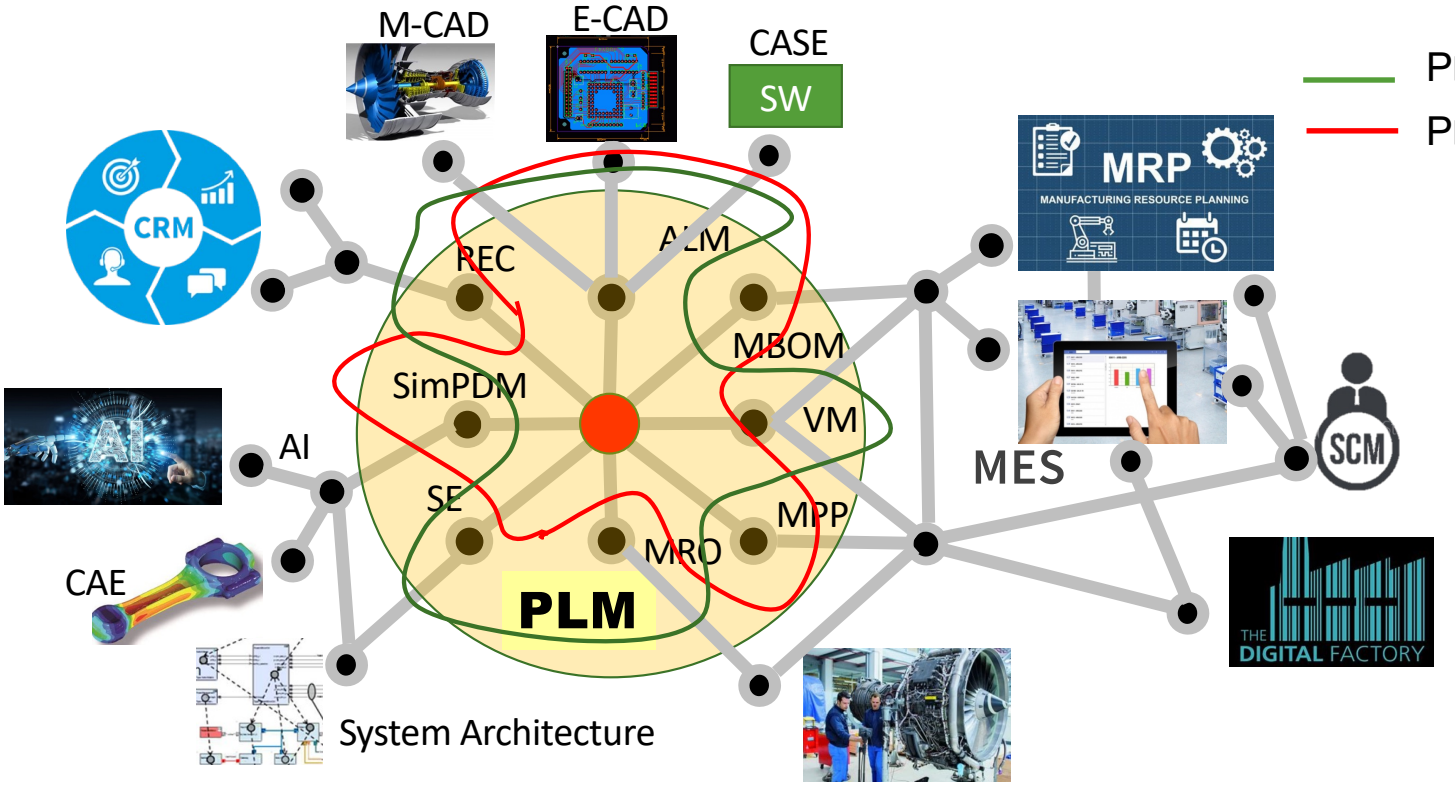
- Incomplete or unclear initial requirements
- Continuous addition of features and integrations
- Stakeholder interventions bypassing governance
- Overambitious “big bang” implementation approaches
- Budget overruns and timeline delays
- Increased system complexity and risk
- Not defined: What is in/out of Scope (Function, Processes)



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Typical PLM-Question: What is in or out Scope of PLM

Specialized stand-alone solutions often offer better functionality than solutions integrated into PLM (e.g., requirements, QMS, assembly planning, etc.).
The permanent discussion: Best in function or best in integration!!!

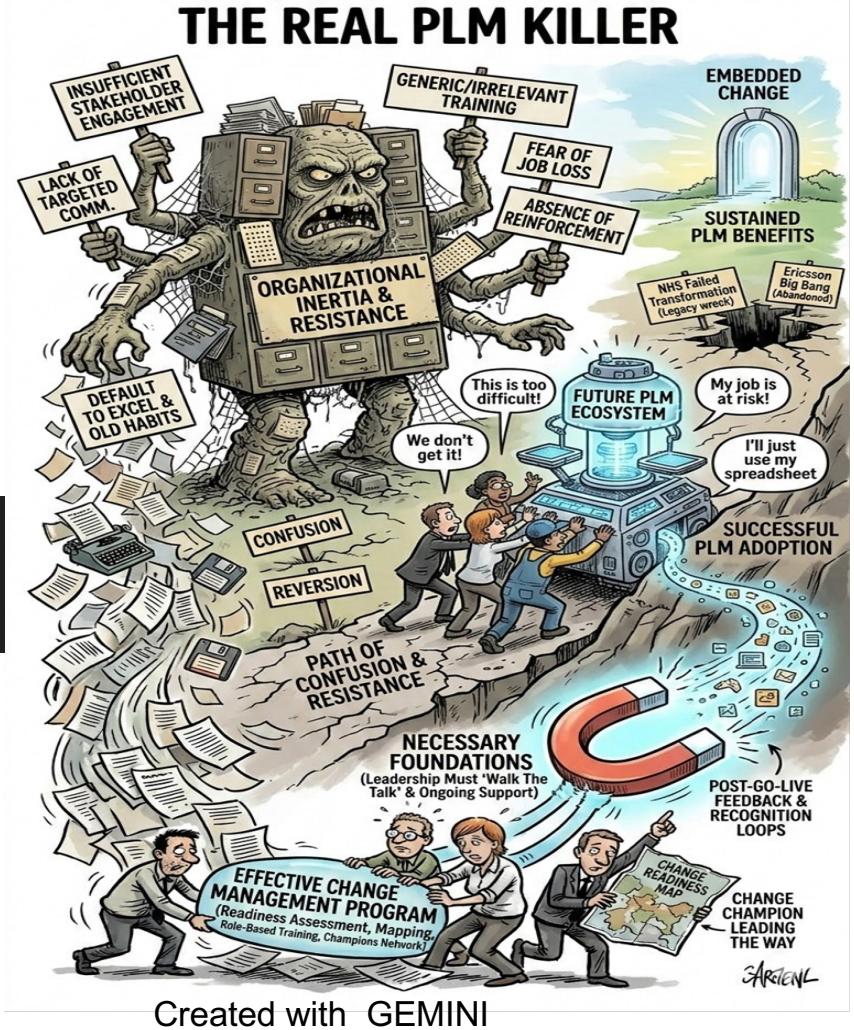


REC: Requirements, Function
MPP: Manufacturing Process Planning
MES: Man. Execution System
VM: Variant Management
SE: Systems Engineering
ALM: Application Lifecycle Mgmt.

4 Missing Cultural Understanding and Change Management

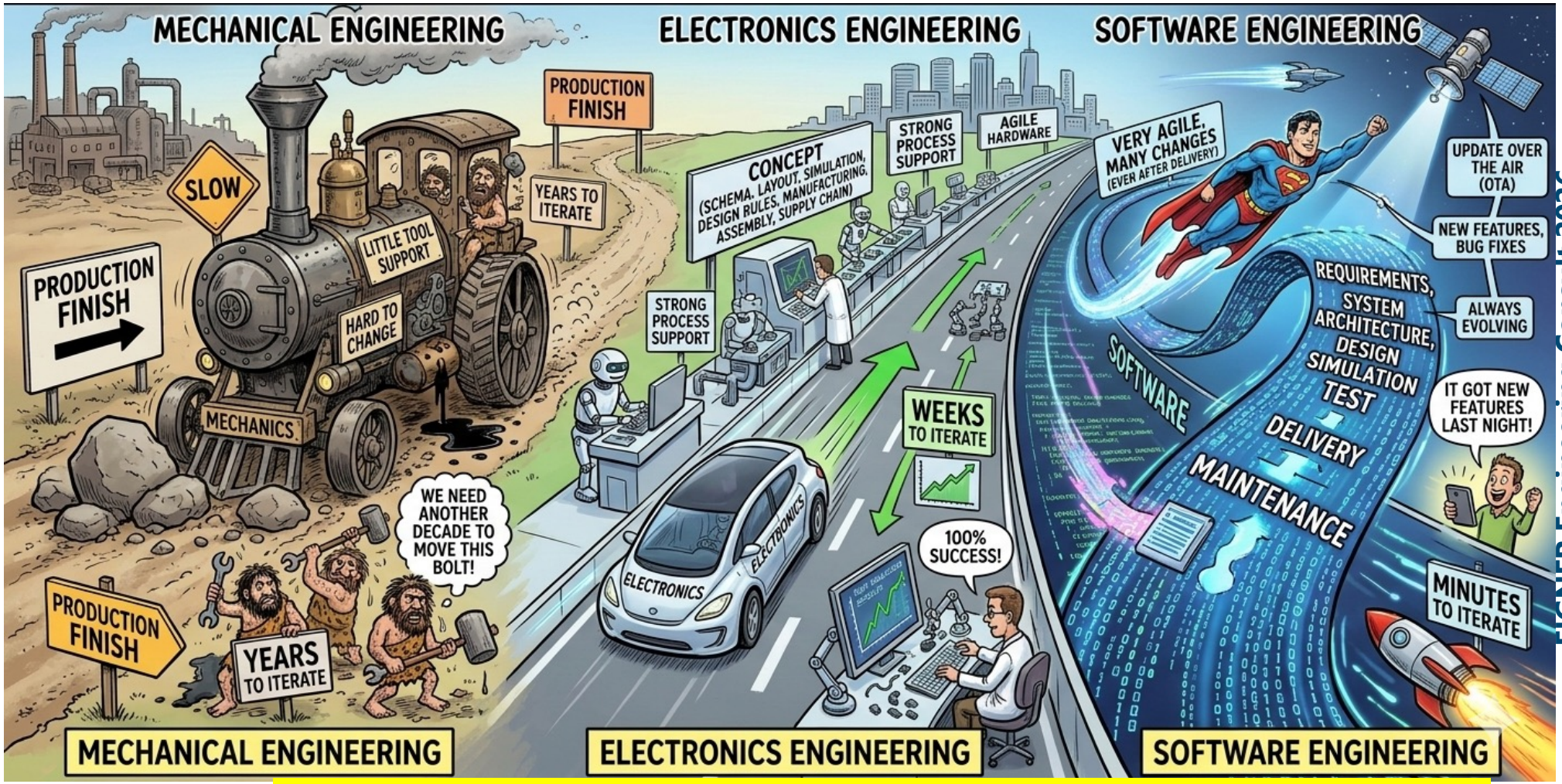
Many manager underestimate the organizational inertia, resistance and cultural change required for success

- Strong attachment to familiar tools and processes
- General resistance to new processes and tools
- Weak communication and information strategies
- Fear of job loss or loss of control
- No transparency and accountability
- No change and acceptance management
- No understanding of cultural differences and behavior along the product lifecycle and between disciplines



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COMPARING ENGINEERING PROCESSES: MECHANIC, ELECTRONIC & SOFTWARE



Different Speed, Processes, Methods, Tools and Culture

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5 Weak Cross-Functional Governance and Data Ownership

PLM is cross-functional, interdisciplinary, spanning the whole Product Lifecycle, but robust governance is missed.

