China Academy of Information and Communications Technology

From Practice to Standards:
A Methodological Perspective on Scaling AI

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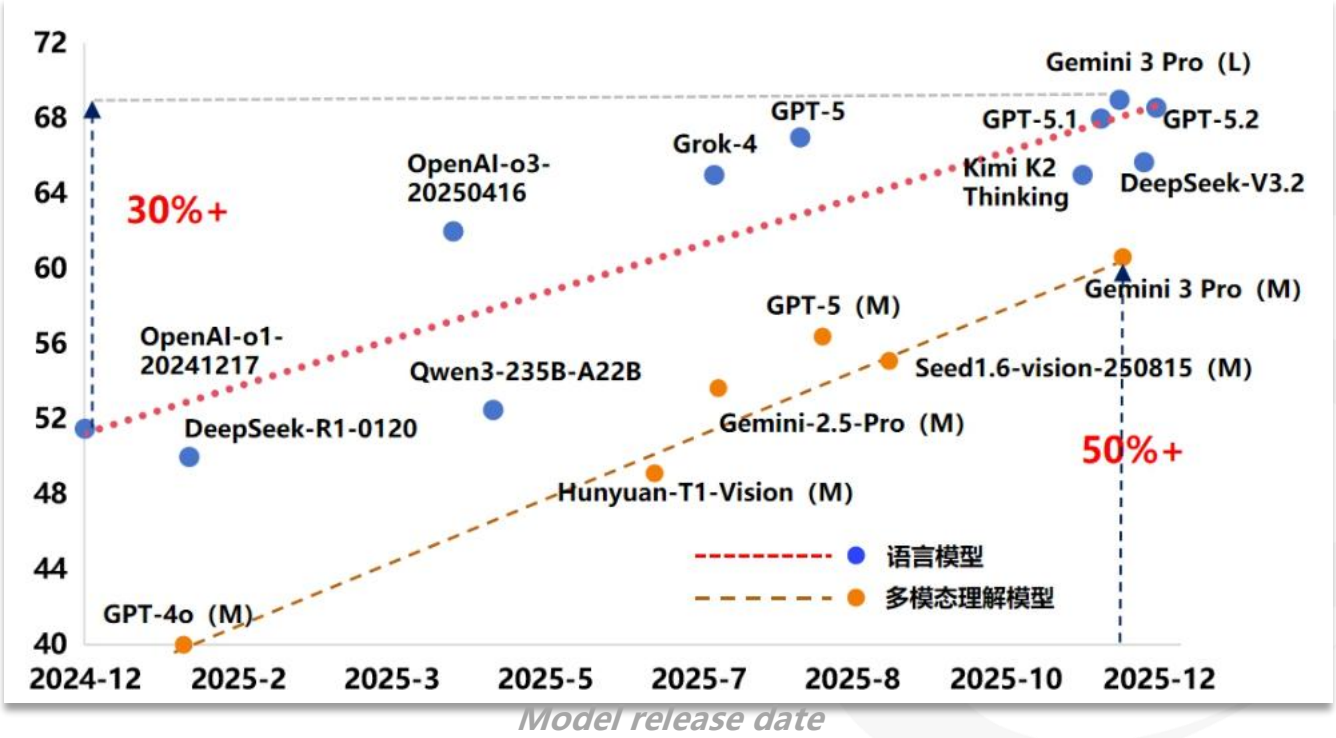
AI Has Entered the Era of Deployment



The overall capabilities of leading large language models—such as GPT-5.2, Gemini 3 Pro, Grok-4, DeepSeek V3.2, Claude 4.5, Qwen3, Doubao-Seed-1.6, Kimi K2 Thinking, and GLM4.5—had **improved by 30% compared** to the end of 2024, while multimodal understanding capabilities **increased by over 50%.**

- The foundational capabilities of large models have achieved a significant leap forward.
- AI capability is advancing rapidly.
- But many organizations still struggle to move from:

Experiment → Pilot → Production → Scale

Why do successful AI pilots often fail to become scalable capabilities?

