Continental
The Future in Motion

AI-Driven Value Creation Across the Automotive V-Cycle

Unlocking Efficiency and Quality through Smart Process Integration

www.conti-engineering.com

Continental Engineering Services

Speaker Intro

Upama Michel

- Senior Manager | Data & AI
- 12+ years in Manufacturing

Data Services

Continental Engineering Services

Empowering your digital journey

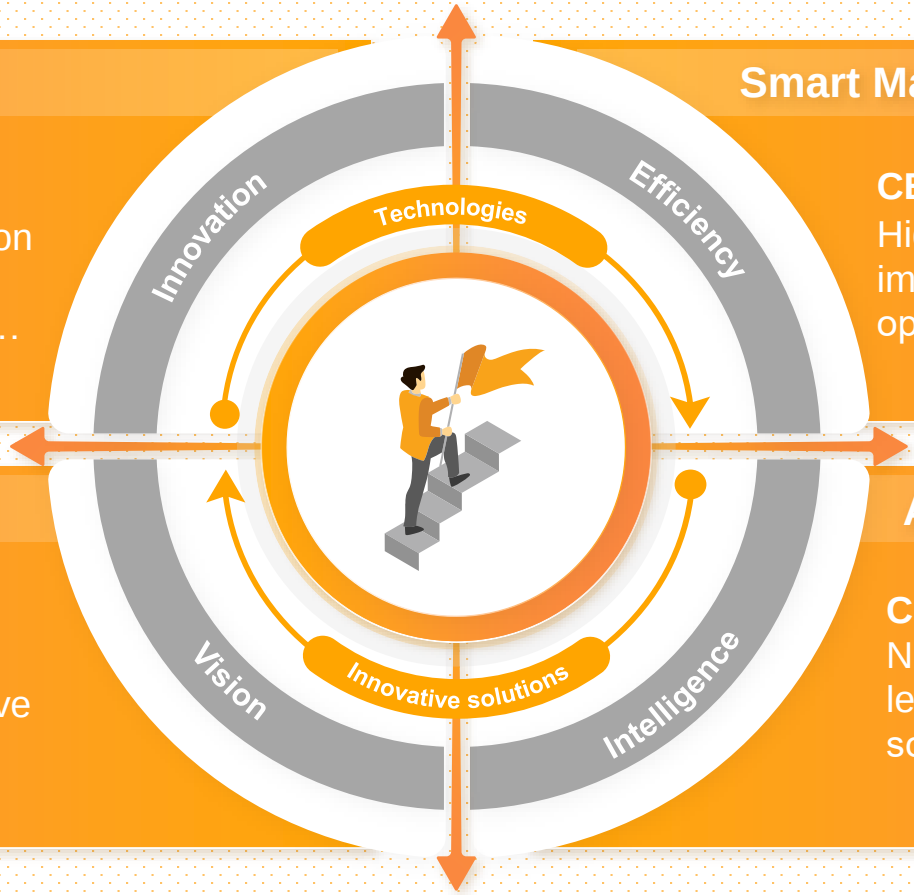
Continental Engineering Services

Digital Supply Chain

CES contribution:
Award-winning global smart allocation solution with visibility in operation disruptions, advanced inventory threshold management…

Smart Manufacturing Solutions

CES contribution:
Highly scalable and automated cpk analyzer, improved efficiency across global plant operations, integrated process optimization…



Digital Strategy & Transformation

CES contribution:
Award-winning, manufacturing-focused data literacy program, smart coaching, cloud-native solution consulting…

AI & Advanced Analytics

CES contribution:
NLP for regulation oversight, machine learning for unplanned line-down detection, scalable process automation…