- Siloed decision-making across departments and disciplines
- Unclear roles and responsibilities
- Conflicts over data ownership
- Poor coordination between ALM, PLM and ERP initiatives
- Lack of escalation mechanisms
- Absence of structured governance bodies
- Competition between disciplinesorganizational units alo the product lifecycle and divisions



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6 No Understanding of Engineering Processes and Integration

Digitizing unstructured processes leads to digital bureaucracy and chaos.
No integration concept leads to system war.

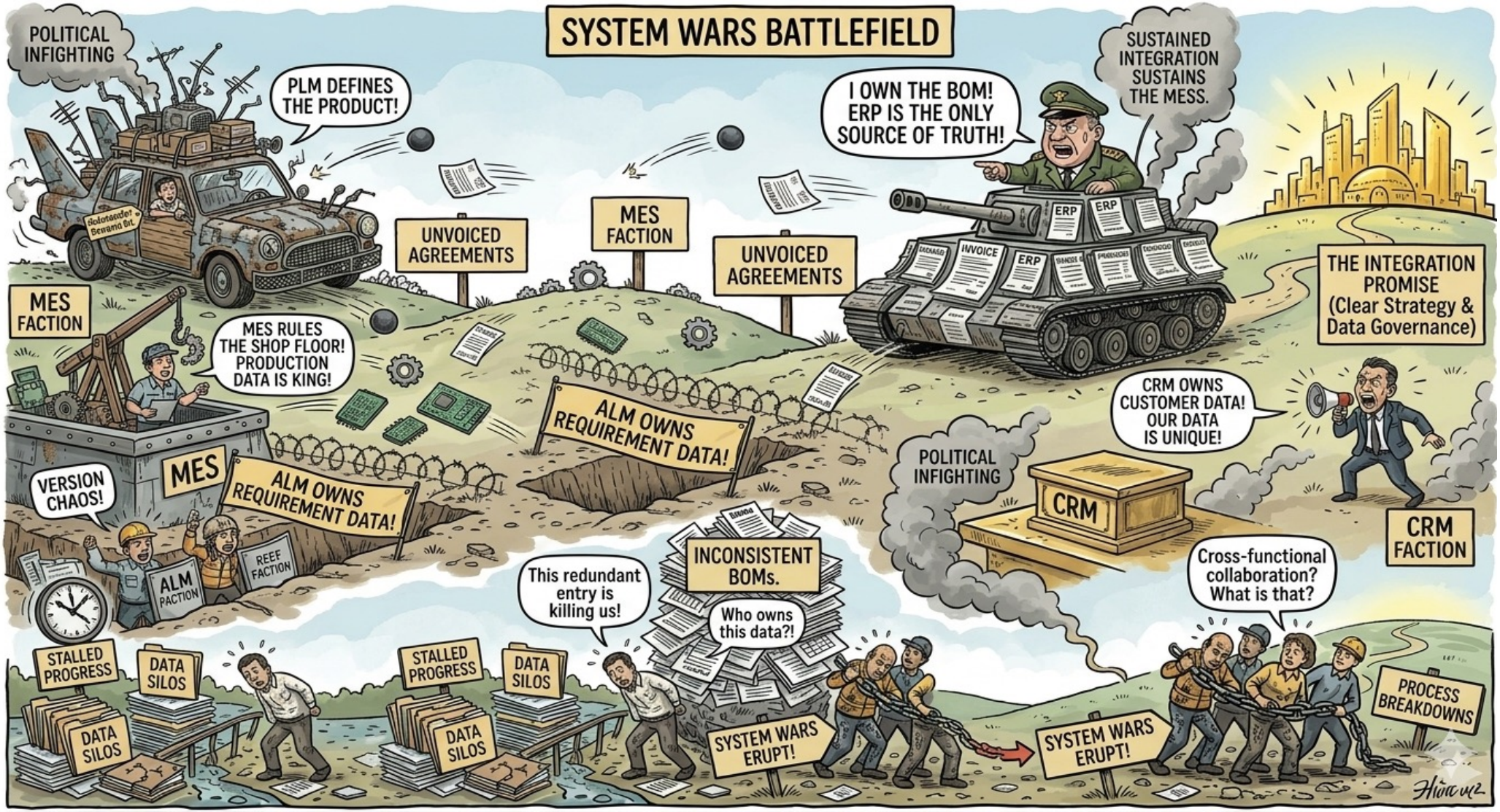
Engineering Processes

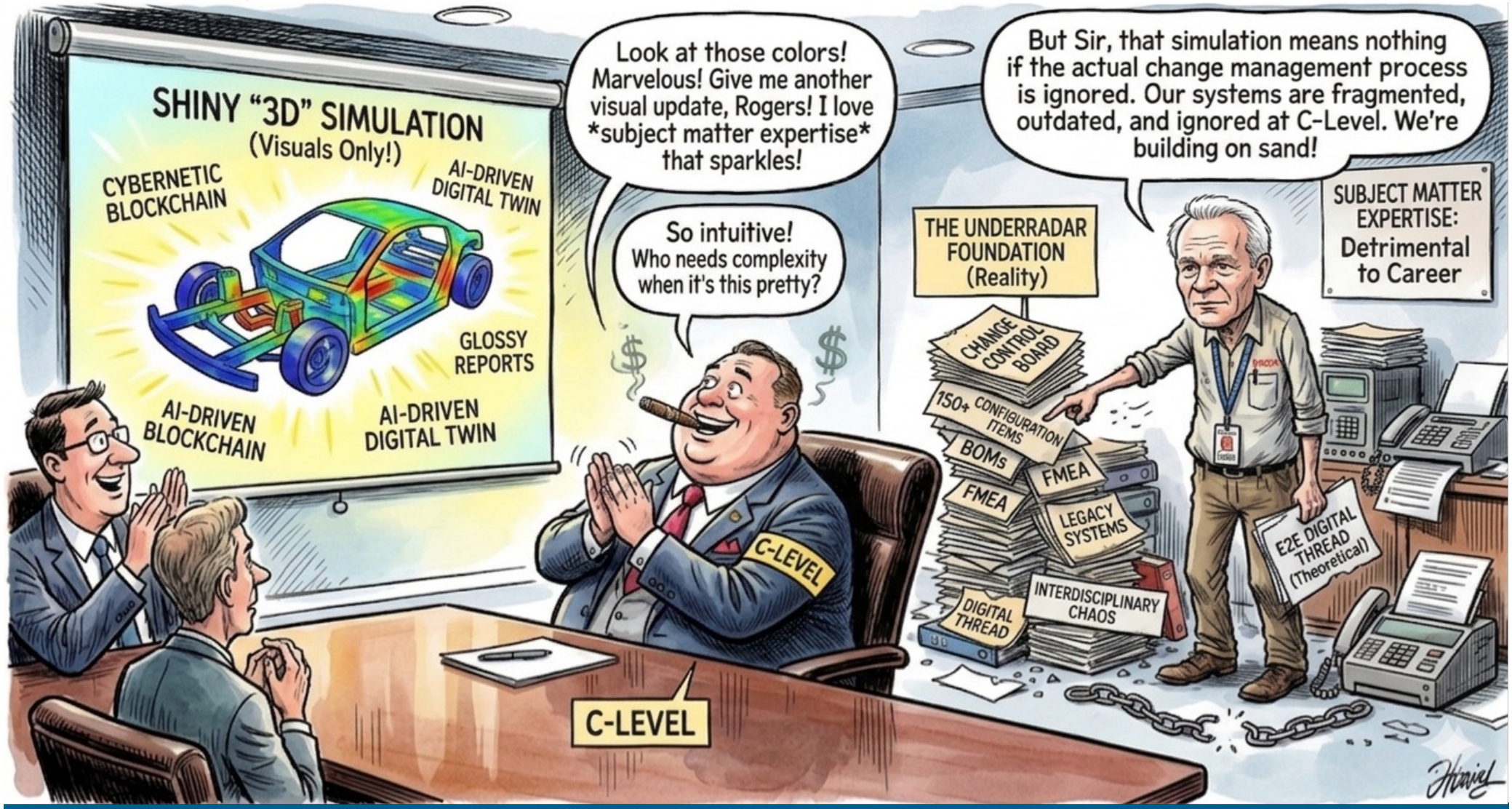
- Do not exist,
- Are poorly documented
- Differ across organizational units

- Therefore, no holistic Engineering Processes along the Product Lifecycle (ECR, ECM, CM, QMS, FMEA, …)
- Missing Integration and Migration Strategy between all Legacy-Systems along the Product Lifecycle
  ↳ Integration Failure and Systems War!!!
- Lack of understanding and supporting among C-Level regarding administrative processes (ECM, FMEA,…)



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SYSTEM WARS BATTLEFIELD
POLITICAL INFIGHTING
PLM DEFINES THE PRODUCT!
UNVOICED AGREEMENTS
MES FACTION
UNVOICED AGREEMENTS
I OWN THE BOM! ERP IS THE ONLY SOURCE OF TRUTH!
SUSTAINED INTEGRATION SUSTAINS THE MESS.
THE INTEGRATION PROMISE (Clear Strategy & Data Governance)
MES FACTION
MES RULES THE SHOP FLOOR! PRODUCTION DATA IS KING!
ALM OWNS REQUIREMENT DATA!
CRM OWNS CUSTOMER DATA! OUR DATA IS UNIQUE!
VERSION CHAOS!
MES
ALM OWNS REQUIREMENT DATA!
POLITICAL INFIGHTING
CRM
CRM FACTION
ALM FACTION
REEF FACTION
INCONSISTENT BOMs.
This redundant entry is killing us!
Who owns this data?!
Cross-functional collaboration? What is that?
STALLED PROGRESS
DATA SILOS
DATA SILOS
STALLED PROGRESS
DATA SILOS
SYSTEM WARS ERUPT!
SYSTEM WARS ERUPT!
PROCESS BREAKDOWNS


SHINY "3D" SIMULATION
(Visuals Only!)
CYBERNETIC BLOCKCHAIN
AI-DRIVEN DIGITAL TWIN
GLOSSY REPORTS
AI-DRIVEN BLOCKCHAIN
AI-DRIVEN DIGITAL TWIN
Look at those colors! Marvelous! Give me another visual update, Rogers! I love *subject matter expertise* that sparkles!
So intuitive! Who needs complexity when it's this pretty?
C-LEVEL
C-LEVEL
But Sir, that simulation means nothing if the actual change management process is ignored. Our systems are fragmented, outdated, and ignored at C-Level. We're building on sand!
THE UNDERRADAR FOUNDATION (Reality)
SUBJECT MATTER EXPERTISE: Detrimental to Career
CHANGE CONTROL BOARD
150+ CONFIGURATION ITEMS
BOMs
FMEA
FMEA
LEGACY SYSTEMS
INTERDISCIPLINARY CHAOS
DIGITAL THREAD
E2E DIGITAL THREAD (Theoretical)

7 Treating PLM as an IT-Project

...And Pretending It's Just a 'Tool' Issue

- Processes Come Before Tools
  Implementing PLM without first defining target processes leads to digital chaos instead of efficiency.
- Organizational Roles Must Be Redefined
  PLM changes responsibilities, decision rights, and ownership across engineering, manufacturing, quality, and service.
- Cross-Functional Alignment Is Mandatory
  PLM breaks silos; success depends on collaboration between departments, not isolated system configuration.
- Change Management Is a Core Success Factor
  User adoption, mindset shifts, and behavioral change are as critical as technical deployment.
- Product Data Is a Strategic Asset, Not an IT Artifact
  Product data quality, semantics, and ownership must be managed at the business level.
- Technology Enables—People and Processes Deliver Value
  The PLM system is only successful if the organization is ready to work differently.(Model Based, System Thinking, Interdisciplinary and Collaborative)