The Bottleneck Is No Longer Model Alone

01

Model-Centric Mindset

Overreliance on model performance metrics, with insufficient attention to the systemic integration, infrastructure and organizational changes required for real-world scaling.

02

Siloed Implementation

Disconnected pilot projects and fragmented data systems hinder interoperability, making it difficult to replicate use cases and scale AI across enterprise workflows.

03

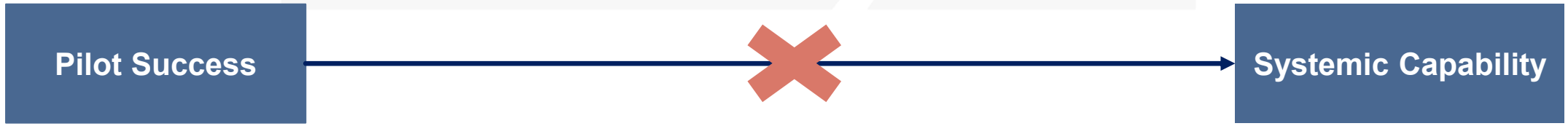
Inconsistent Evaluation

Lack of unified, multi-dimensional evaluation frameworks leads to ambiguous value metrics, hindering objective validation and cross-project benchmarking.

04

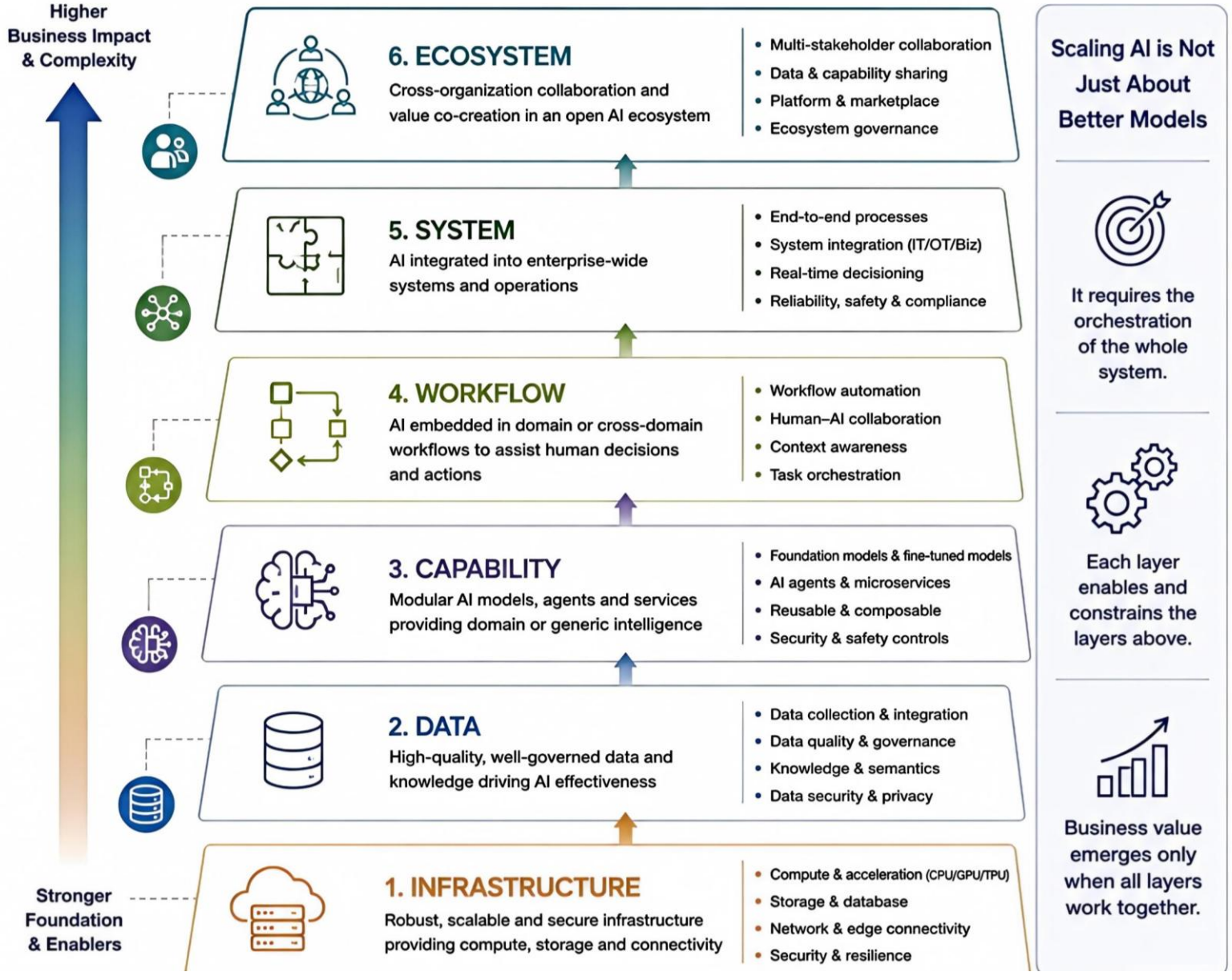
Lagging Governance

Governance and compliance frameworks fail to keep pace with rapid deployment, introducing ethical, security and accountability risks as AI systems scale.



The scaling gap lies between technical feasibility and systemic adoption.

