

Industry 5.0 Essentials for CPA's Beyond Automation

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Learning Objectives



Explain the evolution from Industry 4.0 to 5.0.



Describe how human-centric technologies can augment human judgment and capabilities.



Identify how Industry 5.0 technologies can support sustainability and long-term value creation.



Analyze how emerging technologies can strengthen organizational resilience and enterprise risk management.

Why does Industry 5.0 Matter to CPAs?



Are organizations adopting technology because it creates meaningful value, or simply because the technology is available?



Tectonic Shifts



An aging leadership demographic in CPA firms, declining accounting enrollment, and the rapid pace of technological change have created an environment ripe for disruption. ~Ramamoorti & Herring 2024

Technology Adoption Sprint

Gartner Hype Cycle

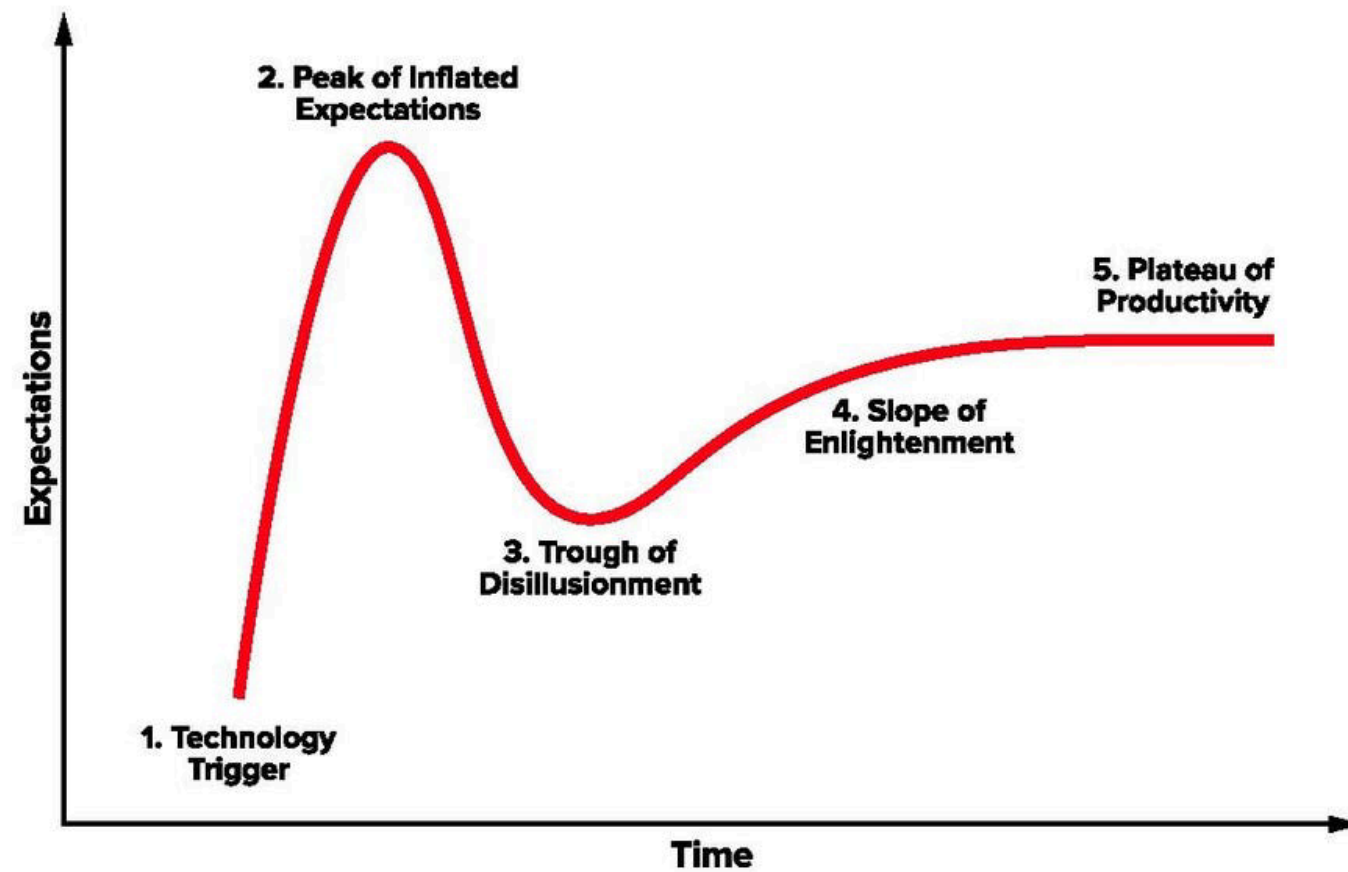
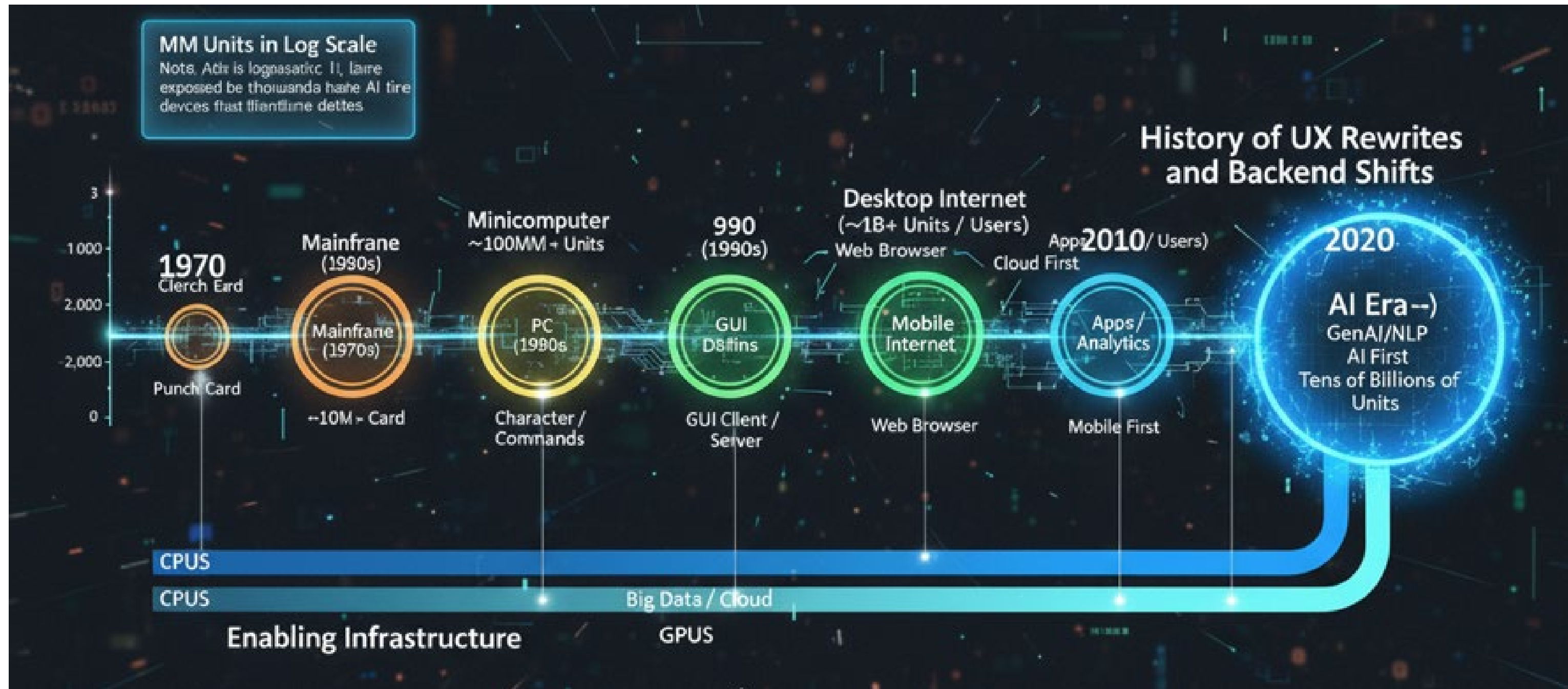