Speaker Intro

Hamza Shah

- Senior Manager | Process Management
- 18+ years in R&D


Enhanced Collaboration
Setup/Enable Delivery Pipeline
Setup Dev-Stack and Manage CI/CD pipeline
Assess/Evaluate R&D processes
Based on Standards, KPIs, Value-Stream Mapping.
AI support for R&D processes
Consultants equipped with AI knowhow and tools to enhance development.
Support for conformance to EU-AI-Act.
Propose & agree on improvements
Leverage strengths, transform weaknesses into solutions.
Organize to Deliver Value
People
Process
Competitive Advantage
Project
Product
Quality and Stability of Deliveries
Deploy agile approach & monitor progress
Own and manage “rules-of-the-game” to achieve projects objectives.
Deploy improvements
Motivate team by Vision/Value, and gain commitment. Sustain by publishing standard process, and trainings.
Prepare & perform PI-Planning
In-charge of Events and their Outcomes.
Faster Releases
Customize Agile approach
Tailor Models/Methods (SAFe, LESS, Scrum, Kanban etc.) to suit Project/Product needs.

Agenda

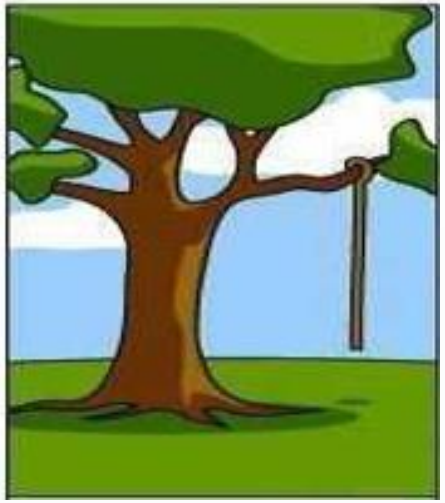
1. R&D Way-Of-Work in Automotive
2. AI across Development Lifecycle
3. AI Application and Limitations
4. Key Take-aways, Q&A
5. Q&A

Do we really need requirements?

Specification

System explained by customer

Implementation



System which was implemented

Validation

What the customer really needed

R&D Approach in Automotive

Complexity Drivers

Sheer quantity of specifications involved.

Number of Requirements

SYS, HW/SW/ME, Production, Sciences…

Disciplines Involved

Strengths
Intelligence, skills, knowledge, experience.