AI Scaling Is a Systems Engineering Problem



Scaling AI is Not Just About Better Models

It requires the orchestration of the whole system.

Each layer enables and constrains the layers above.

Business value emerges only when all layers work together.

AI Scaling = Systems Engineering

Scaling AI means embedding intelligence into an operational system—not simply deploying a better model.

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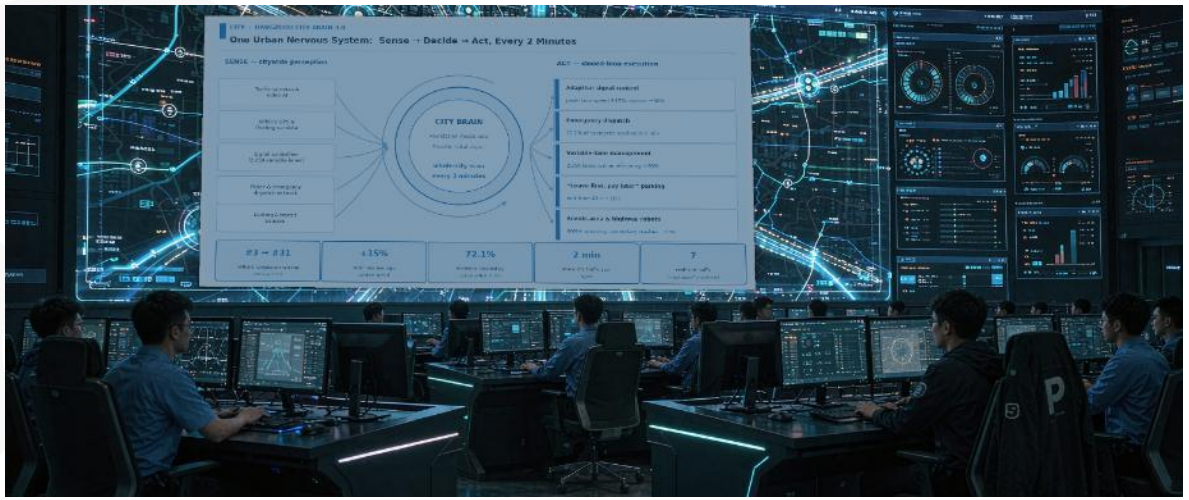
L1 : From Smart Spaces to Urban-Scale Intelligence

Smart Cities & Communities

Xiaomi Whole-Home AI

- Xiaomi Miloco 2.0 delivers full-house intelligence powered by the self-developed MiMo large-language model.
- AI multimodal perception enables proactive awareness of home living scenarios.
- AI orchestrates system-level workflow : IoT Devices → Data Assets → LLM Capability → Automated Scene Execution.