Image created via CoPilot

INSIGHT: “Businesses need to embrace for a three-dimensional risk management approach: probability, impact size, but most importantly, velocity—the sense of timing, speed, and mean-time-to-event mentality.”
~Velocity of Risk™ Ramamoorti & Wanserski (2019)

Human Computer Interface



INSIGHT: At its core, Industry 5.0 is not just about smarter machines, but about smarter collaboration between humans and machines. . This shift is not merely a technological one, but rather a philosophical, organizational, and strategic transformation.

Generational Technology Adoption



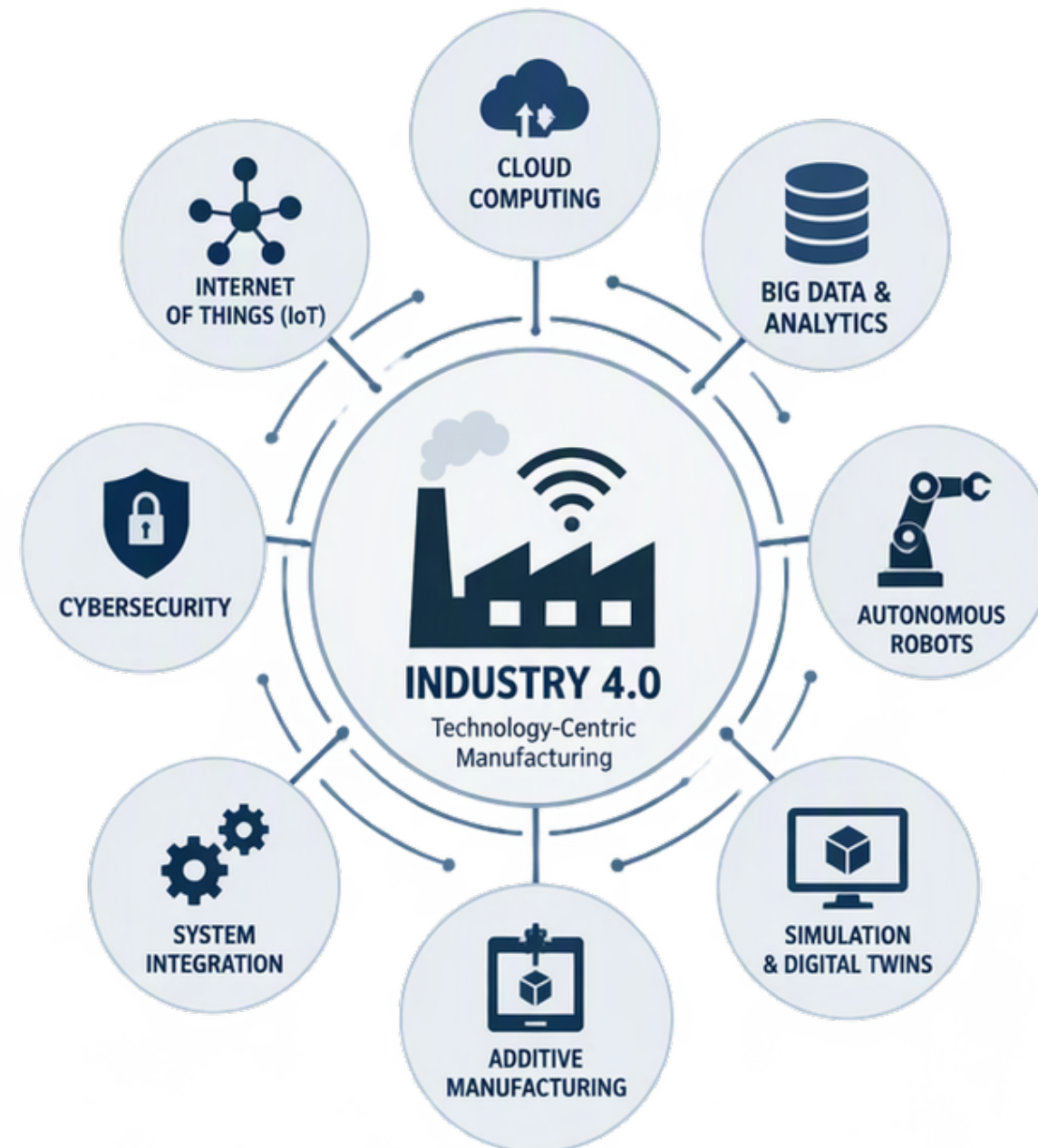
The interface is disappearing: instead of humans learning how to speak to computers, computers are learning how to speak to humans.

