

TRIZ SUMMIT 2025



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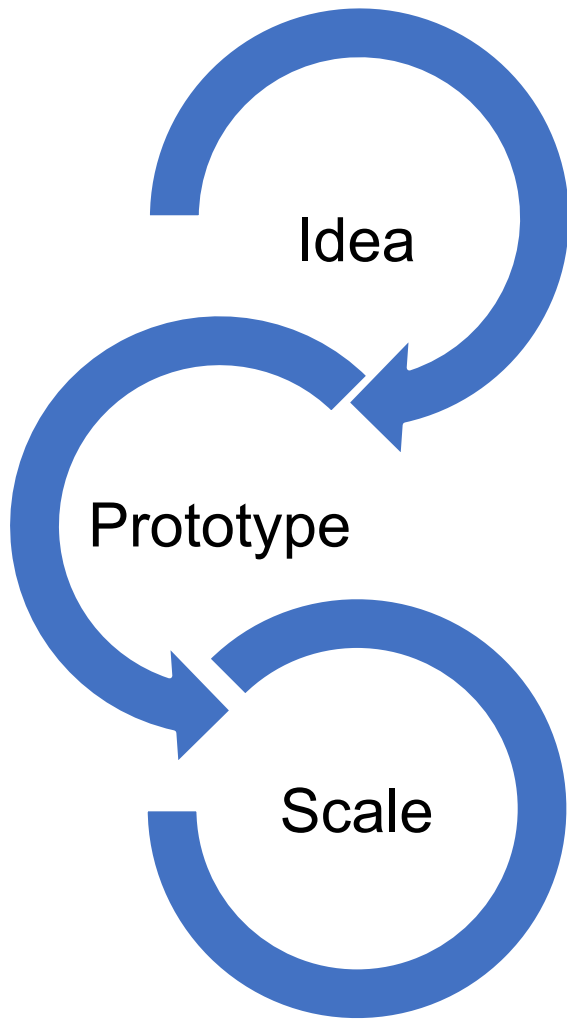
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CEO, Founder Lipongroup

Title of the report

Research (based on TRIZ tools and applications) for systems level thinking and adapting new solutions using **AI / Digital Innovation**



Practical Pathways to Scalable Innovation



- **Start Small, Think Big** – Begin with mini-projects or pilot solutions that can scale.
- **Leverage TRIZ Tools** – Use contradictions, Su-Field analysis, ARIZ, and trends of evolution to uncover unique solutions.
- **Resource Optimization** – Harness existing system resources before adding new ones to cut cost and complexity.
- **Cross-Industry Learning** – Apply TRIZ’s function-oriented search to borrow ideas from other fields.
- **Sustainability First** – Design solutions that reduce harm, cost, and environmental impact.
- **Iterative Scaling** – Test → Refine → Scale with TRIZ as a structured framework.
- **Build Patentable IP** – Use TRIZ methodology to create defensible intellectual property for long-term advantage.

Introduction

Action

TRIZ in Action

- Moving from theory to real-world industrial applications
- Applying Triz tools in real time problems

Scale

Start Small, Scale Fast

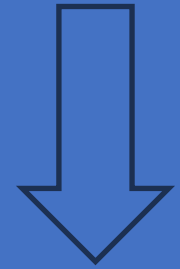
- Mini-projects as stepping stones to impactful innovations
- Collaborate with Students communities across the globe to evaluate right methodology

Impact

Innovation for Impact

- Applying TRIZ in entrepreneurship, startups, and sustainable solutions
- Share and Implement for real time impact solutions

AI



- Quality Tools
- Triz Methodology
- Human behavior sciences
- Emotions and Intelligence
- Social Impact

Comparison of Tradition tools to AI tools

Quality Dimension	Tech Optimizer / TRIZ Modules	AI & Digital Innovation
Quality of Manufacturing (Processes)	Trimming	AI-driven process monitoring, predictive maintenance, IoT sensors for real-time quality control
Quality of Product	Principles & Effects	Digital twins, AI-based defect detection, automated inspection with computer vision
Value or Cost / Benefit-Cost Ratio	Trimming	AI-driven cost optimization, predictive analytics for ROI, ERP-based decision support
Competitiveness	Feature Transfer	Digital benchmarking, AI-assisted product differentiation, market trend prediction
Environmental Quality	Effects & Prediction	AI-enabled emissions monitoring, lifecycle assessment software, predictive sustainability analytics