Hangzhou City Brain



- City Brain 3.0, powered by foundation models, scans and re-optimizes whole-city traffic every 2 minutes.
- AI-driven signal control moved Hangzhou from China's 3rd most congested city (2013) to 31st (2020); peak-hour speed +15%.
- AI coordinates emergency dispatch end-to-end: 72.1% of accidents reached by police within 5 minutes.

Different applications, similar systemic challenges.

L2 : From Automated Lines to Self-Optimizing Factories

Manufacturing

SANY Beijing Lighthouse Factory

- SANY Beijing plant is the WEF's first Lighthouse Factory in heavy industry, orchestrated by an AI factory brain.
- Human-robot collaboration cut the production cycle from 30 to 7 days (-77%) and lifted labor productivity by 85%.
- 375 connected machines and 36,000+ data points double output on the same factory floor area.

NIO Hefei Advanced Manufacturing Base

- Digital-twin infrastructure underpins AI-driven operations across vehicle manufacturing chains.
- AI establishes a real-time closed-loop covering vehicle-end intelligence, battery-swap networks and digital twins.
- AI-enabled automated lines support highly customized vehicle development and mass production.

When AI becomes the factory's brain, productivity is redesigned, not just improved.

L3: AI as an Equalizer — Rebuilding Human Senses at Scale

Accessibility

Baidu Xiling Digital Human

- Baidu Xiling sign-language digital human represents Chinese AI accessibility practice at the UN ITU AI for Good Global Summit.
- Wenxin-driven AI provides real-time sign-language services for 27.8 million hearing-impaired users.
- AI virtual interpreters are deployed for CCTV, government and banking public-service scenarios.

Tencent Ethereal Audio × Nurotron

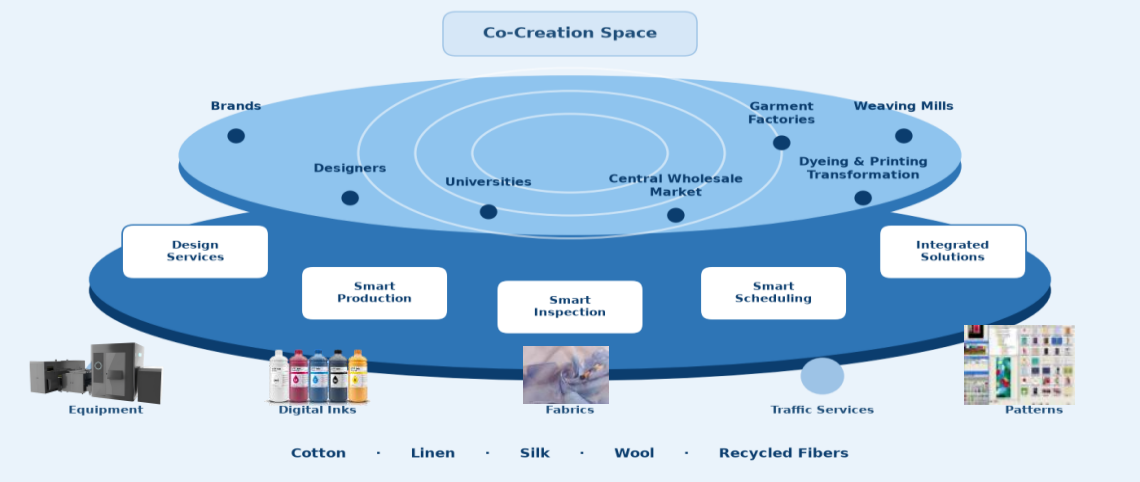
- Tencent Ethereal Audio AI separates speech from noise, boosting the signal-to-noise ratio by 20 dB.
- The phone-companion + cochlear-implant solution improves speech clarity by 40% with <150 ms latency.
- Single-syllable recognition rises 66%; the openly shared technology already benefits ~10,000 implant users.

Scaling AI is not simply scaling automation. It is scaling capabilities.