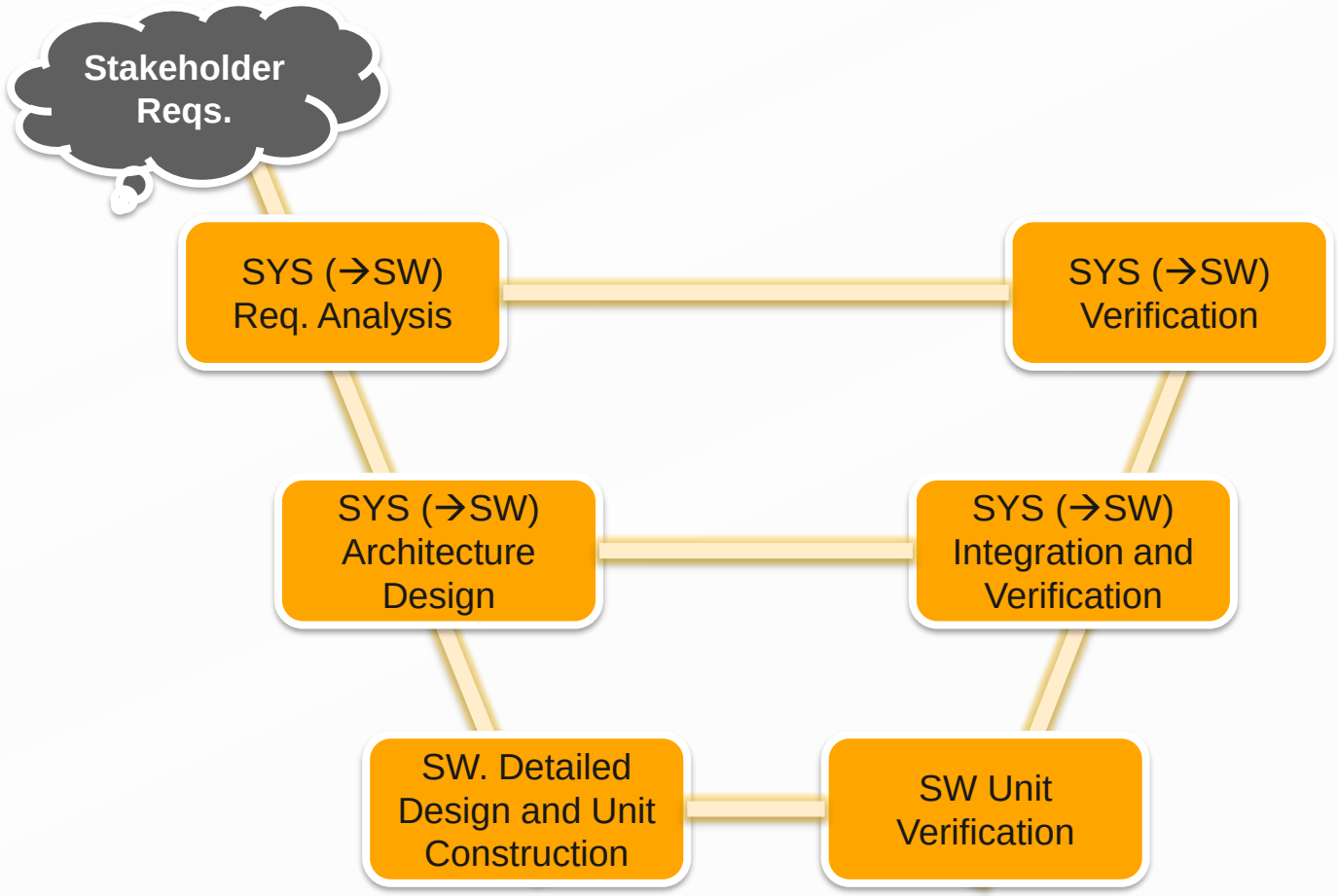
Weaknesses
Communication - Language – a lossy medium –