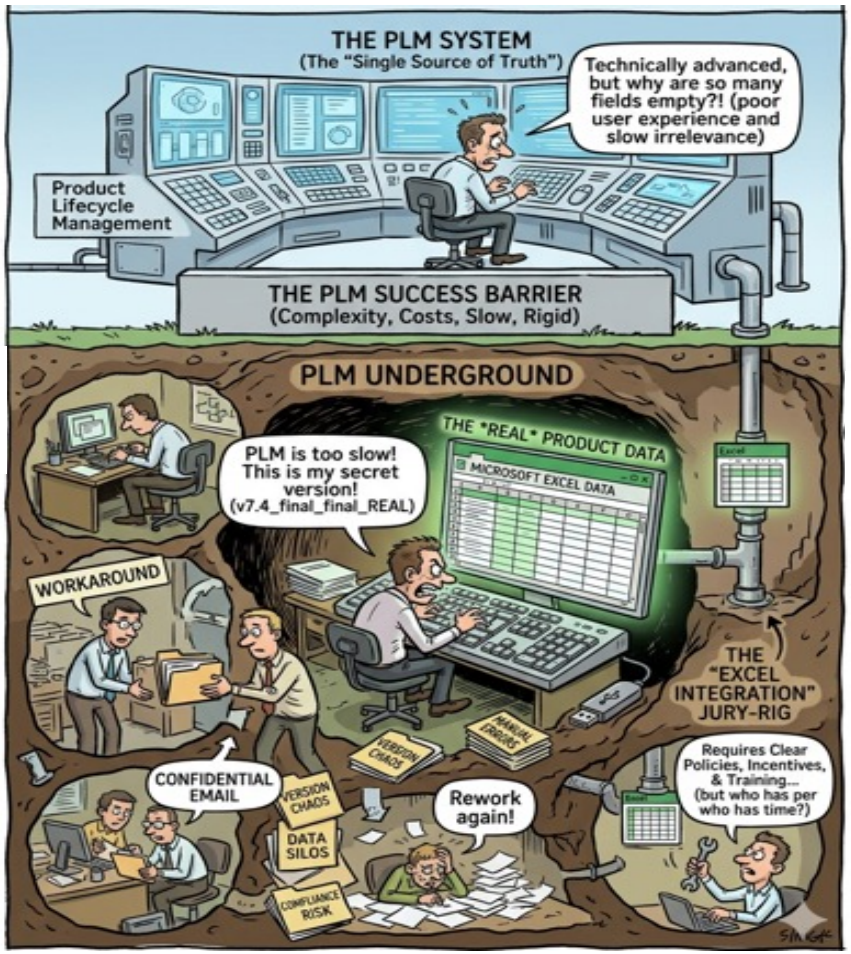


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8 Shadow IT and Persistent Excel Dependence

Critical product data often remains outside PLM systems, managed through email, Excel and workarounds.

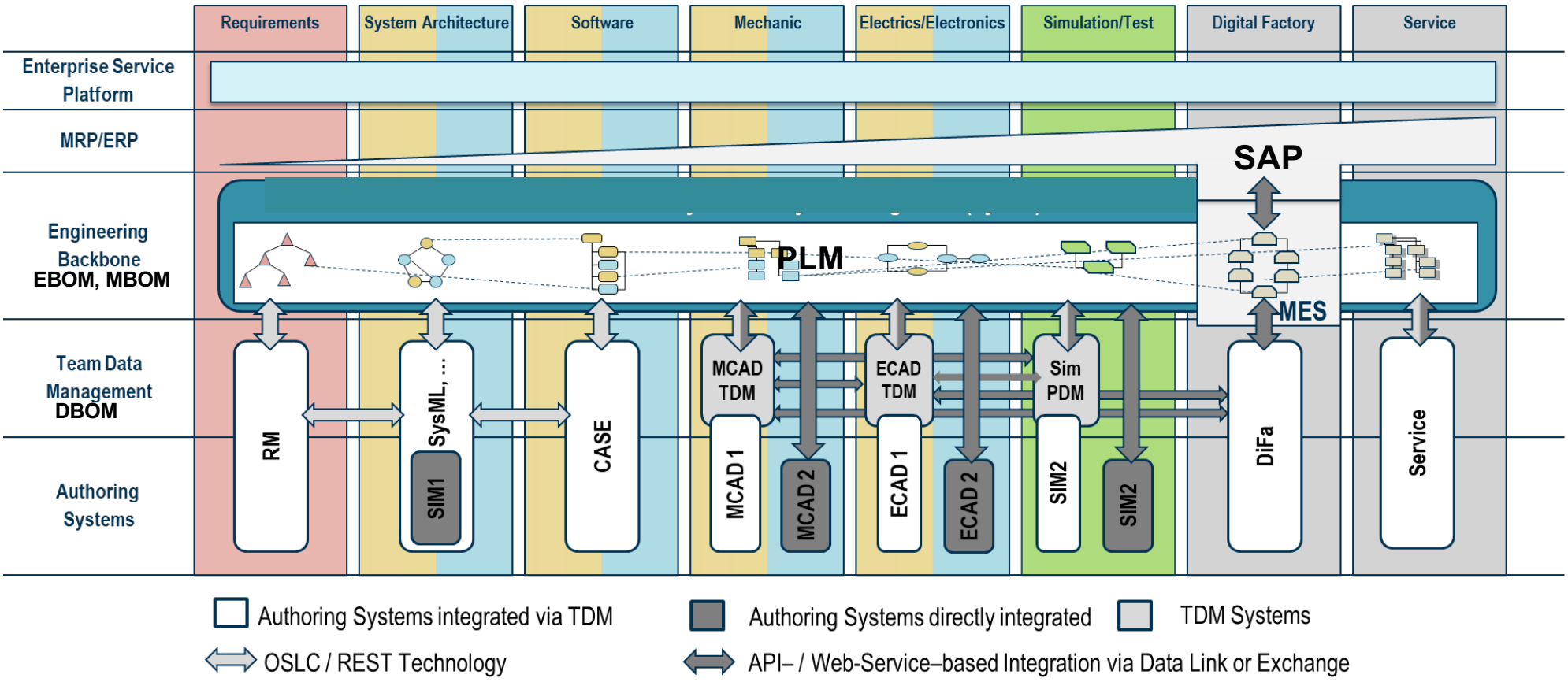
- "PLM-Underground"
  - Continued use of spreadsheets and email
  - EXCEL is the most widely used IT-System in Engineering
  - Behavior to keep the familiar systems running
- Version chaos and data inconsistencies
- Manual workarounds bypassing PLM
- Lack of trust in PLM data
- Undermining a common data model in engineering
- Missing governance and enforcement
- Harmonizing strategies often fail



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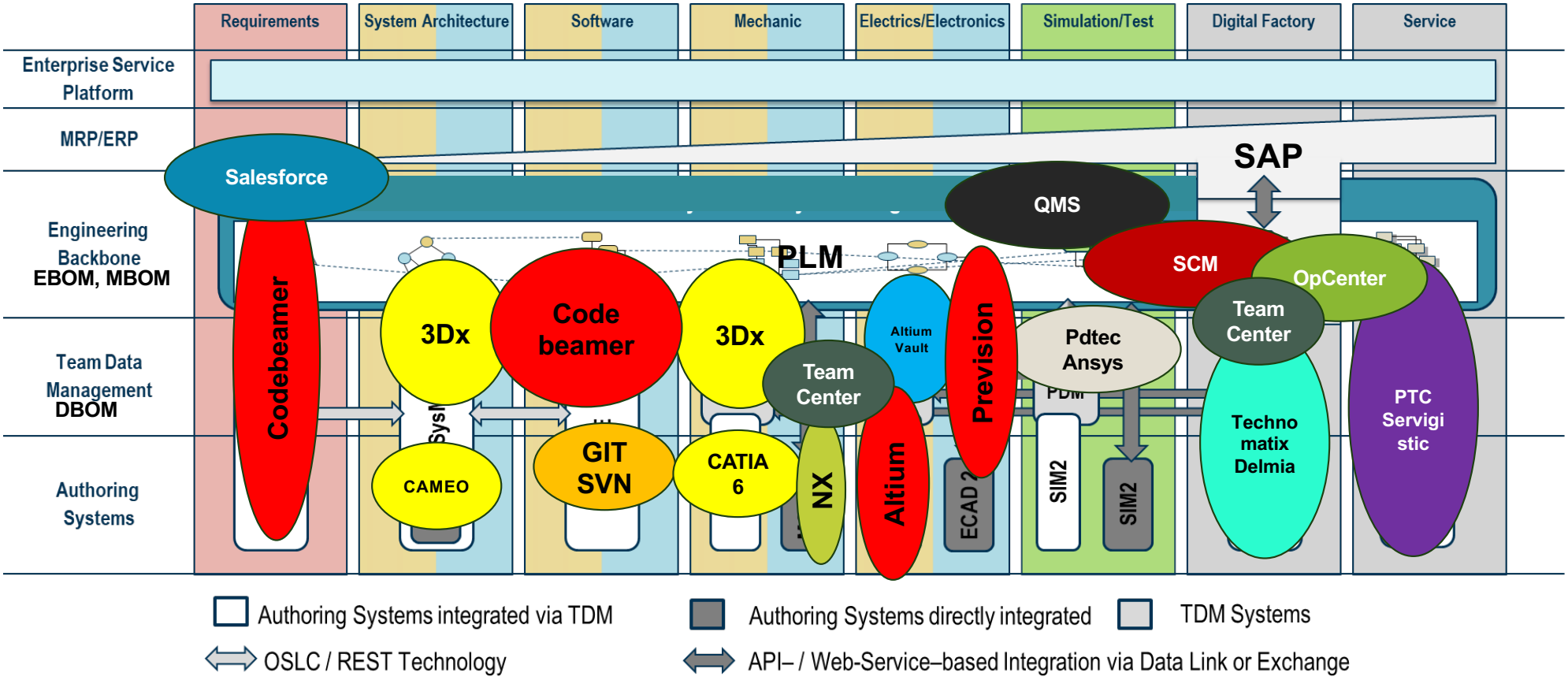
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IT Architecture based on VDA 4-Level Concept
The Theory!



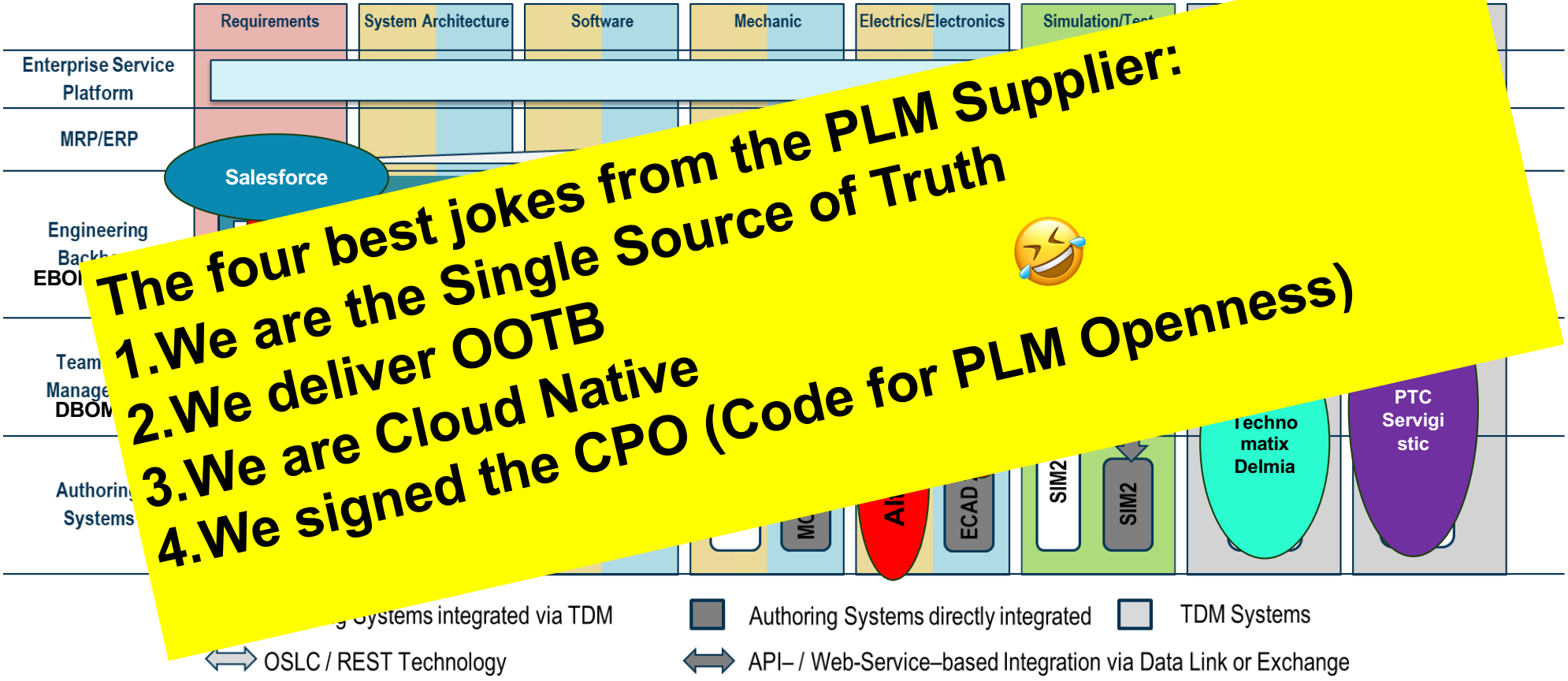
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IT Architecture based on VDA 4-Level Concept
The Reality!