L4: From Artisanal Craft to Scalable Creativity

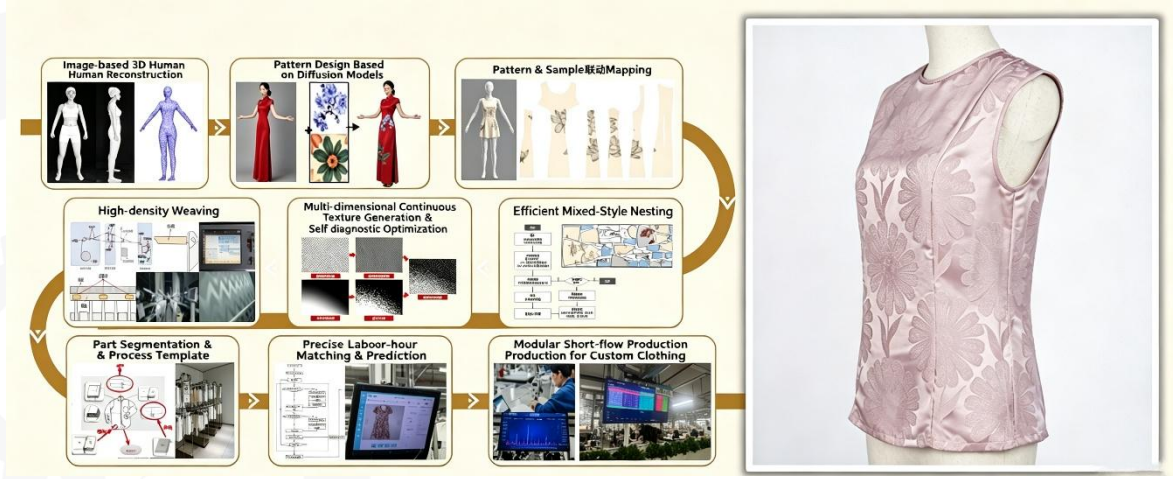
Textile

Wensli “West Lake No.1” AI Designer



- Wensli “West Lake No.1”, co-developed with Microsoft Xiaoice, is the silk industry's first pattern foundation model.
- A hand-drawn pattern took over 72 hours; AI now outputs 200+ unique designs a day from a 700,000-pattern database.
- GBART digital printing emits zero wastewater; custom scarves go from order to delivery within 24 hours.

CATHAYA Butterfly-Satin AI Silk Weaving



- Proprietary AI technology empowers CATHAYA Butterfly-Satin for premium silk jacquard production.
- AI converts textile domain expertise into computable rules for ultra-high-density weaving.
- AI runs an end-to-end closed loop: pattern input→ structural generation → physical weaving → model iteration.

AI makes craftsmanship computable — and creativity scalable.

From Practice to Patterns

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Practice	City	Manufacturing	Accessibility	Textile
Data integration	●	●	○	●
Workflow integration	●	●	●	●
AI capability modularization	○	●	●	●
Human-AI collaboration	●	●	●	●
Evaluation	●	●	●	●
Governance	●	●	●	●
Replicability	●	●	●	●

Across different domains, we identified a common set of patterns that recur in every AI implementation, forming the empirical foundation for building scalable and trustworthy AI systems.

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Six Questions Keep Returning Across Domains

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01 Smart City	▶	Transitioning from vertical, siloed applications to horizontal integration across urban infrastructure.
02 Manufacturing	▶	Evolving from single-point automation to intelligent cloud-edge collaboration and data-driven optimization.
03 Accessibility	▶	Moving beyond simple technology substitution to fundamental capability expansion for inclusive empowerment.
04 ...	▶	*Other domains.....*

"The same six questions recur across sectors, serving as a universal framework for driving impactful AI initiatives."

01	02	03	04	05	06
WHERE?	**WHAT?**	**HOW?**	**READY?**	**SCALE?**	**EVIDENCE?**
Where is the opportunity?	What value should AI create?	How should AI be integrated?	Is the organization ready?	How can it be replicated?	What evidence demonstrates value?