Human Collaboration

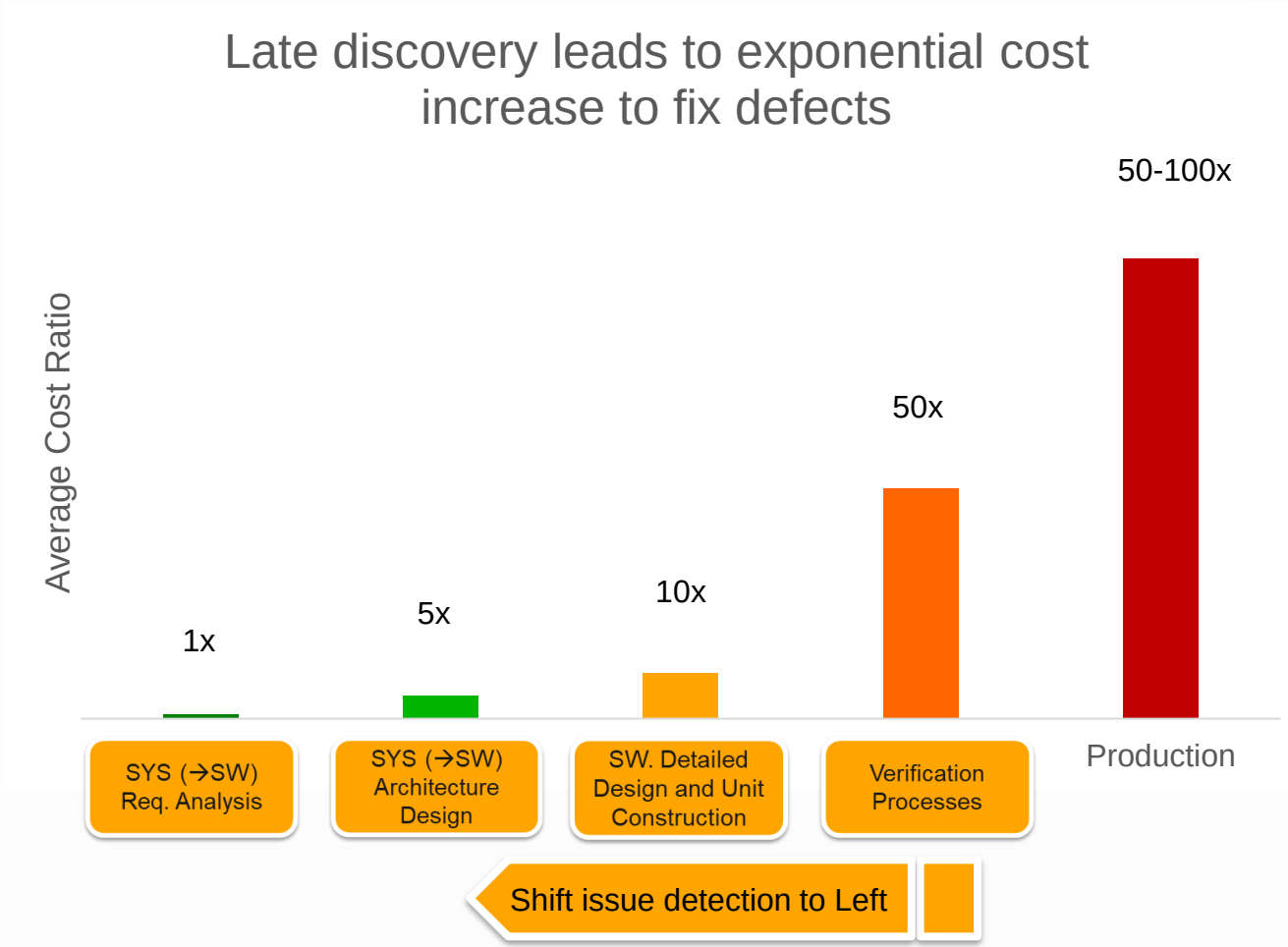
Project Complexity

R&D Approach in Automotive

Complexity – How Do We Handle It



Necessity to Uncover More Issues in Design Phase



Data represented here uses normalized median data per Phase based on various researches - compiled in a paper by NASA

Requirements Analysis Processes
Business Needs and AI Support

Confidence in Compliance:

As a PO (Product Owner), I want to ensure my product adheres to all requirements and necessary standards.

Systematic Requirements Breakdown & Tracing:

- Identify gaps between high-level and low-level requirements (e.g., SYR ↔ LTR, STR).
- Highlight contradictions and redundancies, to resolve them.

Assists requirements **break-down** to lower levels, e.g. Stakeholder Req. (STR) → Sys. Reqs. (SYR).

Decomposition Agent:

Highlights potential **contradictions** or redundancies between requirement sets.

Contradictions Checker:

Suggest matches to help **link requirements** between levels.

Traceability Agent:

Offers precise recommendations on **how to write requirements** per company's standard.

Guideline Support:

Highlight **Functional-Safety and Security** relevance of requirements.

Classification Support

Supports compliance analysis across requirements levels, **highlighting compliance gaps**.

Compliance Checker:

Architecture Design Processes

Business Needs and AI Support

Confidence in Design:

As an architect, I want to highlight which requirements cannot be hosted by the present architecture.

Systematic Analysis:

As an architect, I want to:

- Foresee issues w.r.t. desired Characteristics and Performance parameters.
- Search for efficient alternatives.

Identify issues based on **specified Characteristics and Performance parameters** from various perspectives (stress, user-perception of features)

Analysis Agent:

Suggest matches to link requirements to architectural elements.

Traceability Agent:

SW Detailed Design and Unit Construction

AI is Already Integrated in Tools

Premise

SWDD for components exists

Codebase (legacy) is available

Code Developer → **Reviewer**

Coding Assistance

Write code faster. Perform optimizations.

Static Code Analysis

Identify warnings/errors and vulnerabilities to fix before merge.