Industry 5.0-How we got here?

INDUSTRY 4.0

Automation • Connectivity • Efficiency

Smart Machines. Connected Systems. Greater Productivity.



Do more with Machines
(efficiency for a smarter world)

INDUSTRY 5.0

Human-Centric • Sustainable • Resilient

People and Technology Together for a Better Future.



A Better Future with People and Technology
(innovation for a more sustainable and resilient world)

Industry 5.0-How we got here?

Industry 4.0

- Automation
- Operational Efficiency
- Connected Machines
- Predictive systems
- Technology-centered
- Optimization

Industry 5.0

- Human amplifications
- Purposeful value creation
- Human-machine collaboration
- Adaptive and cognitive systems
- Human-centered
- Sustainability and resilience

Industry 4.0 asks, "What can we automate?"

Industry 5.0 asks, "How can technology help people and organizations create better outcomes?"



Pillars of Industry 5.0

Human Centricity

- Collaboration between humans and AI (powered by LLM and AAI for decision making)

Sustainability

- Focuses on environmental stewardship

Resilience

- Adaptability through autonomous systems for operational continuity.



Image generated with Gemini NanoBanana 2.5

For CPAs, these aren't abstract concepts. They eventually become questions about measurement, controls, risk, reporting, assurance, and decision-making.

Pillar 1: Human Centricity

Human-centric Industry 5.0 emphasizes

- Smarter collaboration between people and machines.
- Cognitive AI that interfaces augment human abilities and support co-creation. (e.g., collaborative robots, smart wearables, and natural-language)



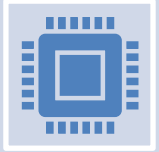
CPA applications:

- AI-assisted audit procedures
- Automated account reconciliations
- Natural-language data analysis
- Continuous monitoring
- Intelligent forecasting
- Research and document summarization
- Exception detection

Technology should amplify human capability rather than merely replace human labor



Cybernetics



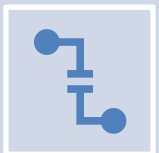
Cybernetics refers to the field devoted to the study of communications between human beings and machines.



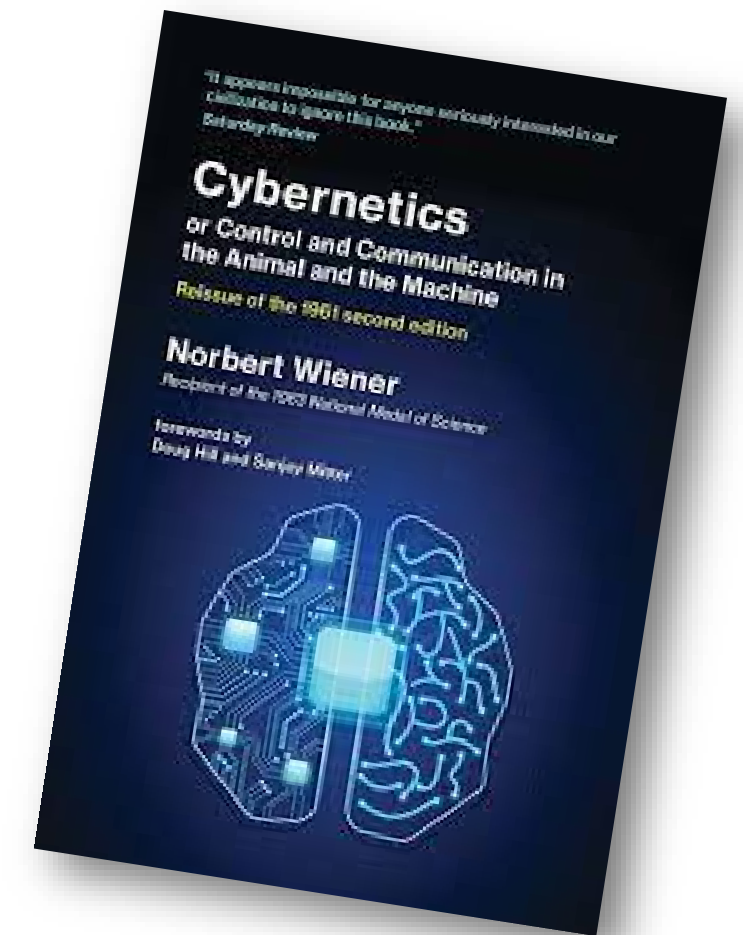
focuses on understanding systems, their behavior, and their interactions with the environment