Different fields, different scenarios — but the answer points to the same methodological framework.

AI Scaling Methodology

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1 Discover — Identify high-impact AI use cases

- High-frequency
- Repetitive
- Data-rich
- Measurable
- ...

2 Define — Define clear KPIs, ROI metrics, and success benchmarks

- KPI
- ROI
- Strategic value
- ...

3 Design — Select optimal models, tools, and infrastructure

- Basic Model
- Knowledge
- Agent
- Infrastructure
- ...

4 PREPARE — Ensure data quality, accessibility, and ethical compliance.

- Dataset
- Organization
- Skills
- Governance
- ...

5 Scale — Path from pilot to large-scale implementation

Pilot → Process → Organization → Replication

6 Prove — Evaluate the value and effectiveness to decide whether to promote and replicate.

- Performance
- Value
- Replicability
- ...

AI Scaling Maturity: From Assistant to Ecosystem

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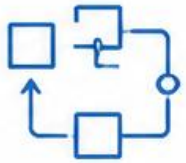
From isolated assistance to ecosystem intelligence

1 Assistant

AI as a tool for individual productivity

- Task-level assistance
- Human initiates and controls
- Limited context
- Standalone applications

2 Workflow



AI embedded in specific workflows

- Workflow automation
- Human-AI collaboration
- Shared context within workflow
- Integration with core systems

3 System

AI integrated into end-to-end systems

- Cross-workflow orchestration
- AI as decision enabler
- Access to enterprise data
- Integration across IT/OT
- Measurable business impact

4 Ecosystem

AI collaborates across organizations and ecosystems

- Cross-organization collaboration
- Data and capability sharing
- Ecosystem-level orchestration
- Co-creation of value
- Adaptive and self-evolving systems

Increasing Integration Depth

Increasing Need for Interoperability and Standardization

The deeper AI is integrated into operations and ecosystems, the stronger the need for interoperability and standardization.

Low — Integration Depth | Business Impact | Complexity — High

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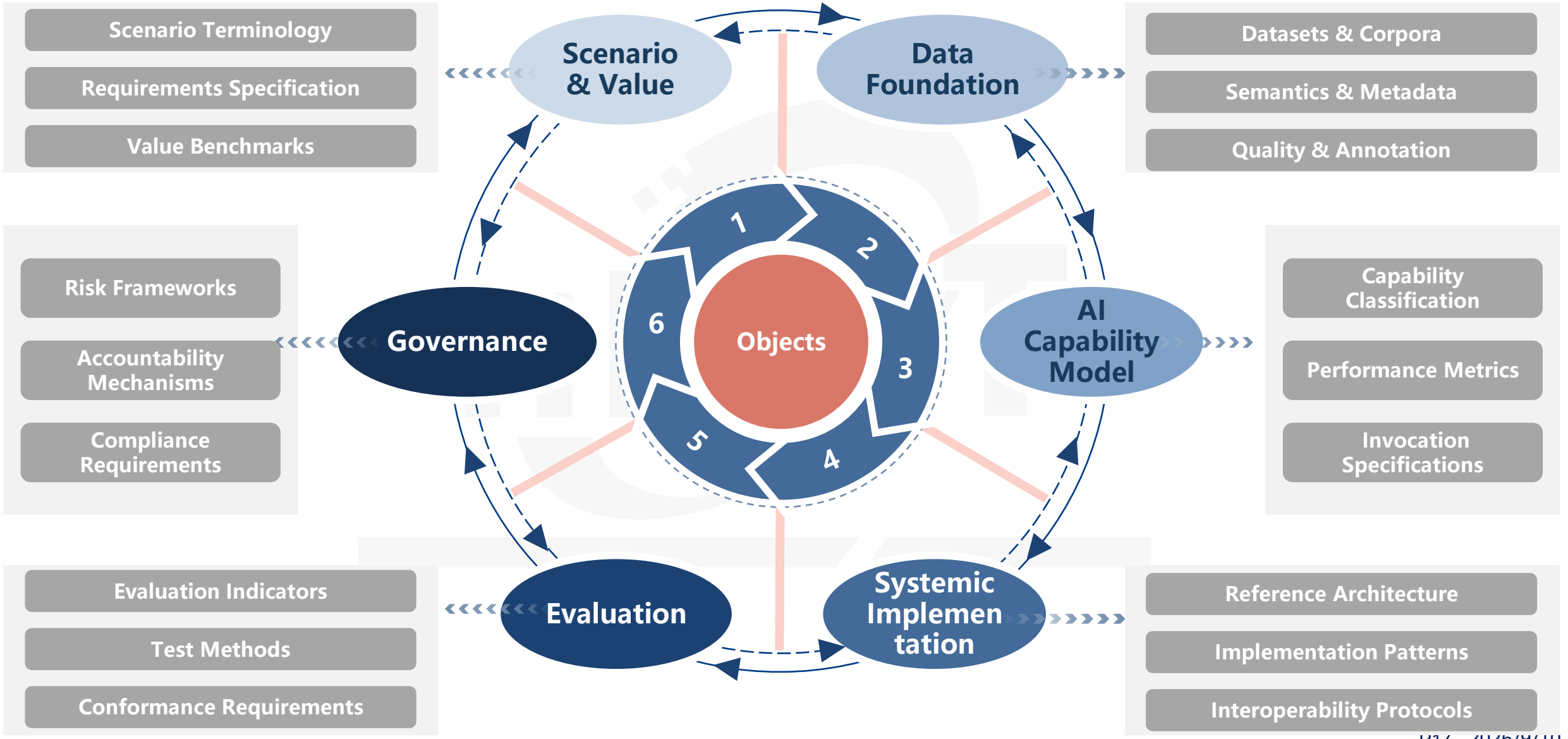
Standardization Objects: Six Common Dimensions