Documentation Assistance

Append (function) summaries, as per pre-defined standards.

Target: Reduce Review Findings

Achieve higher code quality by **reduction** of general and **recurring findings**.

Review visually and with varying levels of abstraction

Review code with varying levels of abstraction (by generating summaries, interaction charts etc.).

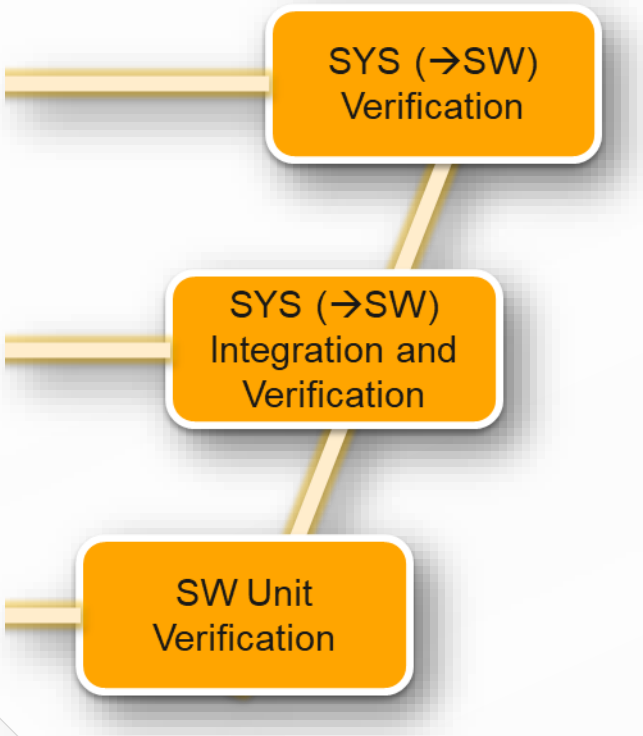
Evaluate Design

Cross-check against design decisions in **SWDD**, and **update**. Ensure trace to SWA and SWR

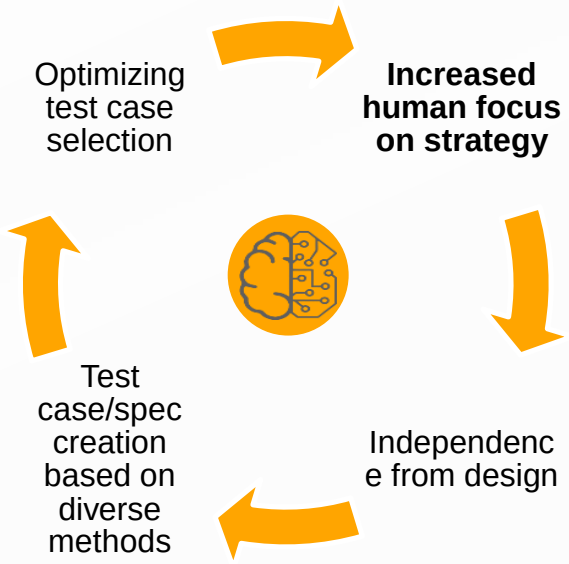
SWDD: Software Detailed Design, SWA: SW Architecture, SWR: SW Requirements