Advanced tools

- 1. Contradiction Matrix & 40 Principles
- 2. Substance-Field Analysis (Su-Field)
- 3. ARIZ
- 4. Trends of Evolution – AI & Digital innovation
- 5. Function-Oriented Search
- 6. Ideality & Resource Utilization

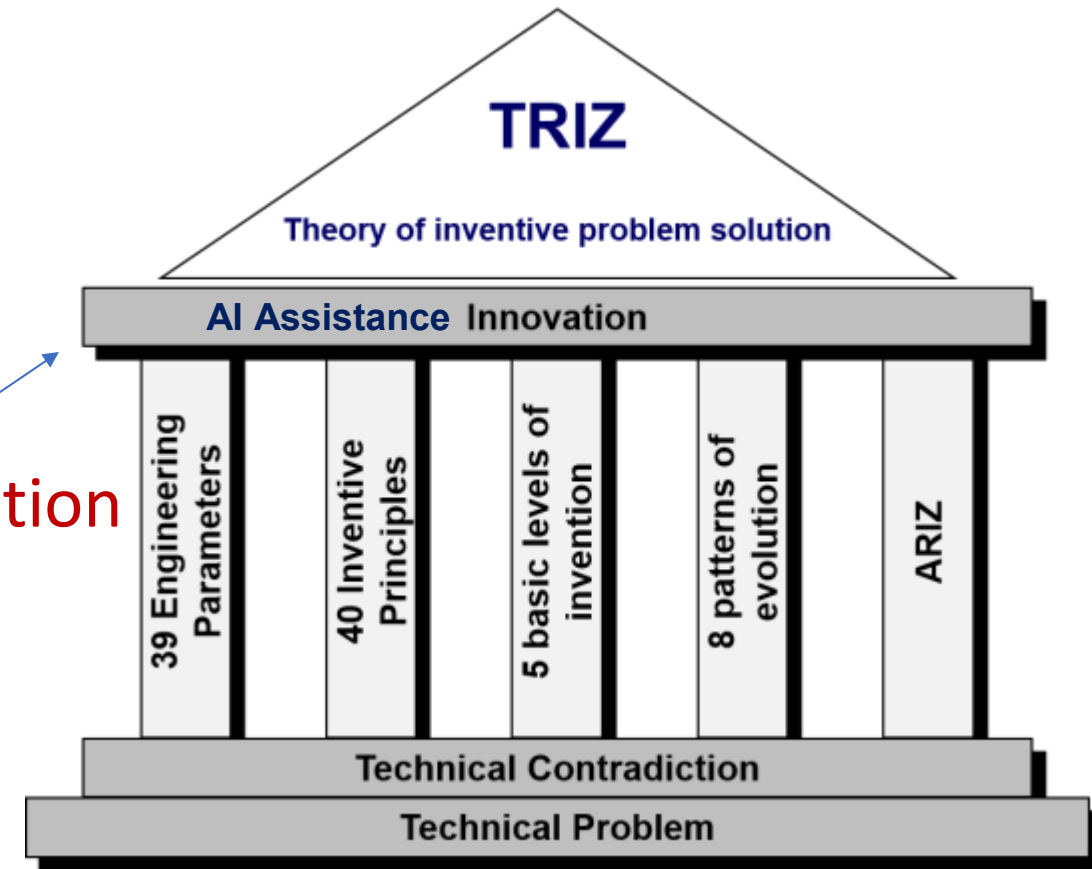
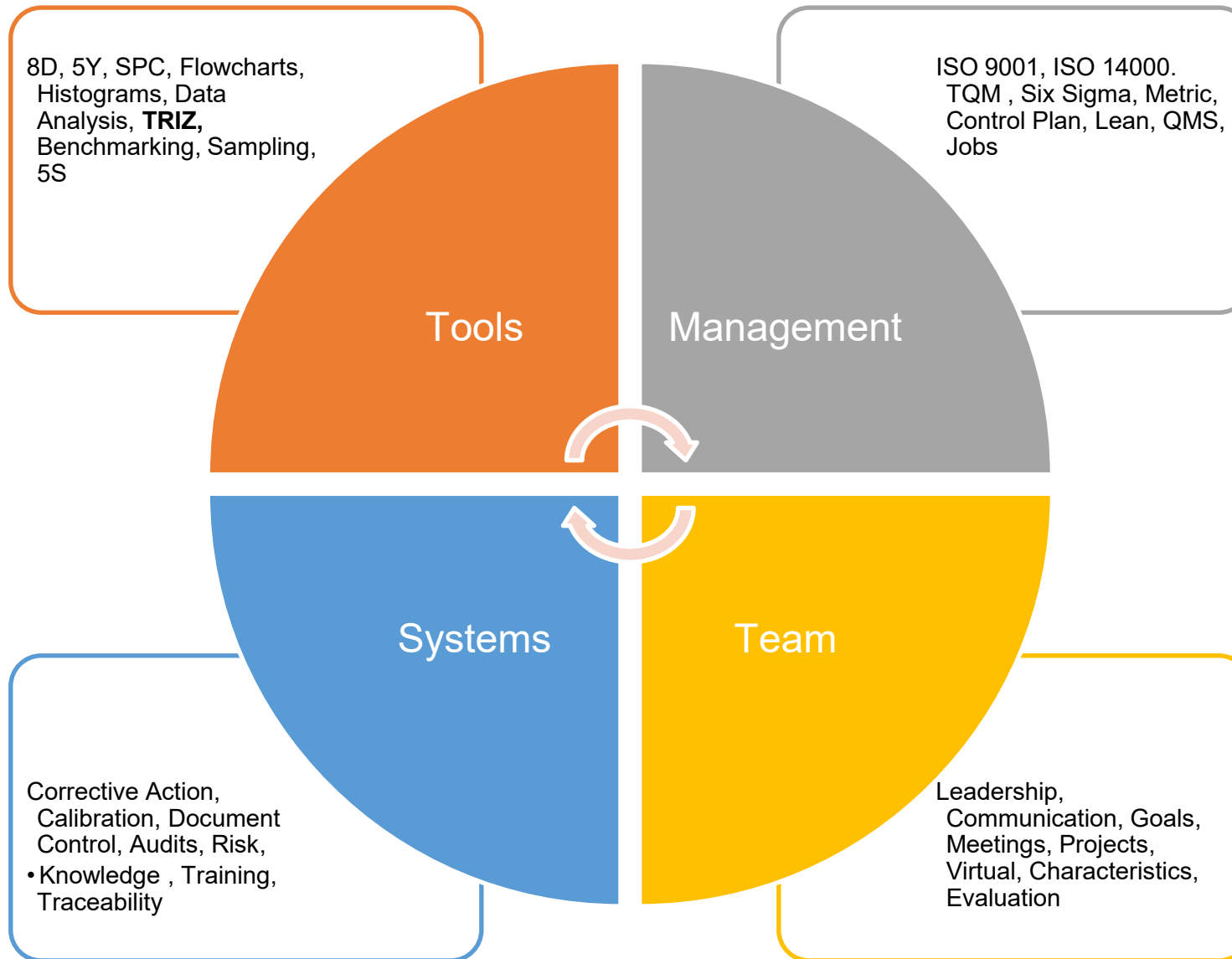