Standardization Impact: A Virtuous Cycle

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01 DESCRIBE

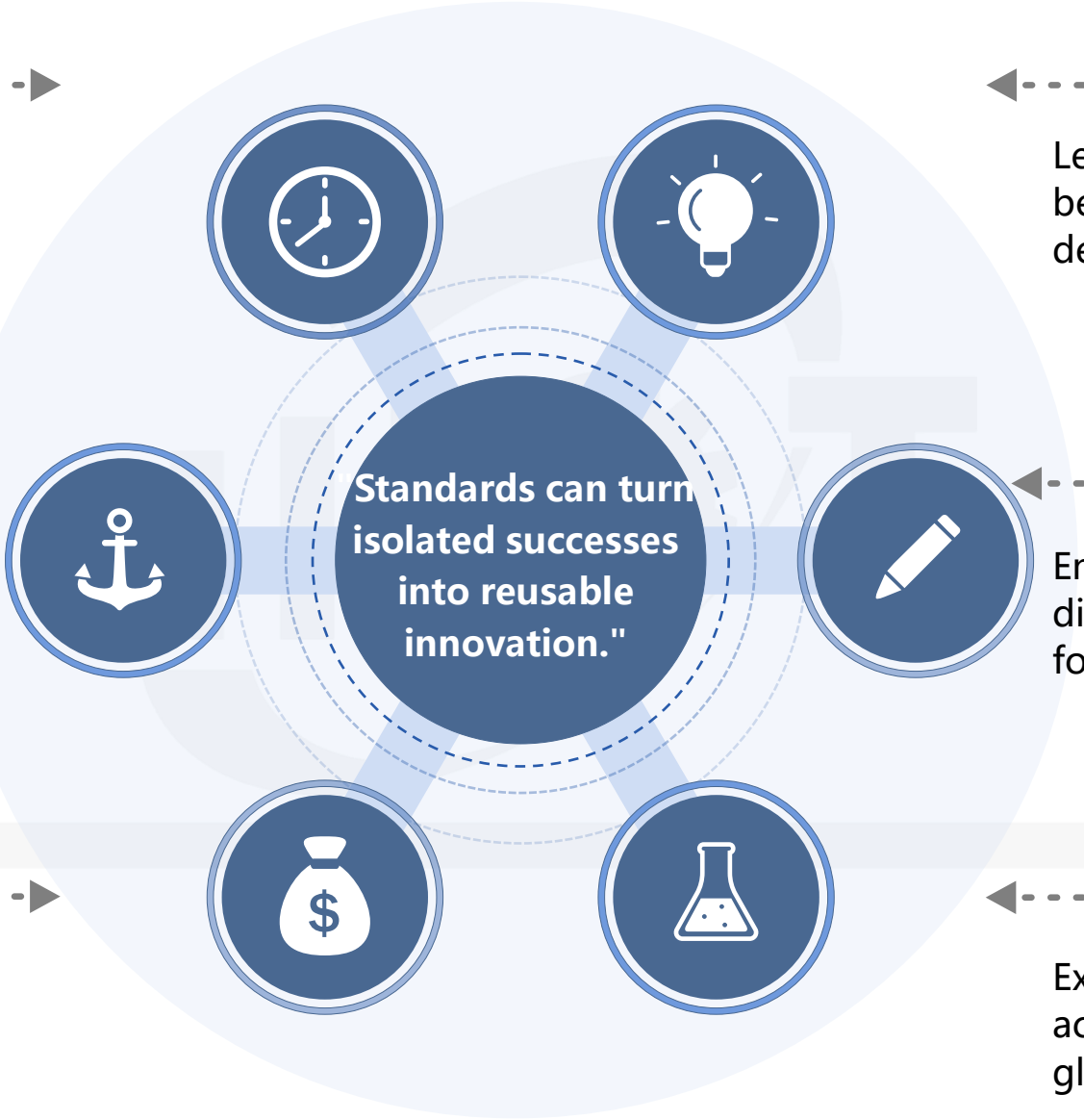
Define clear, consistent models, metadata, and terminology to eliminate ambiguity in AI systems.