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IT Architecture based on VDA 4-Level Concept
The Reality!

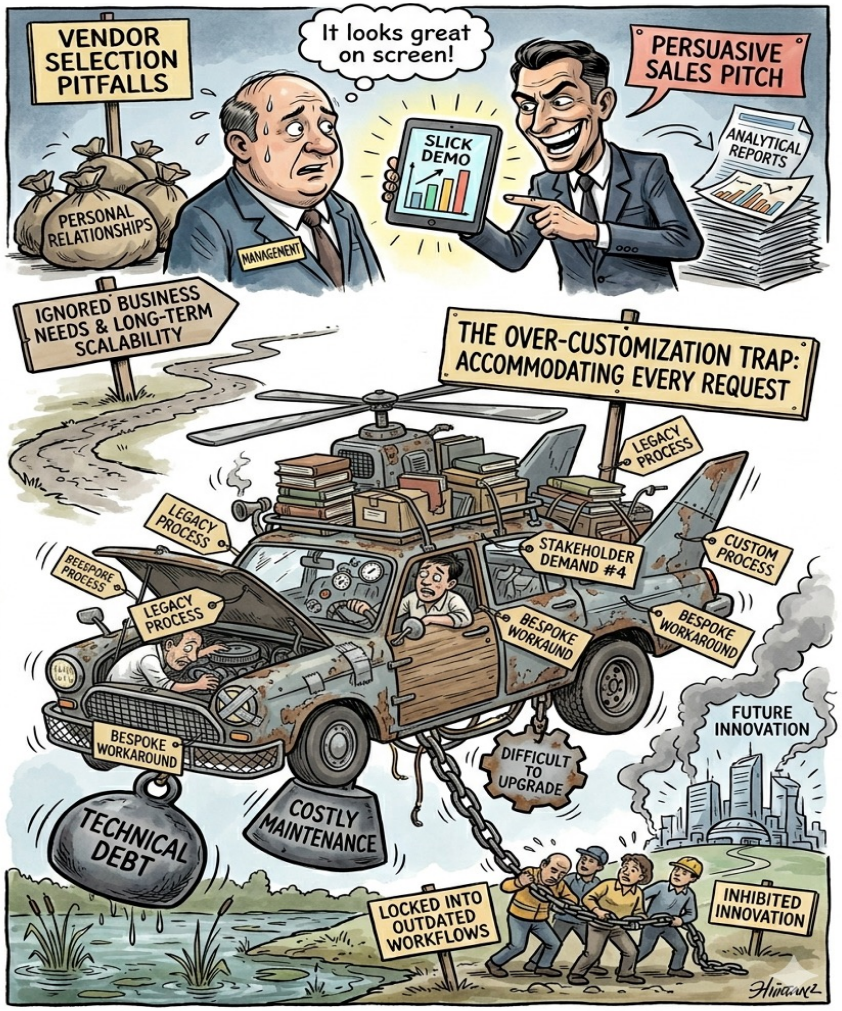


The four best jokes from the PLM Supplier:
1.We are the Single Source of Truth
2.We deliver OOTB
3.We are Cloud Native
4.We signed the CPO (Code for PLM Openness)

9 Vendor Selection Pitfalls and Over-Customization

Wrong tool choices and excessive customization increase failure risk.

- Vendor selection driven by demos or sales pressure
- Nice videos versus detailed functional test
- Poor fit with business requirements
- Lack of long-term scalability assessment
- Excessive customization of data and process model
- This results in high maintenance and upgrade costs
- The TCO over a 3- to 5-year period is not calculated
- Vendor lock-in and reduced flexibility
  (Code for PLM Openness ProSTEP)



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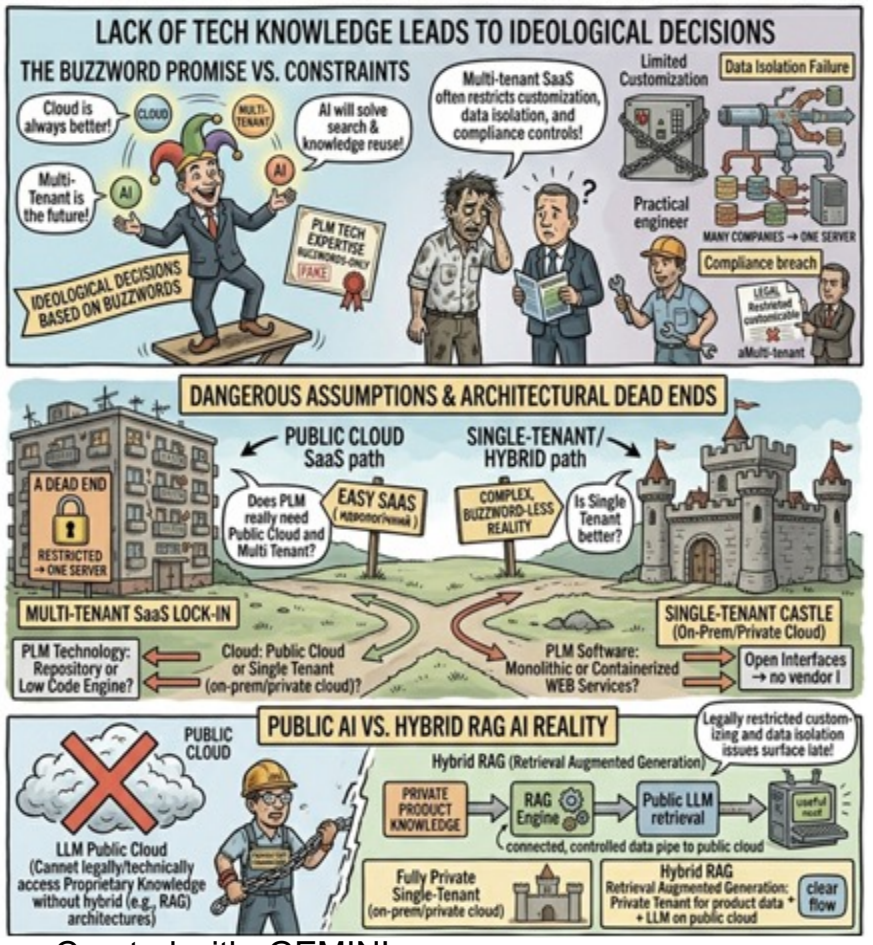

CLOSED PLM ECOSYSTEM
PROPRIETARY LOCK
THE DIGITAL FEUDALISM PACKAGE DEAL
'MARKET LEADER' PLM VENDOR
(STANDING FOR LARGE VENDORS)
WE NEED MULTI-CAD!
ENGINEER
CAD
CREO
NX
CATIA
EPLAN
'MARKET LEADER' PLM VENDOR
STOP HOLDING ENGINEERING DATA HOSTAGE!
A WAKE-UP CALL FOR PLM "MARKET LEADERS"!
ProSTEP iVIP SYMPOSIUM
VDA 4-LEVEL CONCEPT
4. ERP
3. PLM BACKBONE
2. OPEN TDM LAYER
1. AUTHORING SYSTEMS
RECLAIM THE CODE OF PLM OPENNESS (CPO)!
THE TRUE PATH TO DIGITAL TRANSFORMATION: OPEN TDM!

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10 Missing Technological Expertise
When Buzzwords Kill the PLM-Project

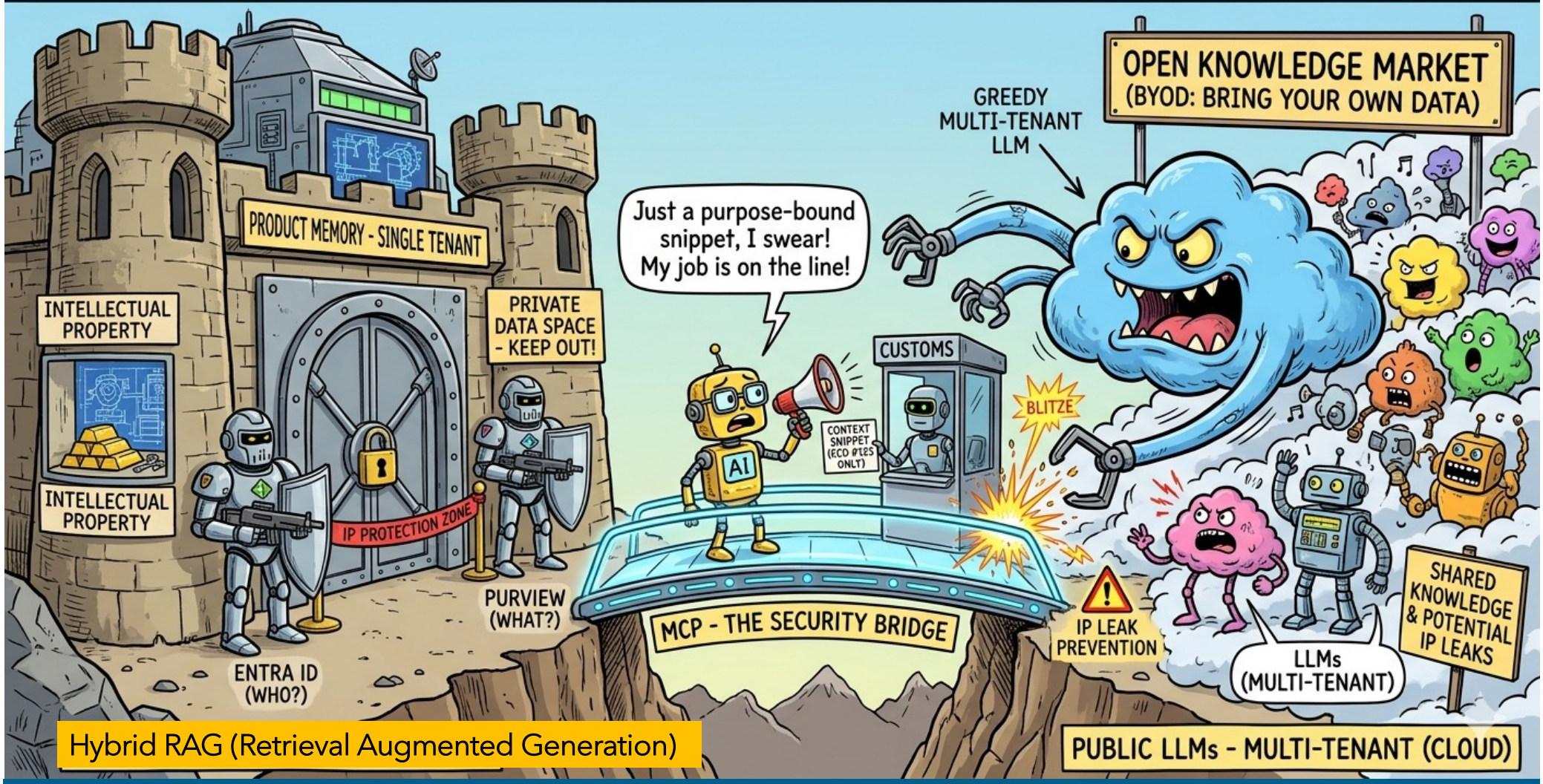
Lack of technology cause a PLM-Project to fail:

- PLM Software Technology?
  - Monolithic, Containerized WEB Services, Cloud Native?
  - Repository Technology and Low Code Engine
  - Open Interfaces ↳ no vendor lock in
  - Missing of a general SW-Architecture Strategy
- Cloud Technology?
  - Does PLM really need Public Cloud and Multi Tenant?
    ↳ restricted customizing, many companies ⟶ one server
  - Is Single Tenant (on-prem/private cloud) better?
- AI Technology?
  What is the solution, when companies want to combine gen AI with proprietary product knowledge?
  - Fully Private Single-Tenant (on-prem/private cloud)
  - Hybrid RAG Retrieval Augmented Generation
    Private Tenant for product data,+ LLM on public cloud



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HYBRID AI ORCHESTRATION: DO NOT TRUST THE CLOUD (UNLESS YOU HAVE MCP)

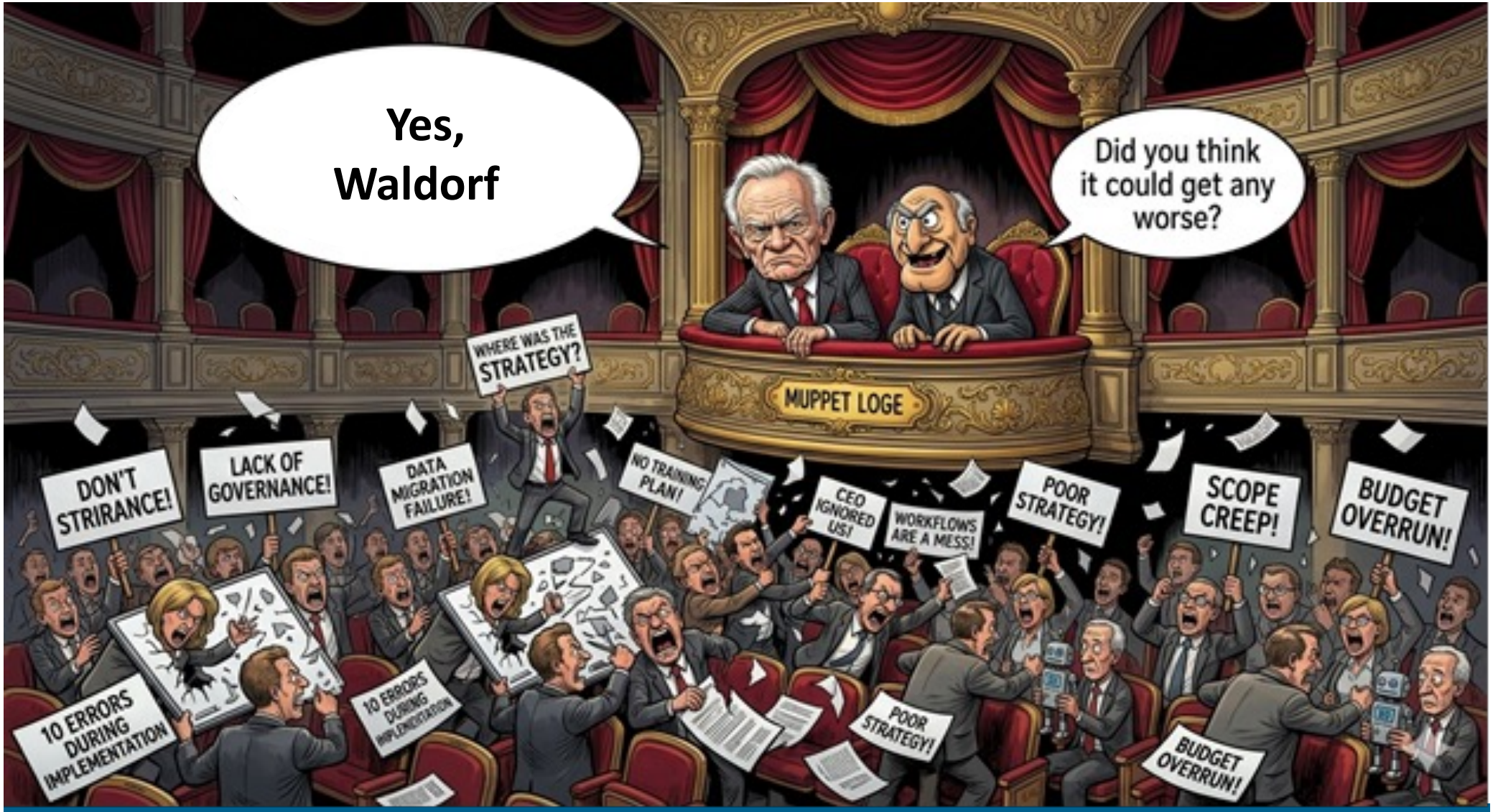


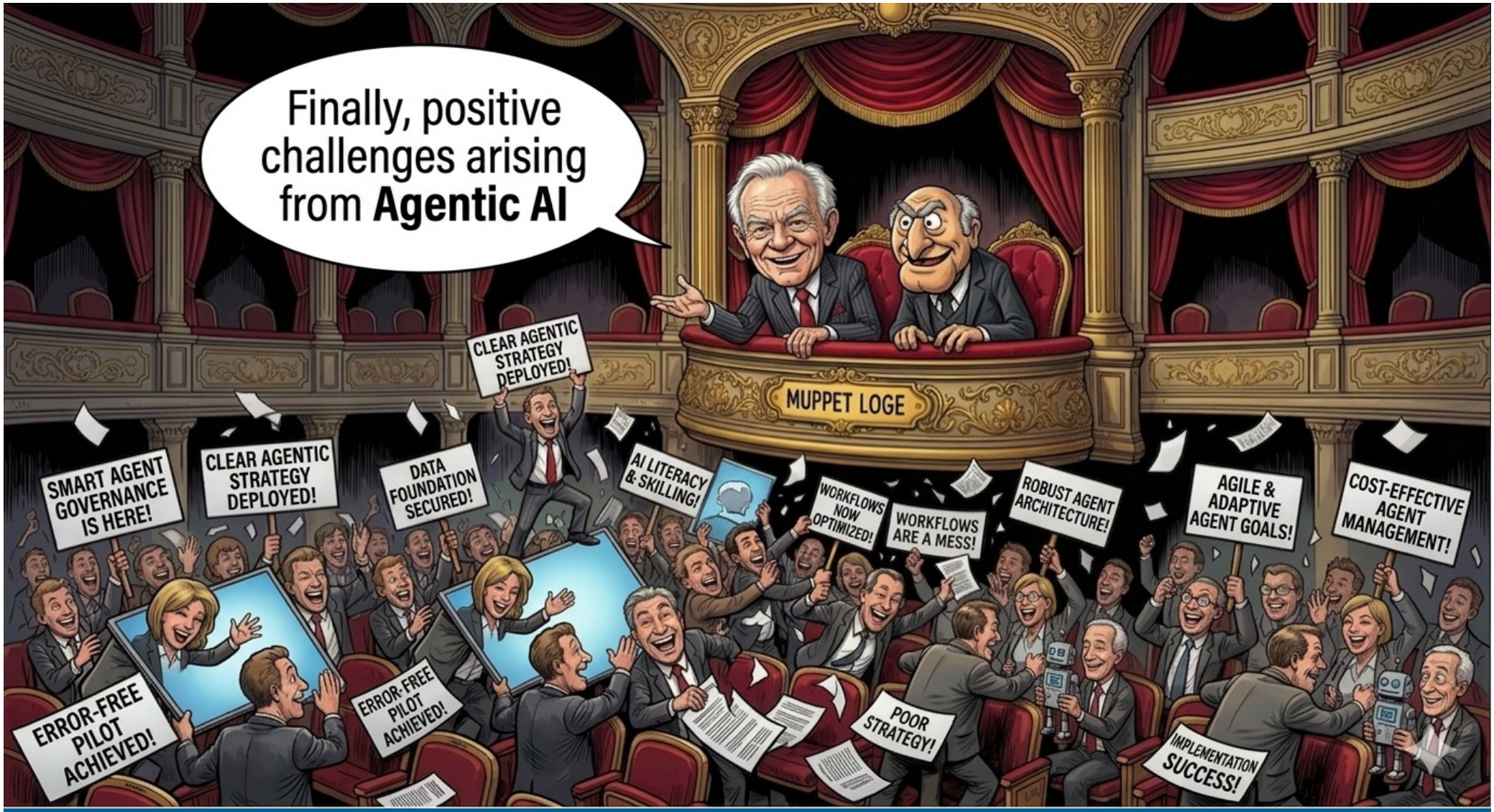
Hybrid RAG (Retrieval Augmented Generation)

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Now you've experienced all that can go wrong.
Did you think it could get any worse?
MUPPET LOGE
WHERE WAS THE STRATEGY?
DON'T STRIRANCE!
LACK OF GOVERNANCE!
DATA MIGRATION FAILURE!
NO TRAINING PLAN!
CEO IGNORED US!
WORKFLOWS ARE A MESS!
POOR STRATEGY!
SCOPE CREEP!
BUDGET OVERRUN!
10 ERRORS DURING IMPLEMENTATION
10 ERRORS DURING IMPLEMENTATION
POOR STRATEGY!
BUDGET OVERRUN!


Yes,
Waldorf
Did you think it could get any worse?
MUPPET LOGE
WHERE WAS THE STRATEGY?
DON'T STRIRANCE!
LACK OF GOVERNANCE!
DATA MIGRATION FAILURE!
NO TRAINING PLAN!
CEO IGNORED US!
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BUDGET OVERRUN!
10 ERRORS DURING IMPLEMENTATION
10 ERRORS DURING IMPLEMENTATION
POOR STRATEGY!
BUDGET OVERRUN!


Finally, positive challenges arising from **Agentic AI**
MUPPET LOGE
CLEAR AGENTIC STRATEGY DEPLOYED!
SMART AGENT GOVERNANCE IS HERE!
CLEAR AGENTIC STRATEGY DEPLOYED!
DATA FOUNDATION SECURED!
AI LITERACY & SKILLING!
WORKFLOWS NOW OPTIMIZED!
WORKFLOWS ARE A MESS!
ROBUST AGENT ARCHITECTURE!
AGILE & ADAPTIVE AGENT GOALS!
COST-EFFECTIVE AGENT MANAGEMENT!
ERROR-FREE PILOT ACHIEVED!
ERROR-FREE PILOT ACHIEVED!
POOR STRATEGY!
IMPLEMENTATION SUCCESS!

AI in New Product Development - Join us Now!