Fig: House of Innovation

TRIZ / Quality Tools – Business Impact



CONTRADICTIONS & INVENTIVE PRINCIPLES

Core of TRIZ: Resolve contradictions without compromise

EFFICIENCY



COST



BUSINESS IMPACT

Reduced energy bills, sustainable competitiveness



SEGMENTATION

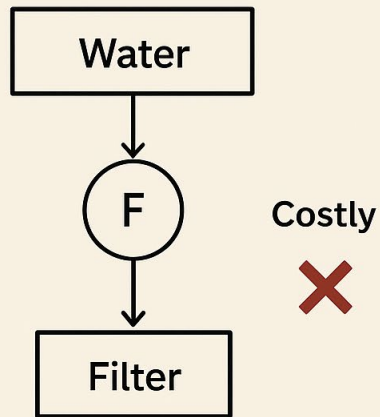


DYNAMIZATION

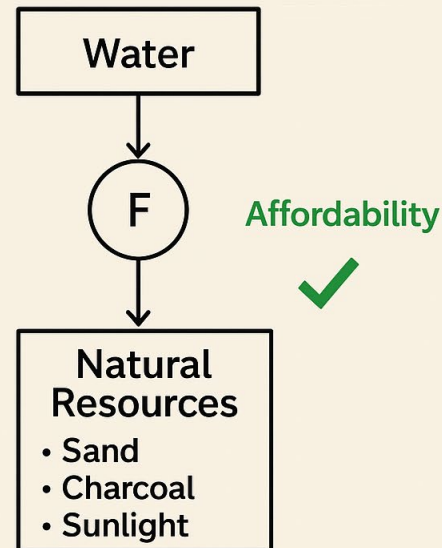
Su-Field Analysis

Su-Field Diagram

Original System



New Solution



Key analysis:

- **System Simplification:** Often the existing S2 (costly filters) is unnecessary; natural substances can do the same job.
- **Field Optimization:** Instead of forcing a mechanical or chemical field, use natural forces (gravity, adsorption, UV).
- **Harm Reduction:** Identify and remove interactions causing environmental, financial, or operational harm.
- **Innovation Insight:** Su-Field Analysis encourages thinking in terms of **interactions**, not just components, which often reveals hidden opportunities.