02 Measure

Evaluate performance, ethical impact, and compliance using unified metrics and benchmarks.

03 COMPARE

Benchmark solutions objectively across diverse use cases, enabling informed selection and optimization.



04 REUSE

Leverage validated components and best practices to accelerate development and reduce redundancy.

05 INTEROPERATE

Enable seamless coordination between disparate tools, models, and platforms, fostering ecosystem synergy.

06 SCALE

Expand AI deployment efficiently across organizations, industries, and global markets with confidence.

Open Discussion: Contributions to Standards

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WHAT? Standardization Priorities

Identify the urgent, high-impact areas that require immediate standardization focus to accelerate global interoperability and innovation.

WHERE? Scope of Standards

Define the geographic, technological, and sectoral boundaries to ensure standards are universally applicable yet contextually relevant.

HOW? Development Process

Establish agile, transparent, and inclusive frameworks that enable diverse stakeholders to co-create and refine standards efficiently.

EVIDENCE? Validation & Testing

Design rigorous protocols and real-world metrics to validate the effectiveness, reliability, and scalability of proposed standards.

Key Takeaways: Three Core Conclusions

PRACTICE REVEALS PATTERNS

Analyzing real-world AI implementations across industries uncovers recurring design patterns and architectural commonalities. These observed regularities form the empirical foundation for building robust, context-aware systems that solve real-world problems efficiently.

METHODOLOGY MAKES PATTERNS REUSABLE

Formalizing patterns into a structured methodology transforms isolated insights into transferable knowledge. This framework empowers teams to replicate success, reduce redundancy, and apply validated solutions to new, analogous AI challenges across different domains.

STANDARDS MAKE REUSE POSSIBLE

Elevating methodologies to international standards establishes a universal language for AI development. This common ground ensures interoperability, simplifies cross-organizational collaboration, and paves the way for scalable, trustworthy AI solutions on a global scale.

Our goal is not to standardize every AI application.
Our goal is to make successful AI practices describable, measurable, interoperable, reusable and scalable.

Thank You!


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