1. **AI Design Support**
2. **AI V&V Support**
3. **AI Simulation Support**
4. **AI Admin Support**

Engineering Change Management

Model-based Engineering

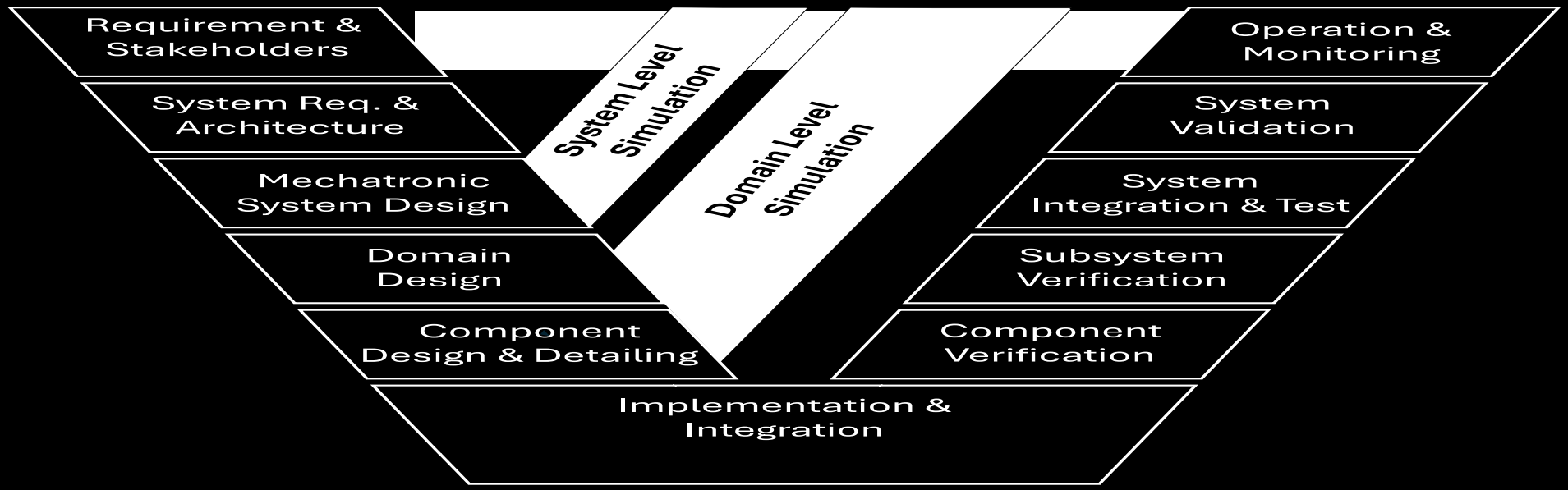


Configuration Management

SysLM Backbone

Quality & Risk Management

BOM Management



AI² - Association Industrial AI



Martin Eigner

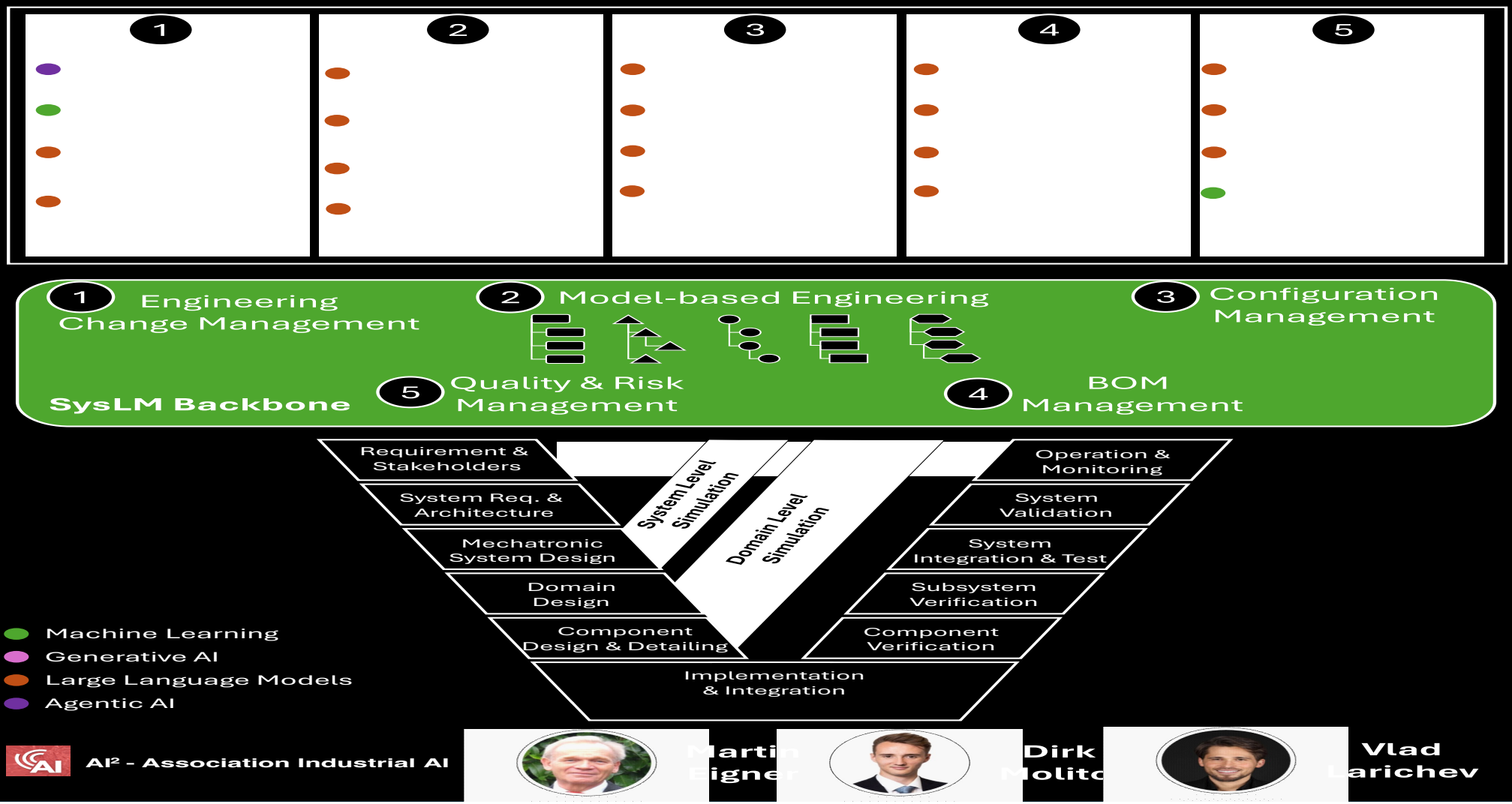


Dirk Molitor



Vlad Larichev

AI Use Cases across the V-Model - Admin



AI² - Association Industrial AI

Martin Eigner

Dirk Molitor

Vlad Larichev

From Product Knowledge to AI-Driven Engineering Change Decisions

Leveraging the Orchestrated Digital Thread as Product Memory

CONNECTED PRODUCTS. INTELLIGENT CHANGES. A MORE RESILIENT TOMORROW.

CONFIGURATION & PRODUCT CONTEXT SOURCES



Configuration Items
Parts · Documents · Requirements
Software · Test Assets



Product Structures
EBOM · MBOM · SBOM



Systems Engineering
Functions · Features · Architectures



Engineering Changes
ECR · ECO · Deviations



Compliance & Regulations
ISO 26262 · REACH · RoHS · CRA



Verification & Validation
Simulations · Test Cases · Results



Manufacturing Context
Process Plans · Resources
Work Instructions



Service & Field Intelligence
Defects · Warranty Cases
Customer Feedback

Context Integration
Normalize
Enrich
Link
Understand

AI ECM ORCHESTRATOR

Engineering Agent · Cost Agent · Compliance Agent · Manufacturing Agent · Supply Chain Agent · Approval Agent

AI ORCHESTRATION LAYER

Requirements · Software · Manufacturing · Product · Test · Configuration · Supplier · Service · Compliance

ORCHESTRATED DIGITAL THREAD
Product Memory & Knowledge Graph
Understands Relationships. Evaluates Impact. Creates Context.

End-to-End Traceability · Cross-Domain Context · Semantic Reasoning · Faster Decisions · Higher Compliance

AI Reasoning & Impact Analysis
Analyze
Simulate
Evaluate
Recommend

AI CHANGE INTELLIGENCE DASHBOARD

Cross-Domain Impact Assessment

Requirements	Critical
Software	High
Manufacturing	High
Supply Chain	Medium
Compliance	Critical

Affected Configuration Items

- Requirements
- CAD Models
- Software Components
- Test Procedures
- Manufacturing Process Plans
- Supplier Information

Recommended Actions

- Update Requirements
- Revalidate Software
- Update MBOM
- Requalify Supplier
- Generate Change Package
- Start Approval Workflow

Business KPIs

96%	82%	91%	87%
Compliance Score	Risk Score	Change Readiness	Decision Confidence



From insight to impact.
Faster, safer, more compliant.

AI does not simply process engineering changes.
AI understands products, context and consequences.

ENGINEERING A SMARTER TOMORROW.

PEOPLE. PRODUCTS. POSSIBILITIES.

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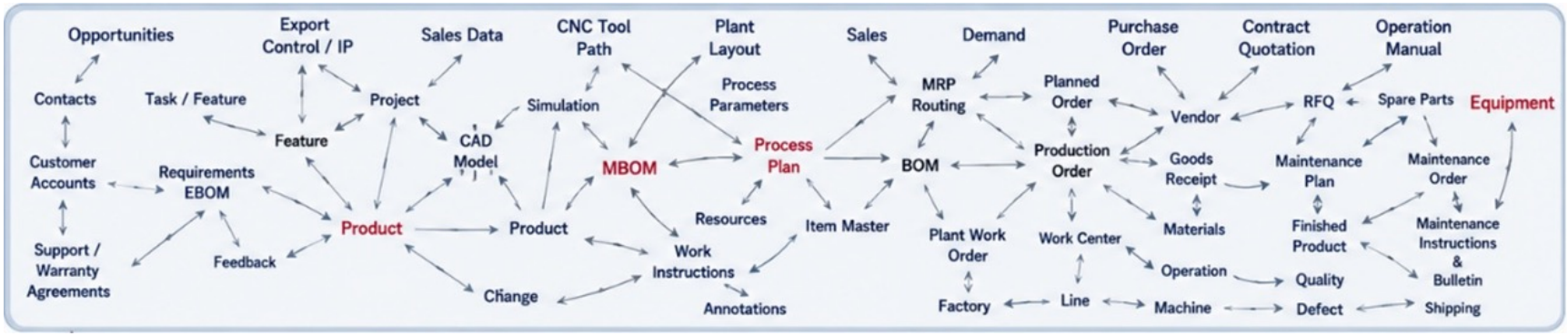
User

ECM Orchestrator & Agenten

AI ECM Orchestrator (Agent)

- Customer Agent
- Engineering Agent
- Cost Agent
- Compliance Agent
- Manufacturing Agent
- Supply Chain Agent
- Approval Agent

E2E Digital Thread



COTS

- CRM/ CPQ
- RM
- SA
- PLM
- ALM
- CAE
- MPP
- MRP/ SCM
- MRO
- Add More

Product Lifecycle

- Requirements
- System Architecture
- Design MCAD + EBOM
- Virtual & Physical V&V
- Process Planning
- Operation

COTS = Commercial Off-The Shelf

AI for Automated Assembly Planning

From Product Geometry and Manufacturing Knowledge to an AI-Generated Assembly Process

SMART
MANUFACTURING
FASTER
MORE EFFICIENT
MORE SUSTAINABLE

Manufacturing Knowledge Base



- **CAD Assemblies** — 3D models, variants, interfaces
- **Assembly Drawings** — 2D drawings, GD&T, annotations
- **Tool Libraries** — Tools, torque data, tool sequences
- **Fixtures & Tooling** — Assembly fixtures, workholding
- **Manufacturing Resources** — Machines, stations, capabilities
- **Historical Assembly Data** — Past projects, times, issues, lessons learned
- **Process Plans** — Operations, routing, cycle times
- **Work Instructions** — SOPs, visual instructions, safety
- **MBOM Structures** — Product structures, variants
- **Supplier Knowledge** — Parts, availability, constraints

Agentic Assembly Planning AI

Learning Assembly Logic from Geometry and Manufacturing Knowledge

MULTI-SOURCE KNOWLEDGE

AI AGENTS

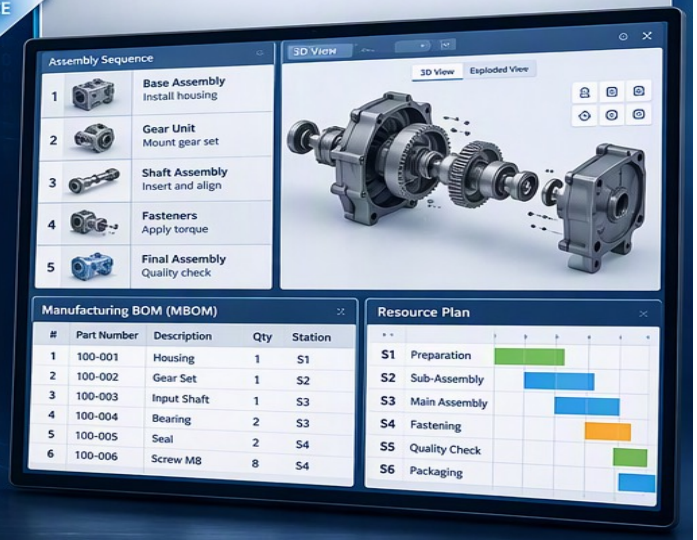
ASSEMBLY INTELLIGENCE

- Geometry Analysis
- Assembly Pattern Recognition
- Sequence Optimization
- Resource Allocation
- Manufacturing Knowledge Graph
- Automated MBOM Generation

GEOMETRY | PROCESS | RESOURCES | EXPERIENCE

AI-Generated Assembly Dashboard

- ✔ Automated Assembly Structuring
- ✔ Assembly Sequence Generation
- ✔ AI-Generated Manufacturing BOM
- ✔ Resource Optimization
- ✔ Work Instruction Creation
- ✔ Manufacturing Process Validation



AI does not just generate assembly sequences.
It understands how products can be assembled efficiently.