S1	F	S2	Notes
Contaminated water	Mechanical + chemical + gravitational + UV	Natural sand, charcoal, sunlight	No costly synthetic filters, scalable, low maintenance

AI tools in simplification

System Simplification

Challenge: Existing systems (like costly S2 filters) may be over-engineered, performing functions that simpler or natural alternatives could achieve.

AI Contribution:

Predictive Analysis: AI can model the performance of alternative natural substances and predict if they can replace costly components without compromising quality.

Material Screening: Machine learning (ML) algorithms can analyze large databases of materials (e.g., natural adsorbents, UV-sensitive compounds) to identify suitable substitutes.

Simulation: AI-driven simulations can test “what-if” scenarios, showing how removing or replacing components affects system performance.

Result: Significant cost savings and reduced complexity with validated solutions.

Field Optimization

Challenge: Traditional solutions often rely on forced fields (mechanical, chemical), which may be energy-intensive or environmentally harmful.

AI Contribution:

Natural Force Mapping: AI can analyze system behavior to identify where gravity, adsorption, or UV effects are sufficient, reducing the need for artificial fields.

Optimization Algorithms: AI optimizers can balance process parameters (flow, exposure time, etc.) to maximize natural effects efficiently.

Predictive Maintenance: By understanding natural field efficiencies, AI can suggest when minor adjustments are needed rather than major mechanical interventions.

Result: Energy-efficient processes with minimal environmental impact.

Su-field Analysis

Harm Reduction

Challenge: Traditional solutions often rely on forced fields (mechanical, chemical), which may be energy-intensive or environmentally harmful.

AI Contribution:

Interaction Analysis: AI models can detect hidden harmful interactions between components, chemicals, or processes.

Risk Prediction: ML can predict potential failure points or pollutant generation based on historical and real-time data.

Optimization for Safety: AI can propose modifications to remove harmful interactions while maintaining system effectiveness.

Result: Energy-efficient processes with minimal environmental impact.

Innovation Insight (Su-Field Analysis)

Challenge: Traditional thinking focuses on components rather than the interactions between them.

AI Contribution:

Interaction Modeling: AI tools can model and visualize interactions at multiple levels (chemical, mechanical or operational), revealing hidden opportunities for innovation.

Pattern Recognition: AI can learn from existing solutions across industries to suggest novel ways to modify interactions instead of components.

Idea Generation: AI-driven generative design or reasoning system can propose alternative configurations that a human designer might not consider.

Result: Energy-efficient processes with minimal environmental impact

Conventional Vs AI Triz Tools

Aspect	Traditional / Conventional Tools	Real-Time Example (Traditional)	AI-Supported Tools	Real-Time Example (AI)
Problem Analysis	Manual identification of contradictions; brainstorming and experience-based methods.	Engineers identifying pump clogging due to incompatible materials by reviewing system logs.	AI analyzes large datasets to detect hidden contradictions automatically.	Predictive maintenance AI detects potential clogging in pipelines before it occurs using sensor data.
System Simplification	Experts evaluate components and suggest simplifications; trial-and-error testing.	Replacing multi-stage filters with simpler media based on lab tests.	AI simulates system performance with alternative components or natural substances.	AI proposes natural adsorbents to replace costly chemical filters in water treatment plants, validated via simulations .
Field Optimization	Rely on standard mechanical/chemical/electrical solutions; intuition-driven.	Manually adjusting pump speed or chemical dosing in water treatment.	AI models natural forces (gravity, adsorption, UV) and optimizes parameters.	AI-controlled wastewater system adjusts flow to use gravity and UV disinfection efficiently, reducing chemical use .
Harm Reduction	Experts identify harmful interactions based on experience or regulations.	Operators reducing chemical spills in processing plants by standard SOPs.	AI predicts harmful interactions before they occur; enables proactive mitigation.	AI predicts hazardous reactions between chemicals in real-time, triggering automatic adjustments in chemical dosing .
Innovation Insight / Su-Field Analysis	Manual mapping of component interactions using TRIZ matrices.	Engineers modifying conveyor belts by adding rollers to reduce friction.	AI visualizes and simulates multi-level interactions, revealing hidden opportunities.	AI simulates mechanical, thermal, and chemical interactions in a production line, proposing a novel modular assembly reducing energy use by 20% .