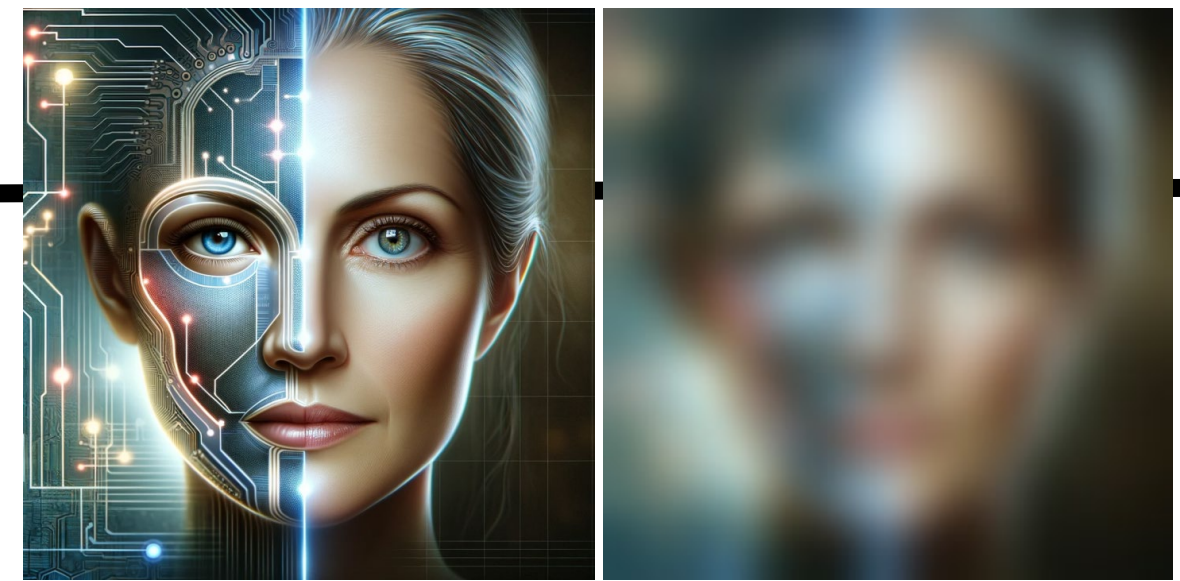
offers a framework for analyzing and designing systems that exhibit feedback loops, self-regulation, and adaptation



Feedback loops: positive (amplifying deviations from a desired state) or negative (reducing deviations from a desired state).