Verification Processes

AI Has Already Empowered Strategic Focus

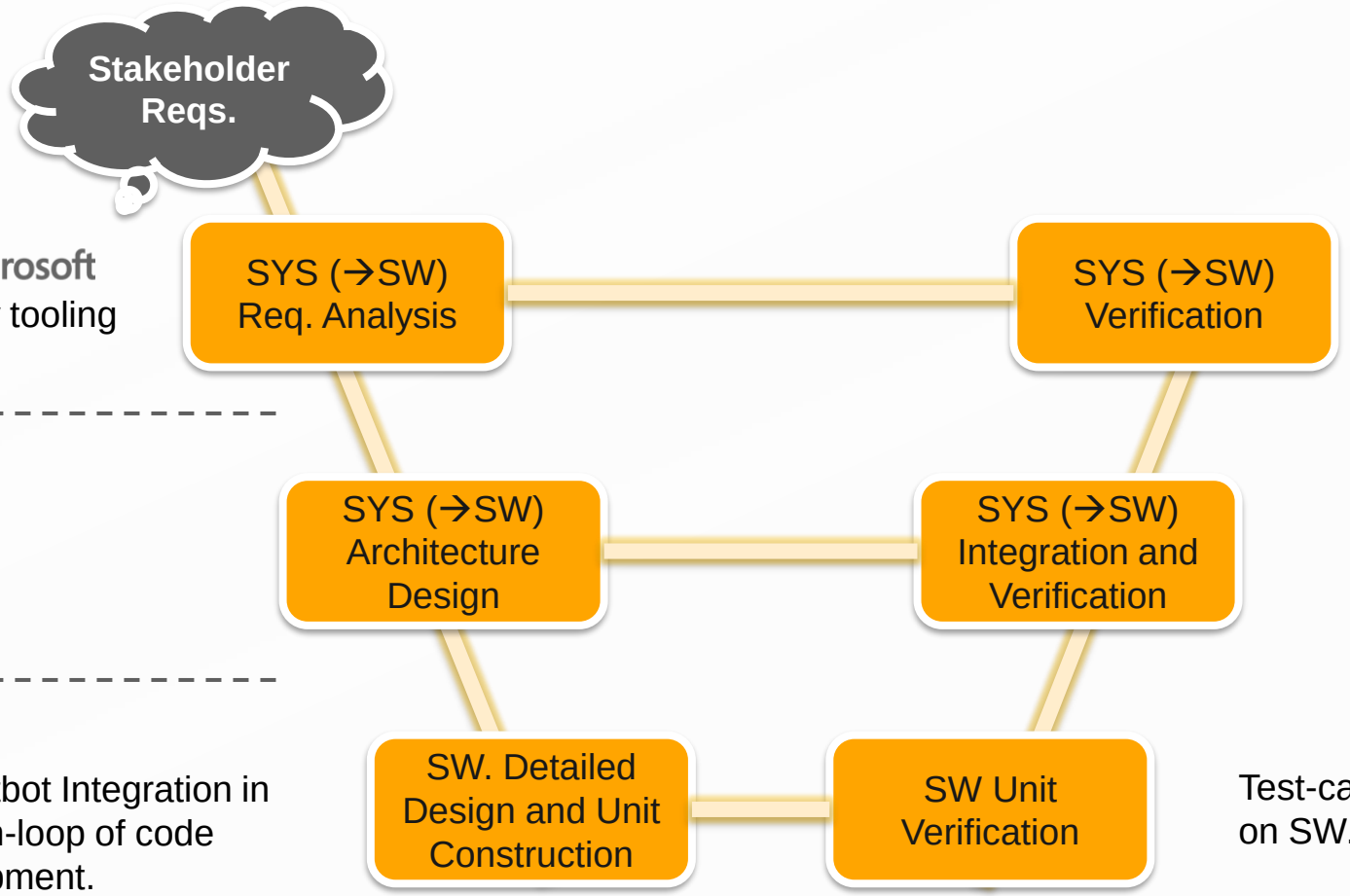


AI assisted verification is un-covering more issues by enabling:



Cost is the only limiting factor!

Where We Are at Continental



Continental Microsoft

AI-based propietry tooling deployed.

AI-powered management and enhancement of test-specs.:

- State testing e.g. HMI
- Test case selection

AI-Chatbot Integration in IDEs, in-loop of code development.