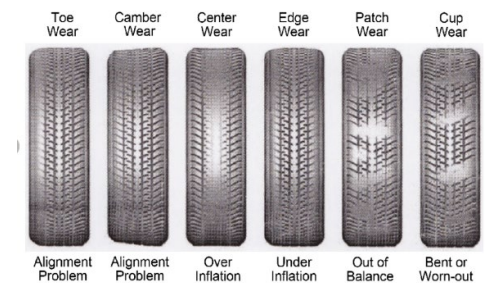
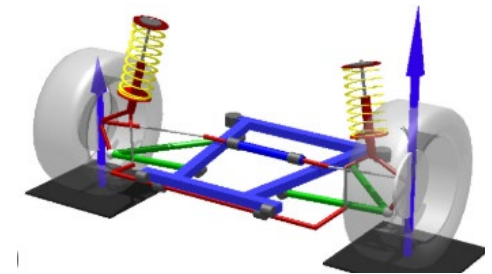
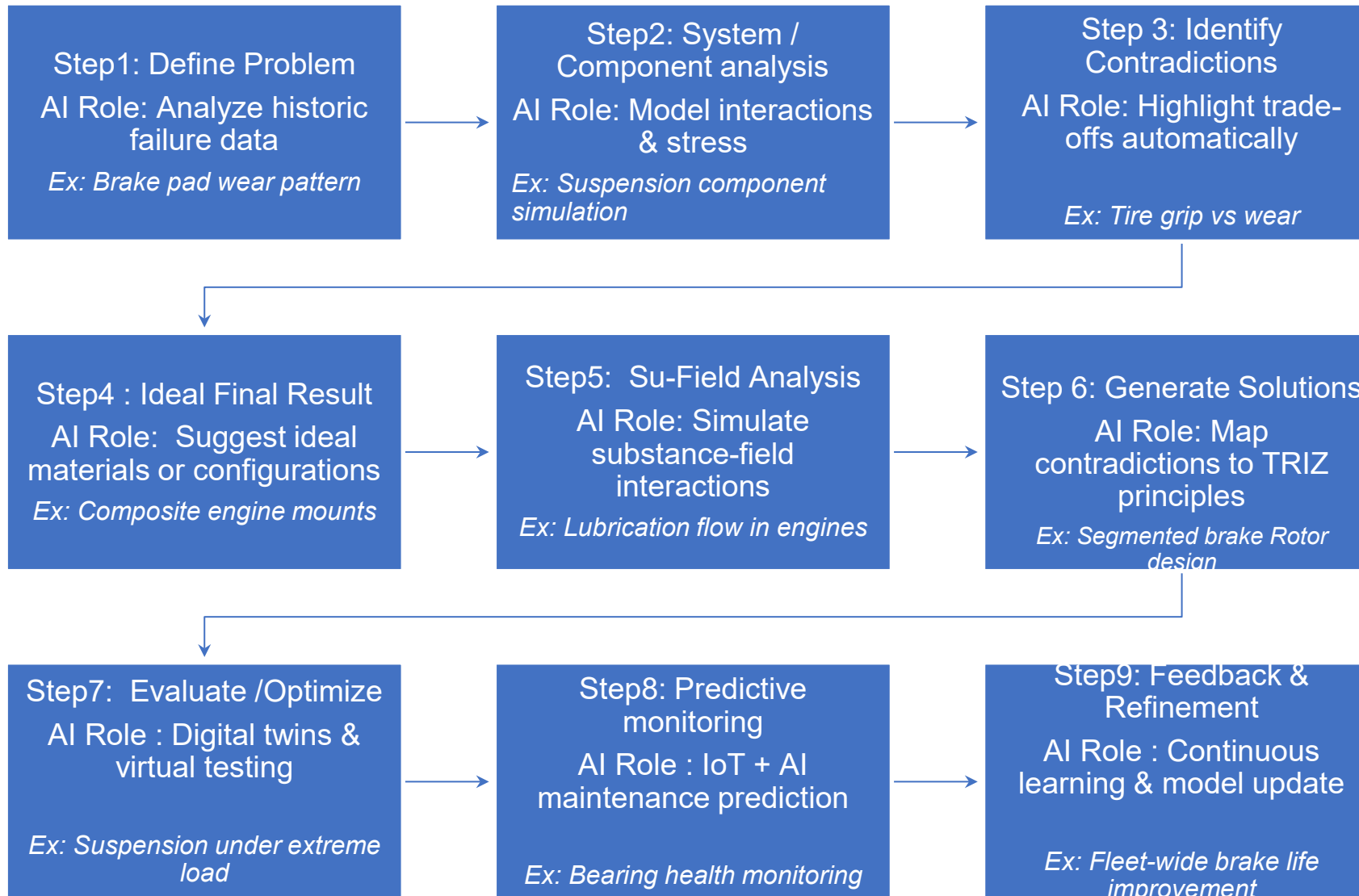
Conventional Vs AI Triz Tools