Blurred Lines



Machines are getting more like humans

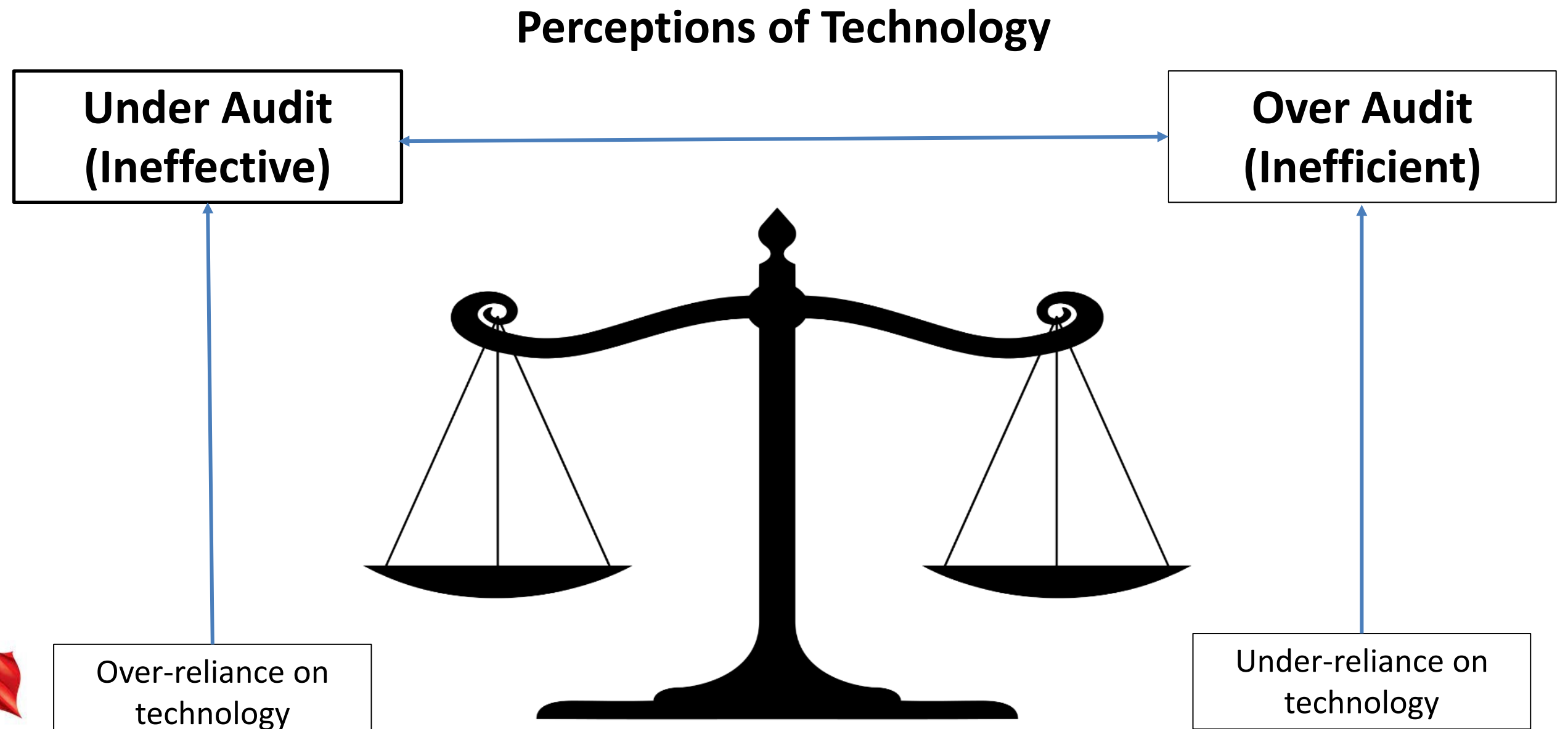
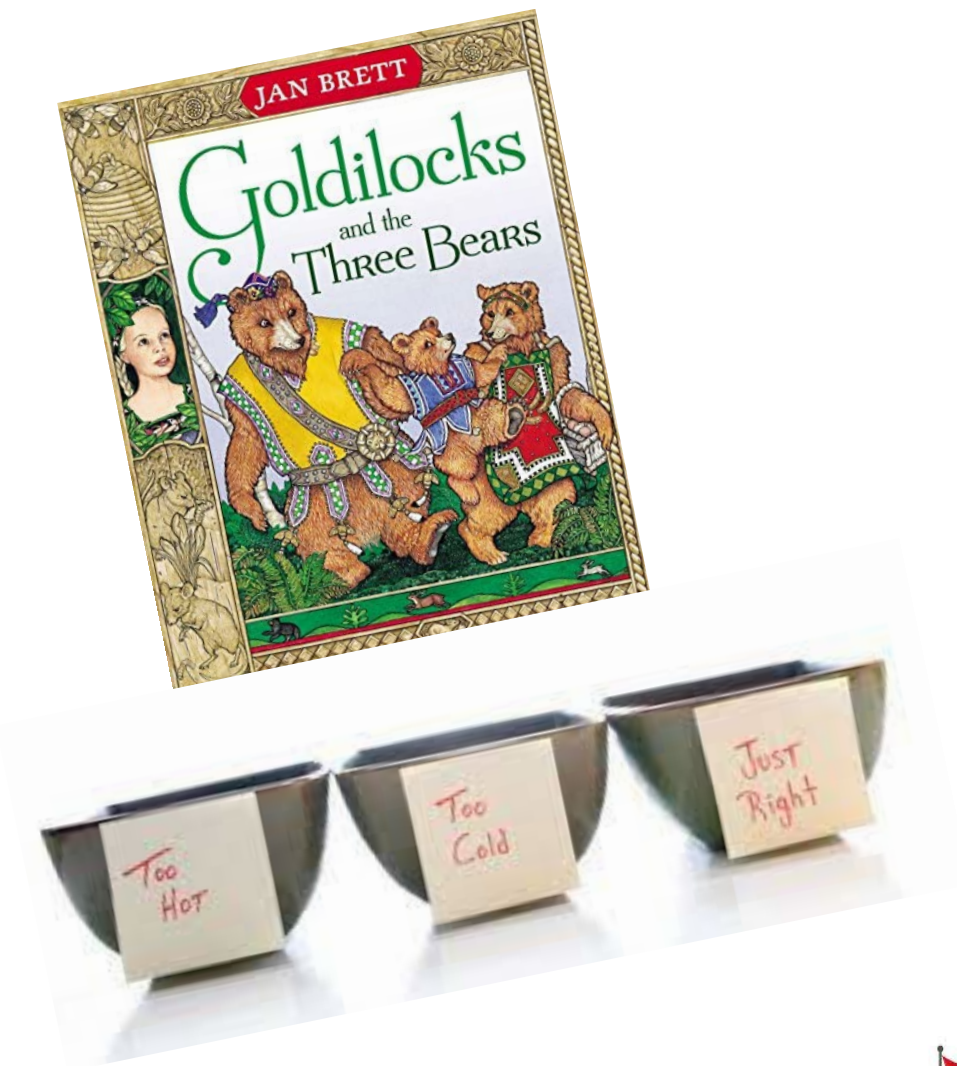


Humans are getting more like machines



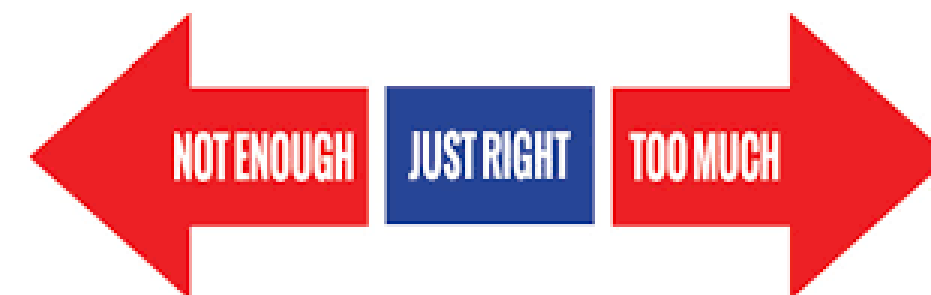
INSIGHT: It is not a lack of trust in technology, but uncritical acceptance of AAI output.

Goldilocks “Just Right” Effect



THE GOLDILOCKS PRINCIPLE

Complete acceptance of technological capabilities



Complete denial of technological capabilities

Human Technology Value Loop

Human Insight

- We define the problem and provide context.

Intelligent Technology

- Technology amplifies what humans can see and do.

Business Value Creation

- Technology only matters when capability becomes value.