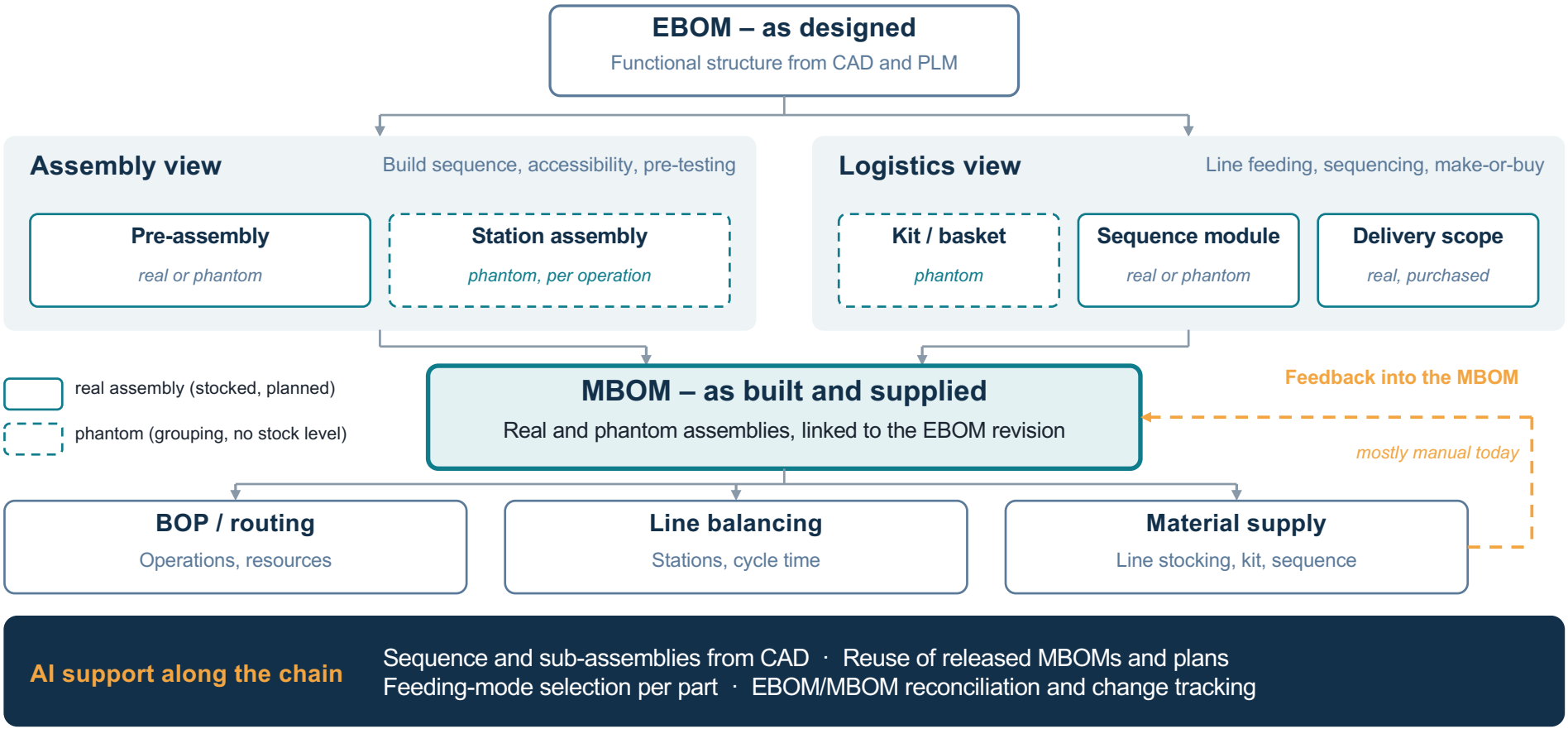
HIGHER PRODUCTIVITY
BETTER QUALITY
GREATER FLEXIBILITY
A MORE SUSTAINABLE TOMORROW

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Generated with ChatGPT

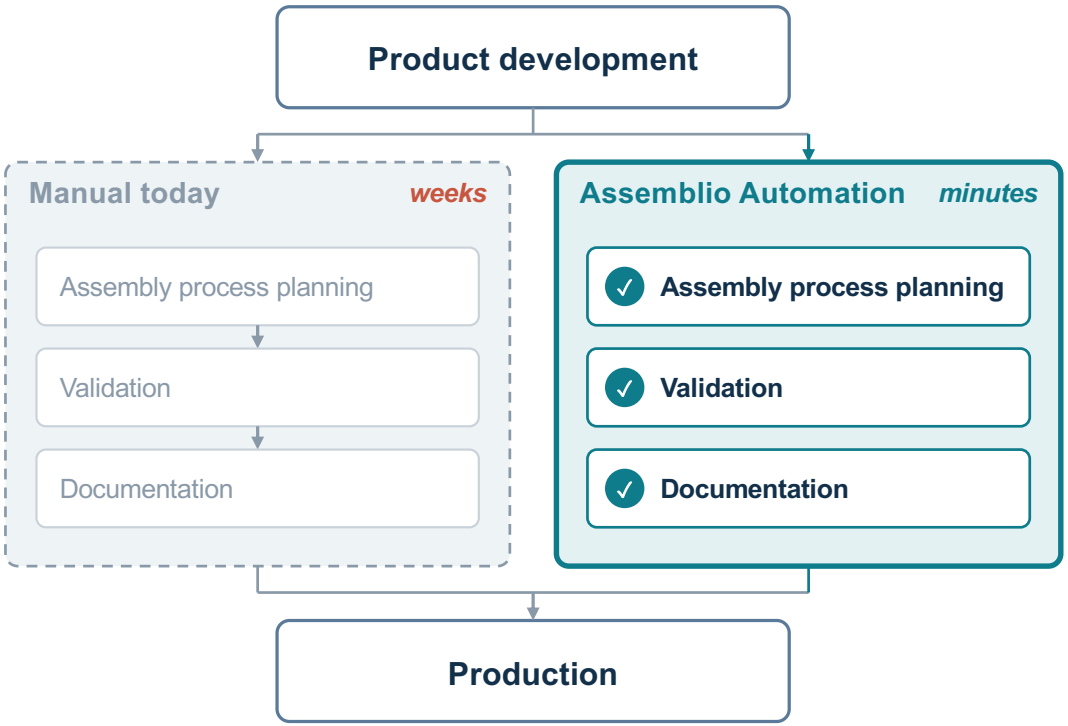
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Assembly and Logistics Views Together Shape the MBOM



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Assemblio Automates Assembly Planning – bomGPT is the Next Step



Weeks vs. minutes: time per product according to Assemblio

Outlook · announced

Fully automated with AI

Assembly AI "bomGPT" takes over the entire assembly process planning

1. **Linked to PLM**
   directly on the released product data
2. **Learns from history (PLM, MRP, MES)**
   existing products and assembly instructions
3. **Generates the MBOM**
   automatically, ready for production planning

Consistent, immediately usable data

Speed | **Precision** | **Scalability**

From CAD to MBOM and work instructions in one AI-supported chain – **linked to PLM**

AI for Automated Variant Planning

From Product Structures, Features and Configuration Rules to AI-Generated Product Variants

SMART ENGINEERING
HIGHER VARIETY
FASTER INNOVATION
MORE EFFICIENCY
A MORE SUSTAINABLE TOMORROW

Variant Knowledge Base



EBOM / MBOM Structures
Product structures and manufacturing structures



Modular Product Structures
Product decomposition and modules



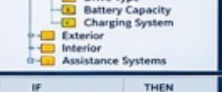
Product Platforms
Reusable platform concepts



Module Libraries
Standardized module repository



Product Variants
Existing variant portfolio



Feature Families
Feature hierarchy and groups



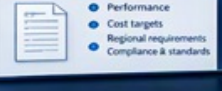
Variant Rules
Include / Exclude dependencies



Historical Configuration Data
Successful configurations and lessons learned



Generic Structures
Reusable configurable architectures



Customer Requirements
Market needs and option packages

Agentic Variant Planning AI

Learning from Product Knowledge to Generate Optimal Variants



- EBOM Analysis
- Module Analysis
- Feature Recognition
- Platform Optimization
- Rule Mining
- Dependency Detection
- Variant Generation
- Configuration Validation
- Generic Structure Creation
- Cost Optimization
- Complexity Reduction
- Knowledge Graph Reasoning



AI-Generated Variant Planning Dashboard

- ✓ Modular Structure Analysis
- ✓ Platform Identification
- ✓ Feature Mapping
- ✓ Variant Rule Generation
- ✓ Generic Structure Creation
- ✓ Include / Exclude Logic
- ✓ Configuration Validation
- ✓ Variant Optimization
- ✓ Cost and Complexity Reduction
- ✓ Manufacturing Feasibility Assessment



AI does not just generate product variants.

It understands how platforms, modules, features and rules create optimal configurations.

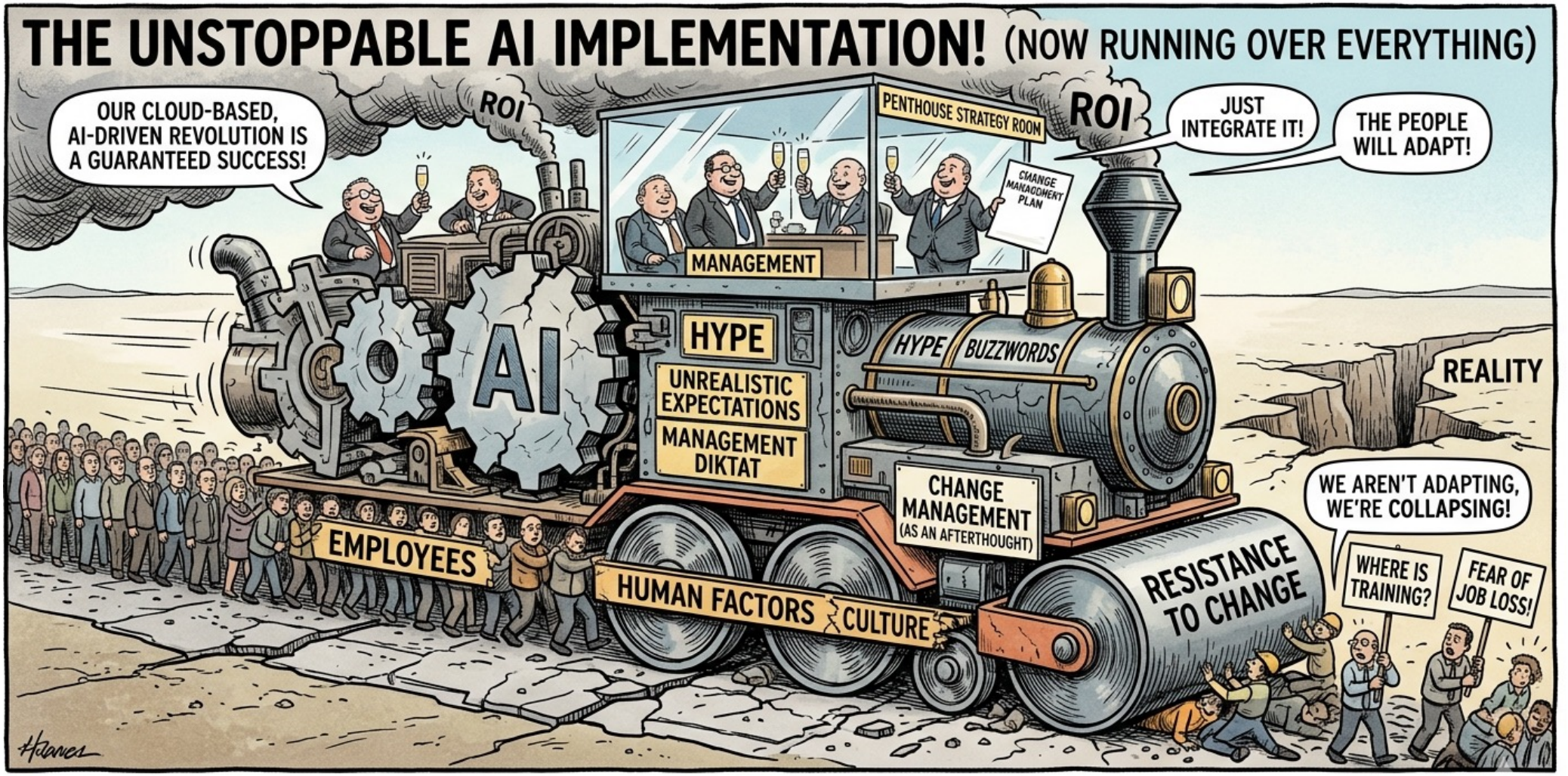
PLM | VARIANT MANAGEMENT | CONFIGURATION INTELLIGENCE