Aspect	Traditional / Conventional Tools	Real-Time Example (Traditional)	AI-Supported Tools	Real-Time Example (AI)
Idea Generation	Brainstorming sessions, morphological charts, TRIZ 40 principles applied manually.	Design team generates new ergonomic tool handles using TRIZ principal "Segmentation".	AI generative design proposes multiple novel solutions exploring permutations beyond human intuition.	AI generates hundreds of design alternatives for drone frames optimizing weight, strength, and material cost.
Knowledge Integration	Dependent on expert knowledge and case studies; slow knowledge transfer.	Engineers referencing past project manuals to design pipelines.	AI integrates multi-industry datasets, patents, research, and TRIZ solutions.	AI analyzes thousands of patent filings to suggest a novel filtration method for air purification systems.
Speed & Scalability	Manual, slow, resource-intensive; scaling requires more experts.	R&D team testing each filter modification sequentially.	Fast, automated, scalable; analyzes thousands of variables simultaneously.	AI simulates 10,000+ filter configurations in hours for optimal performance in industrial water systems.
Validation & Testing	Physical prototyping or simulations based on human input; iterative and time-consuming.	Building multiple physical prototypes of a pump impeller to test efficiency.	AI-driven simulations and digital twins allow rapid virtual testing.	Digital twin of a chemical plant tests new valve configurations virtually, reducing prototyping time by 70%.
Decision Support	Relies on human judgment; subject to bias.	Operators deciding on maintenance schedules based on historical data.	Data-driven decision support with predictive outcomes and risk analysis.	AI recommends optimal maintenance schedules for wind turbines, reducing downtime and repair costs.

ARIZ vs TRIZ AI tools

- Structured approach for complex problems
- Steps: Problem definition → Contradiction → IFR → Resources → Solution
Example: Failure prediction in automotive components
- Used contradiction mapping + predictive analytics for reliability

Steps: ARIZ & Triz AI



Future: Trends of Technological Evolution

Evolution paths: Mono → Multi → Dynamic → Adaptive

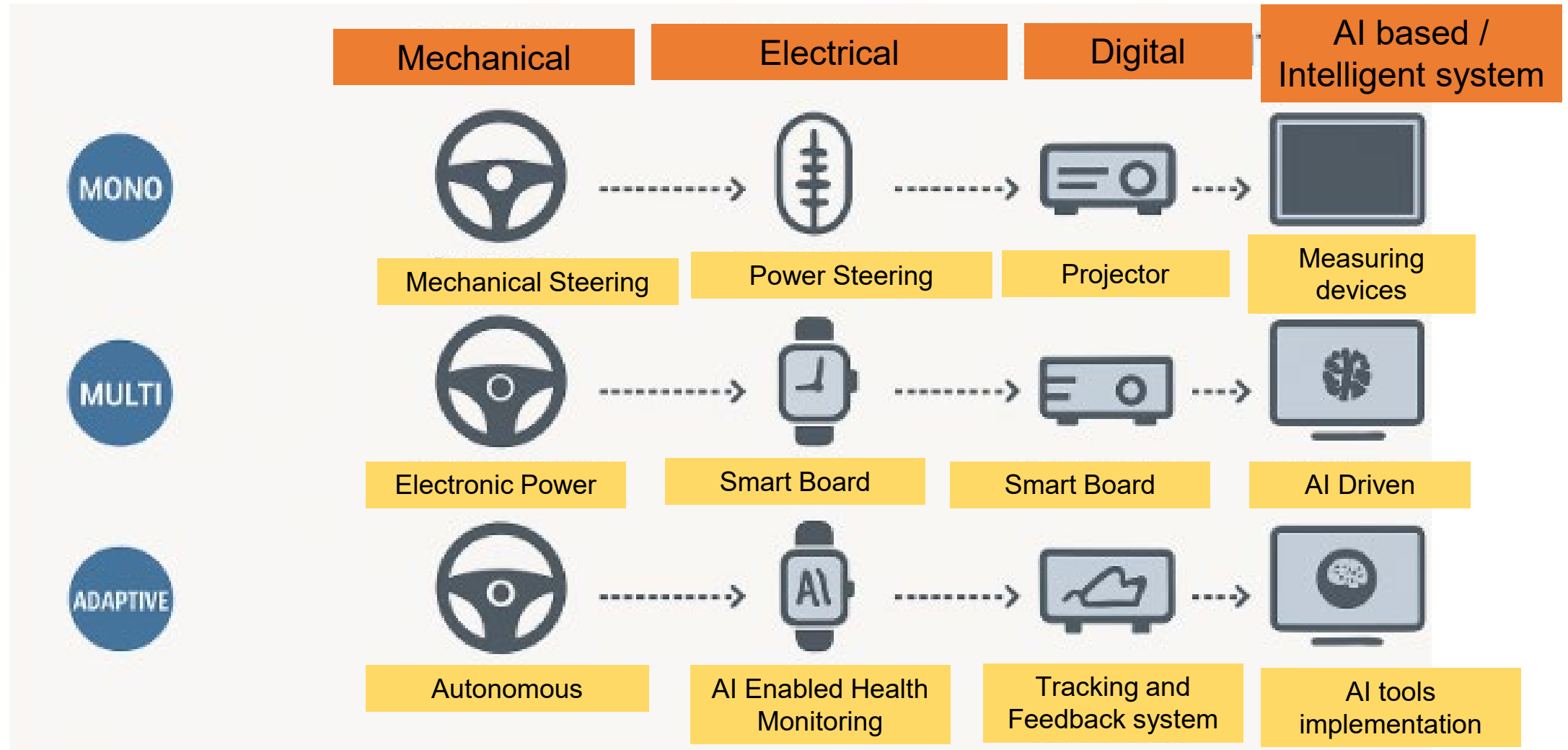
Transition: Mechanical → Electronic → Digital → Intelligent systems