Data Feedback & Learning

- Every interaction creates information that can improve the next decision.

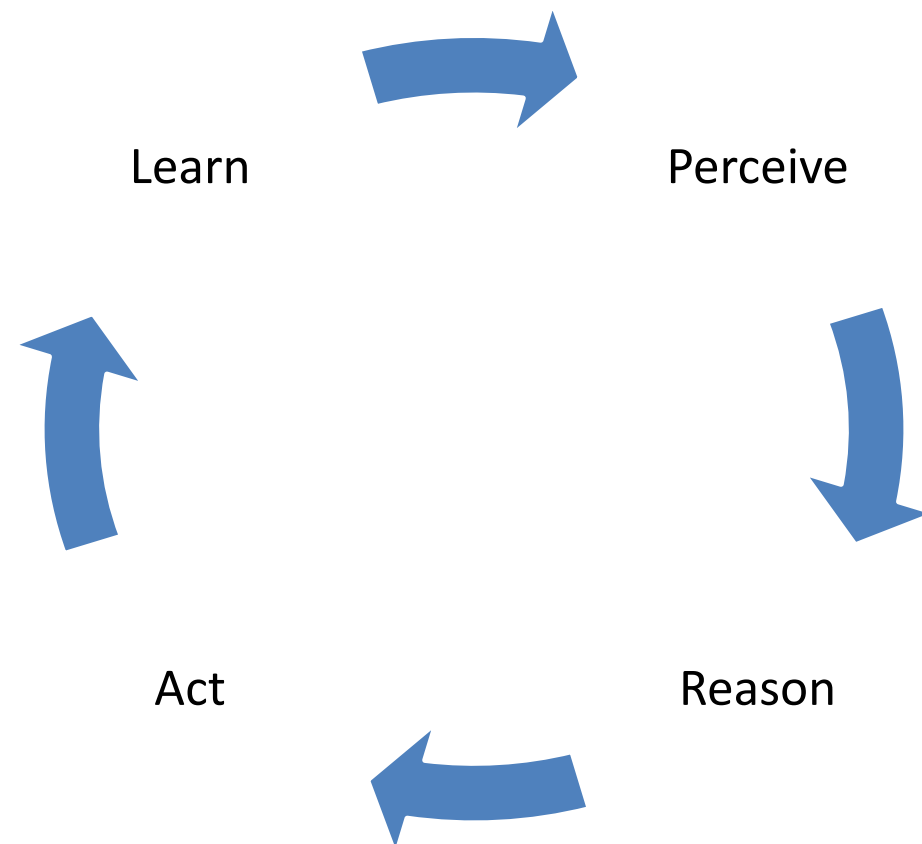


The computer identifies patterns. The CPA interprets their significance.



Humans don't leave the loop. They elevate their role within it.

Agentic AI



Generative AI vs. Agentic AI vs. AI Agents



Generative AI

Generative AI generates new content such as text, images, and music based on training data



Agentic AI

Agentic AI performs tasks autonomously and can pursue goals by interacting with its environment



AI Agents

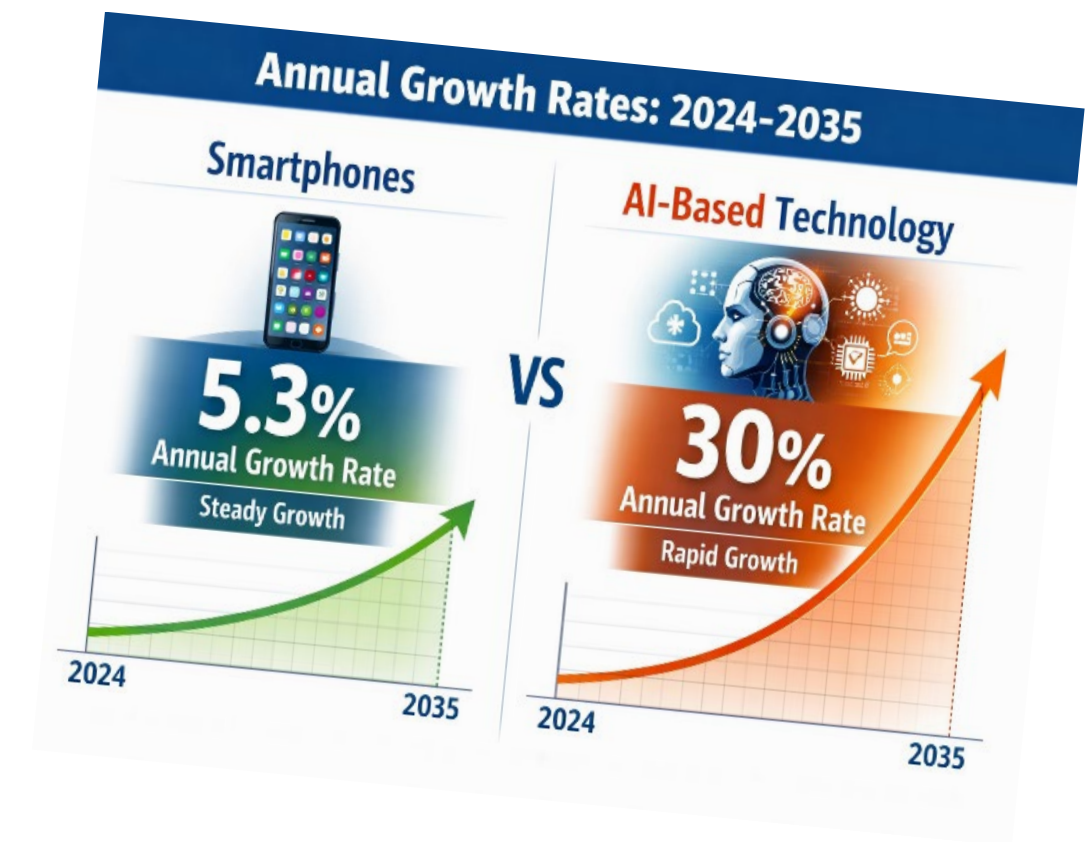
AI agents combine generative and agentic capabilities to accomplish complex objectives

Unlike traditional AI that simply answers questions, agents can think, plan, remember, and learn from experience — driving efficiency and innovation across industries like finance, healthcare, retail, and customer service.