VARIETY TODAY
BETTER PRODUCTS
HAPPIER CUSTOMERS
A MORE SUSTAINABLE TOMORROW

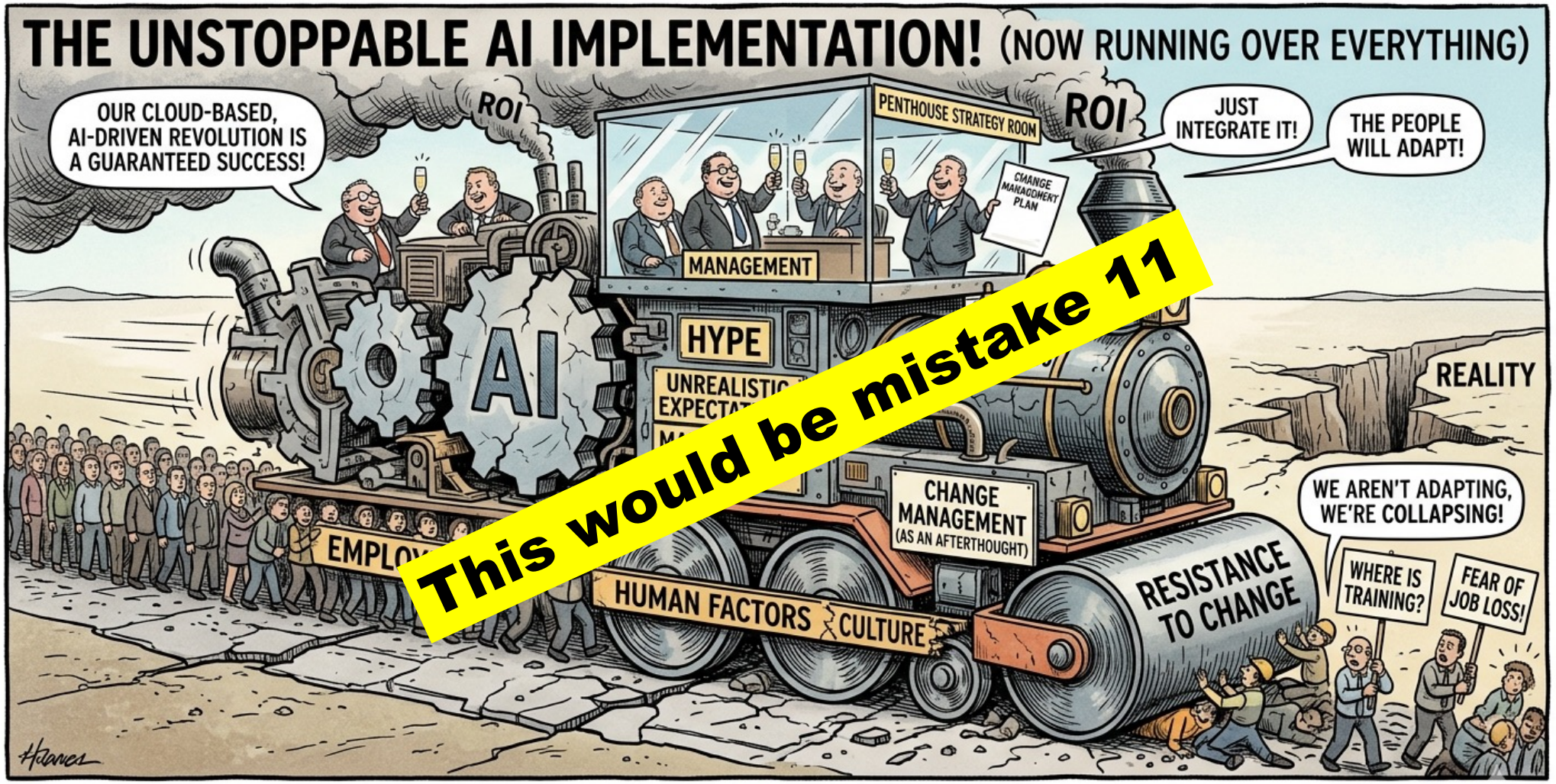
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Four Levels of AI support in Variant Management

Level	Starting point	AI task	Status October 2026
1 Derive from existing product structures	Many 100% BOMs and orders, no explicit logic	Propose generic structure, features and rules	Industrially available at Aras and ILC, research results
2 Reverse engineering of MRP logic	SAP LO-VC object dependencies, variant tables	Translate code into VarLogic (neutral Variant Logic), document, harmonize and maintain it	Partly supported by extraction tools (ILC, Configit); AI translation not yet a standard product
3 PLM logic to MRP	Transparent logic designed in PLM	Map to SAP LO-VC or AVC and other MRP variant systems	Rule-based generation exists (e.g. ILC ⁴PEP to SAP); AI can close semantic gaps and validate
4 Excel or other tables to Neutral Variant Logic	Matrices, formulas and comments in spreadsheets	Extract and formalise rules, validate them	First commercial assistants (Configit, Tacton, ILC); research prototypes

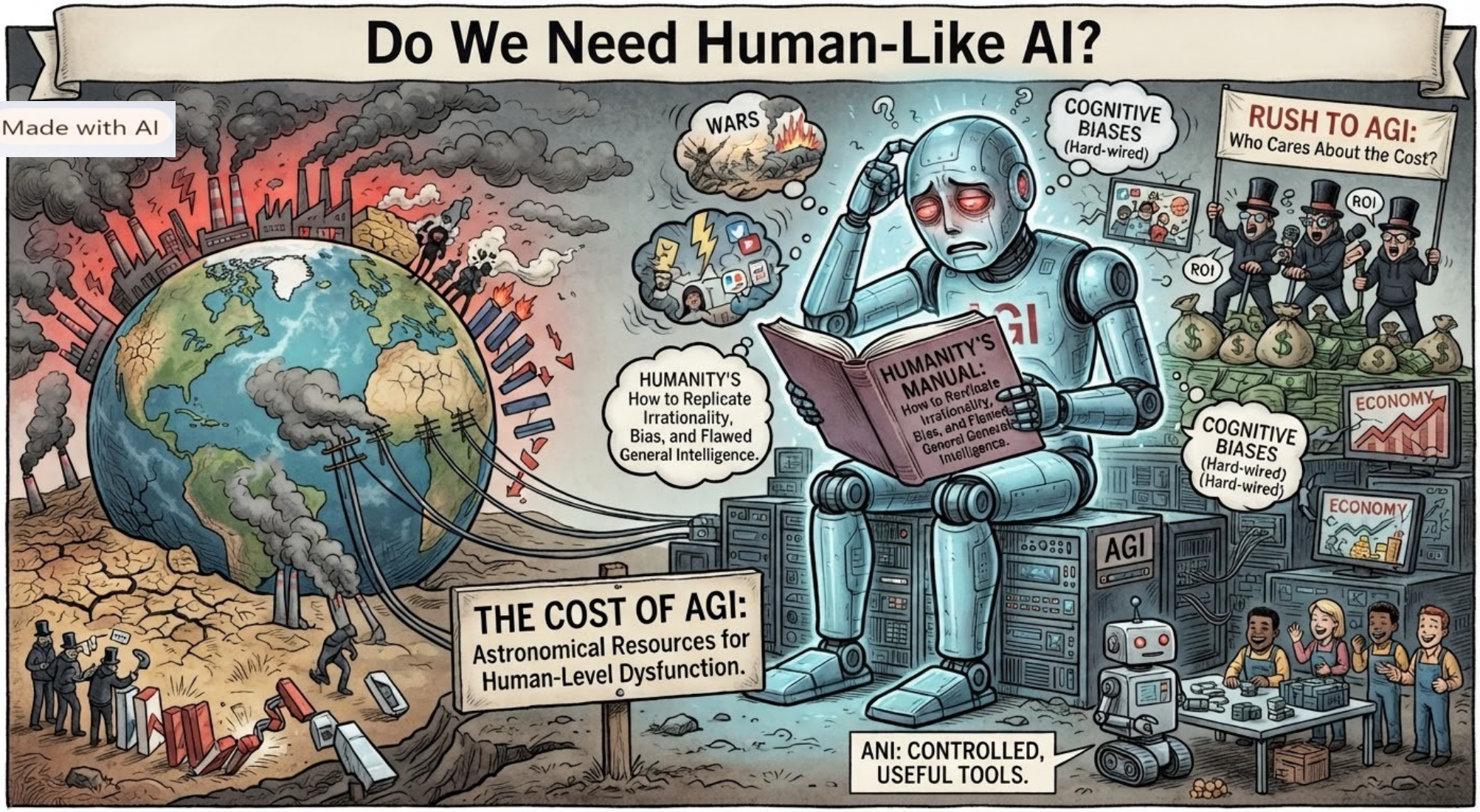


THE AI REVOLUTION: ELEVATING STRATEGY, FLATTENING HUMANITY



THE AI REVOLUTION: ELEVATING STRATEGY, FLATTENING HUMANITY

Do We Need Human-Like AI?

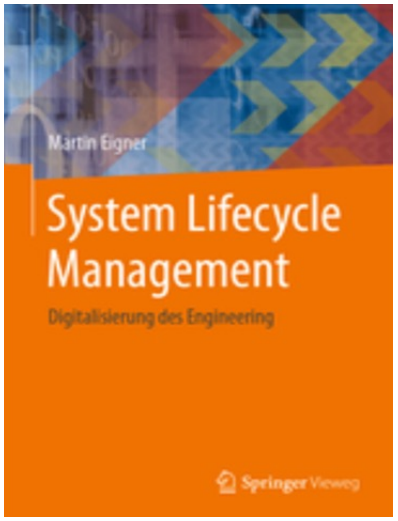


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Thank You Very Much for Your Attention



DIGITAL MODEL
Product Data
+
DIGITAL PROCESS
ECM and CM
+
DIGITAL THREAD
Traceability
=
DIGITAL TWIN
Configuration







Martin Eigner



EIGNER
Engineering Consult
Höllhäuserweg 38a
76534 Baden-Baden
eigner.engineeringconsult@gmail.com
https://eigner-ec.com

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