Example:

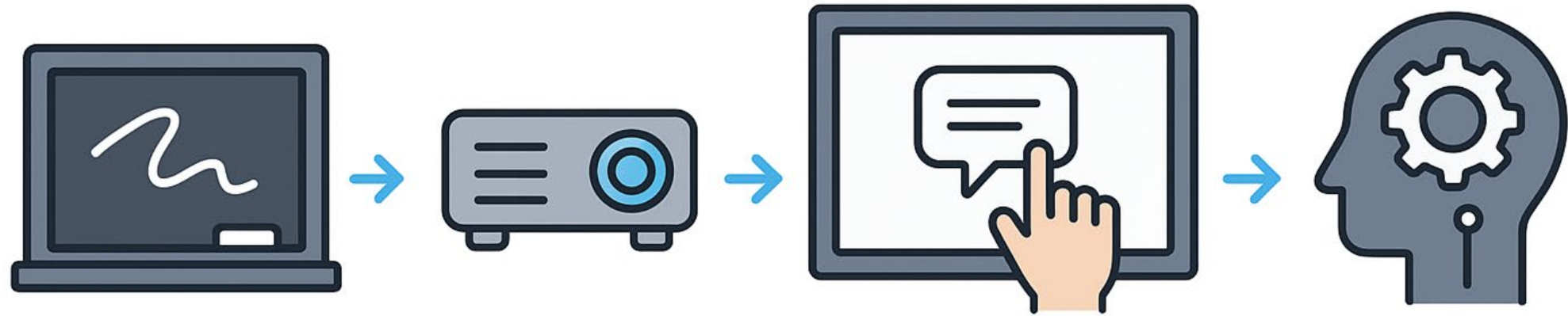
Smart classrooms – Chalkboard → Projector → Smart boards → AI tools