~Amazon Web Services

AAI: the Genie is out of the Bottle!

How AI is Changing Business Decisions



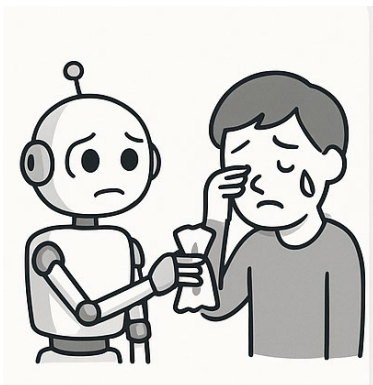
AI is also having a dramatic influence on “how businesses do business”. According to McKinsey & Company (2026), about 80% of businesses worldwide are using some type of AI in at least one business function.

“Empty Ethics” *the Illusion of Morality in AI*



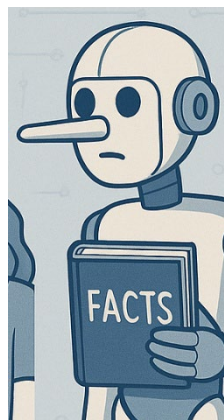
AI Has No Ethics or Moral Compass

🧭 *"AI doesn't know right from wrong—it only follows rules."*



AI Lacks Compassion and Empathy

💔 *"AI can simulate empathy, but it doesn't feel anything."*



AI Can Be Taught to Lie—Without Knowing It

😬😞 *"AI can generate falsehoods without understanding truth."*

H-I-T-L Governance



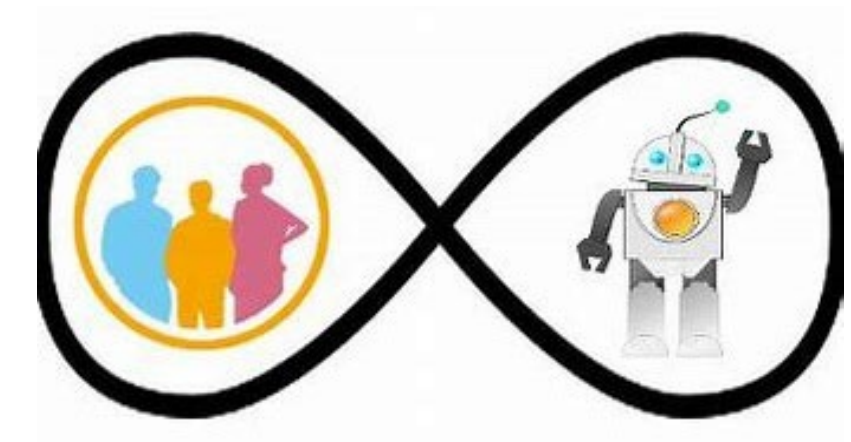
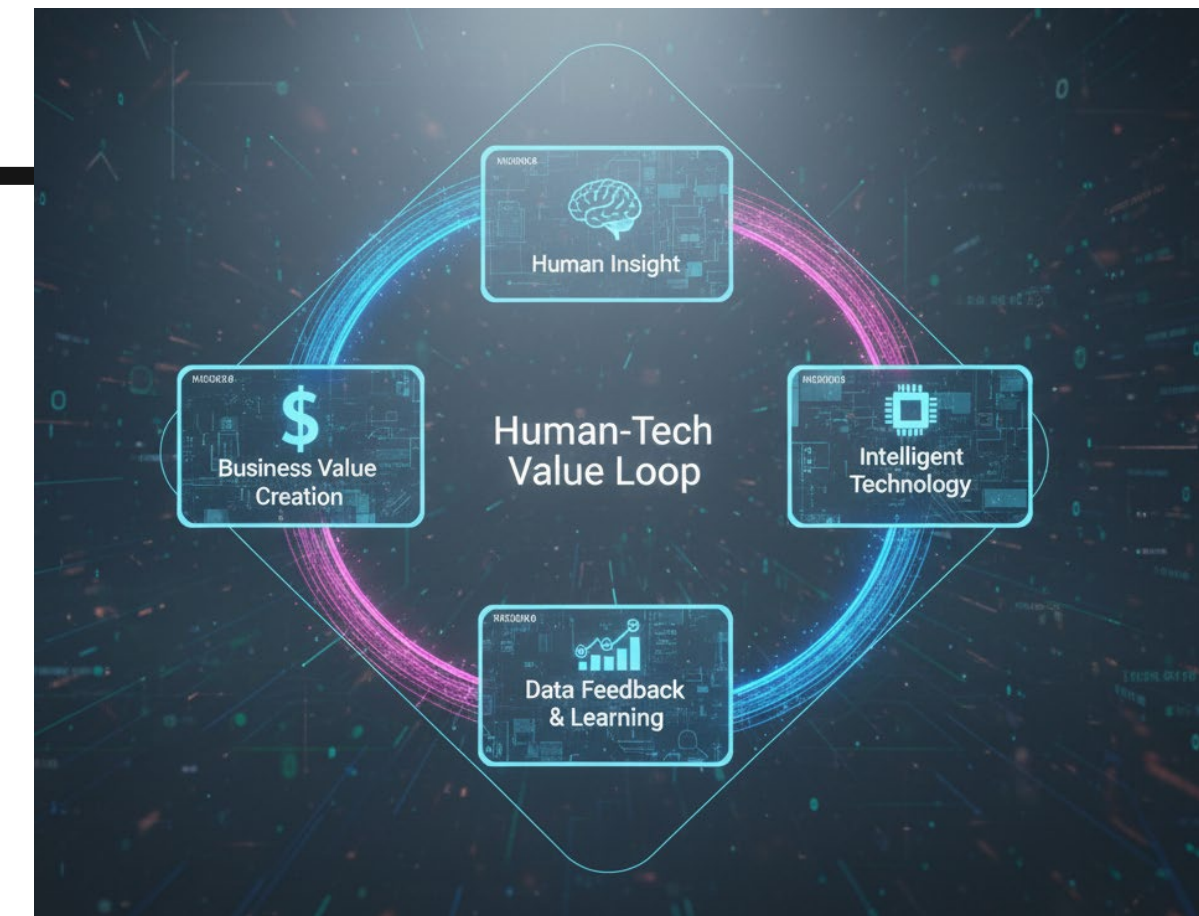
HITL: the human is another “cog” in the system whereas with HOTL, the human being is ON the loop exercising ethics and professional judgement