Test-case generation based on SW. Detailed Design

AI Application
Requirement Analysis

Requirements Engineering Solution

- **Solution:**
  - Gen AI based solution built on a hyperscaler
  - Uses prompt engineering to extract and categories requirements
  - Comparison against a catalogue of reusable features
- **Benefits:**
  - Process multiple documents simultaneously
  - Highly efficient on extracting requirements
  - Tabular and categorized output *(discipline, SRF/NSRF, FR/NFR)*

AI Application
Copilot

Copilot Integration into Developer Workflows

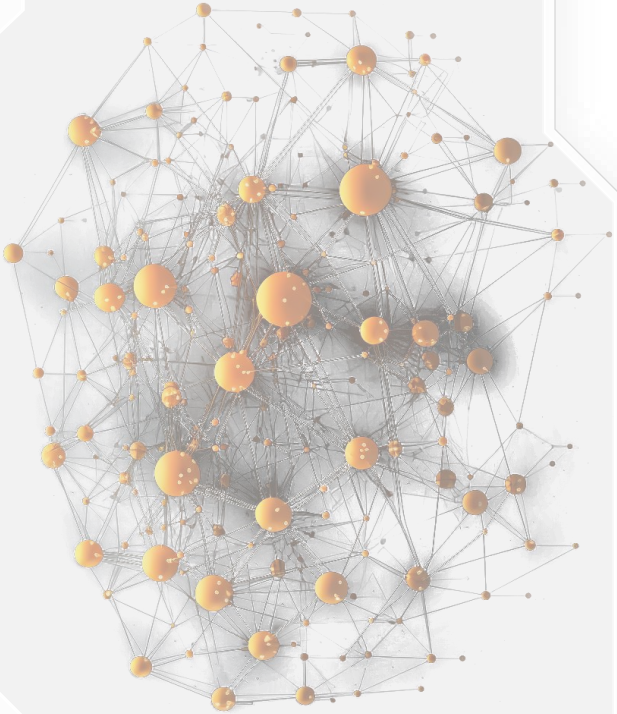
- **Solution:**
  - Copilot as part of our standard tool stack
  - Training on responsible usage
    - **Always** review AI- generated code

- **Benefits:**
  - Auto-generation of codes
  - Code refactoring
  - Improved test coverage

Limitation of AI Solutions

AI is Brilliant - Until it Meets Sarcasm, Jargon, or Your Budget!

- **Ambiguity in Natural Language** → AI struggles with vague or unclear phrasing
- **Limited Domain Understanding** → Lacks deep knowledge of specialized industries
- **Over Reliance in Training Data** → Performance depends heavily on past examples
- **Human Oversight Still Needed** → final judgement and validation require experts
- **Cost & Complexity** → Advanced tools can be expensive and hard to adopt



Limitation of AI-Solutions
Examples

- **Ambiguity in Natural Language**
  - *Example: “The system shall **support** adaptive cruise control in **all driving conditions**.”*
  - *Drivers: Context dependence, lack of quantification, implicit assumptions…*
  - *Countermeasures: Training, ambiguity detection, reference standards (e.g. ISO, ASPICE etc)*

- **Cost**
  - *Example: LLM-Based Engineering Knowledge Assistant within a hyperscaler environment*
  - *Drivers: Inference Costs + Fine-Tuning + Storage & Transfer*
  - *Countermeasures: Cost trackers, usage quotas, smaller models, hybrid solutions…*

Final Takeaways

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Integrating AI — from requirements engineering to code generation to testing — is not just about automation.

- AI enables early detection of issues, reducing overall development cost!
- Shaping the future of mobility together

Q&A

- **How can large automotive OEMs or Tier 1 suppliers develop internal capabilities in emerging technologies (like Generative AI, Platform Engineering, AR/VR) to match the agility and expertise of smaller, specialized tech firms?**
  - *Internal innovation hub, competence center, like Data Services + Access to huge pool of data + Upskilling programs*
- ***How reliable do you consider AI-generated code, test cases, etc., at this point in time?***
  - *Increasingly reliable with appropriate human oversight*
- ***Do you use AI in the early phase of product development / V-Model to process needs or requirements?***
  - *Yes*
- **How AI is useful in EV validation, operation, manufacturing and sales?**
  - *Yes, Quality (ML for NVH), Production (unplanned line down detection), HR (ticket clustering) Marketing (NLP for sentiment analysis), Legal (LLM for EU regulation)…*