- Takeaway: TRIZ forecasts technology evolution

Ex: Technology Evolution : Resources



Impact of Smart AI Classrooms



CHALKBOARD

PROJECTOR

SMART BOARD

AI TOOLS



Smart Class rooms: AI tools

Aspect	Traditional TRIZ Tools	AI-Supported TRIZ Tools	Smart Classroom Example
Problem Identification	Human experts analyze contradictions manually (e.g., “we need better visibility but chalk causes dust”).	AI scans classroom data (e.g., video/audio logs, engagement analytics) to detect where contradictions exist.	AI identifies that projector content is visible but students disengage after 15 mins → contradiction: visibility ↑ but engagement ↓.
Contradiction Matrix / 40 Principles	Human selects inventive principles from TRIZ handbooks (e.g., segmentation, dynamization).	AI recommends TRIZ principles automatically by mining large education datasets and past solutions.	Instead of manual principle lookup, AI suggests “Segmentation” (divide lessons into short interactive modules).
Su-Field Analysis	Teacher/researcher models interactions between substances & fields.	AI simulates and optimizes interactions (e.g., student-attention + multimedia field + adaptive learning tool).	AI predicts how changing lighting/audio influences student focus with smart boards.
ARIZ (Algorithm of Inventive Problem Solving)	Manual, step-by-step logical approach requiring expertise.	AI accelerates ARIZ steps: problem modeling, root-cause analysis, contradiction resolution.	AI applies ARIZ to detect that projector solves visibility but causes passive learning → recommends Smart Board.
Forecasting Evolution (Laws of Tech Evolution)	Experts forecast technology paths by TRIZ laws (Mono → Multi → Dynamic → Adaptive).	AI models evolution trends using patent analysis, usage data, and TRIZ laws.	AI shows trajectory: Chalkboard → Projector → Smart Board → AI adaptive tutor → future AR/VR immersive classrooms.
Knowledge Base	Relies on TRIZ literature, expert training, case libraries.	AI pulls from global patent databases, research papers, classroom performance analytics.	AI mines thousands of “EdTech” patents to suggest next-gen adaptive tools for classrooms.
Speed & Scale	Manual, slower, depends on expertise availability.	Automated, faster, scalable across many schools & regions.	Instead of one teacher experimenting, AI applies TRIZ to optimize learning across thousands of classrooms.
Bias / Limitations	Relies on expert’s subjective interpretation.	Risk of AI bias from limited or noisy data.	AI may misinterpret cultural/learning context if dataset is skewed.

Advantages Vs Disadvantages

$$\text{Ideality} = \text{Benefits} / (\text{Cost} + \text{Harm})$$

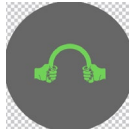
- Goal: Maximize benefits, minimize cost & harm
- Emphasizes using hidden resources in system

Example: Local resource-based water filtration

- Outcome: Sustainable innovation at low cost

Differences between Traditional TRIZ tools vs AI TRIZ tools

Feature	Traditional TRIZ	AI TRIZ
Problem Analysis	Manual identification of contradictions and patterns.	AI can automatically detect contradictions in text, drawings, or system descriptions.
Solution Generation	Based on 40 principles, separation techniques, and human creativity.	AI suggests solutions using historical data, patent databases, and predictive modeling.
Speed	Slower; depends on user's skill.	Faster; can process large datasets and multiple iterations quickly.
Knowledge Base	Limited to what the practitioner knows and TRIZ reference manuals.	Huge, including patents, technical databases, research papers, and real-time data.
Flexibility	Requires adaptation by user; creativity-driven.	Suggests optimized solutions but may lack unconventional creativity unless trained broadly.
Learning Curve	Steep; requires training in TRIZ methodology.	Lower for the user; AI handles much of the methodology, but understanding AI outputs is necessary.
Visualization & Modeling	Manual sketches, charts, functional analysis diagrams.	Automated diagrams, solution maps, and simulation-based predictions.



Advantages

Advantages

Traditional TRIZ

- **Deep Understanding** – Enhances human problem-solving skills and domain knowledge.
- **Creativity & Flexibility** – Encourages out-of-the-box solutions.
- **No Technology Dependence** – Works without software or databases.
- **Proven Track Record** – Used successfully in engineering and R&D for decades.

AI TRIZ

- **Speed & Efficiency** – Processes large datasets and generates multiple solution options rapidly.
- **Knowledge Expansion** – Accesses global patents, research, and real-time data beyond human memory.
- **Error Reduction** – Minimizes oversight in identifying contradictions or patterns.
- **Decision Support** – Offers prioritized solutions based on predicted feasibility and impact.
- **Integration** – Can be embedded with CAD, PLM, or simulation tools for automated innovation workflows.

Disadvantages

Traditional TRIZ

- Time-Consuming – Manual analysis can be slow.
- Human Bias – Limited by practitioner experience or perspective.
- Scalability Issues – Difficult for large systems or massive patent analysis.
- Requires Expertise – High learning curve for effective application.

AI TRIZ

- Data-Dependent – Requires high-quality datasets; bad input → bad solutions.
- Less Human Intuition – May miss unconventional or “wild” ideas.
- Technical Complexity – Users need to interpret AI outputs carefully.
- Cost & Resources – Developing or using AI TRIZ software can be expensive.
- Over-Reliance Risk – Users might trust AI blindly, reducing critical thinking.

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Q&A SESSION



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THANK YOU!
Спасибо!