AI may be intelligent, but only humans can tell the story clients believe in.

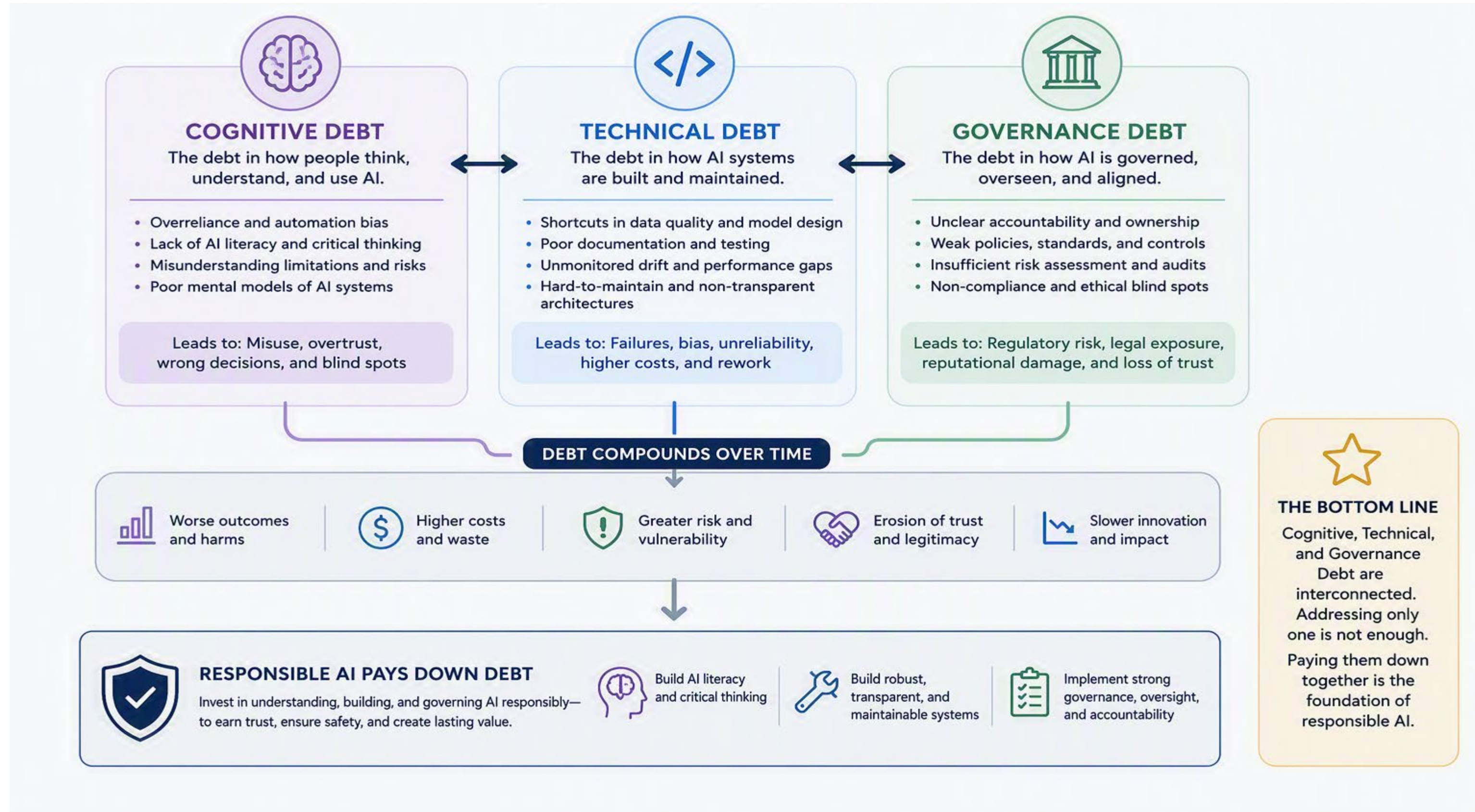


Human involvement transforms technical output into meaningful, trusted audit value.”



Humans don't leave the loop. They elevate their role within it.

Hidden Debt of AI Adoption



Pillar 2: Sustainability

Sustainability moves the organization beyond narrow operational efficiency toward:

- Environmental stewardship
- Resource optimization
- Circular business models
- Ethical supply chains
- Long-term value creation

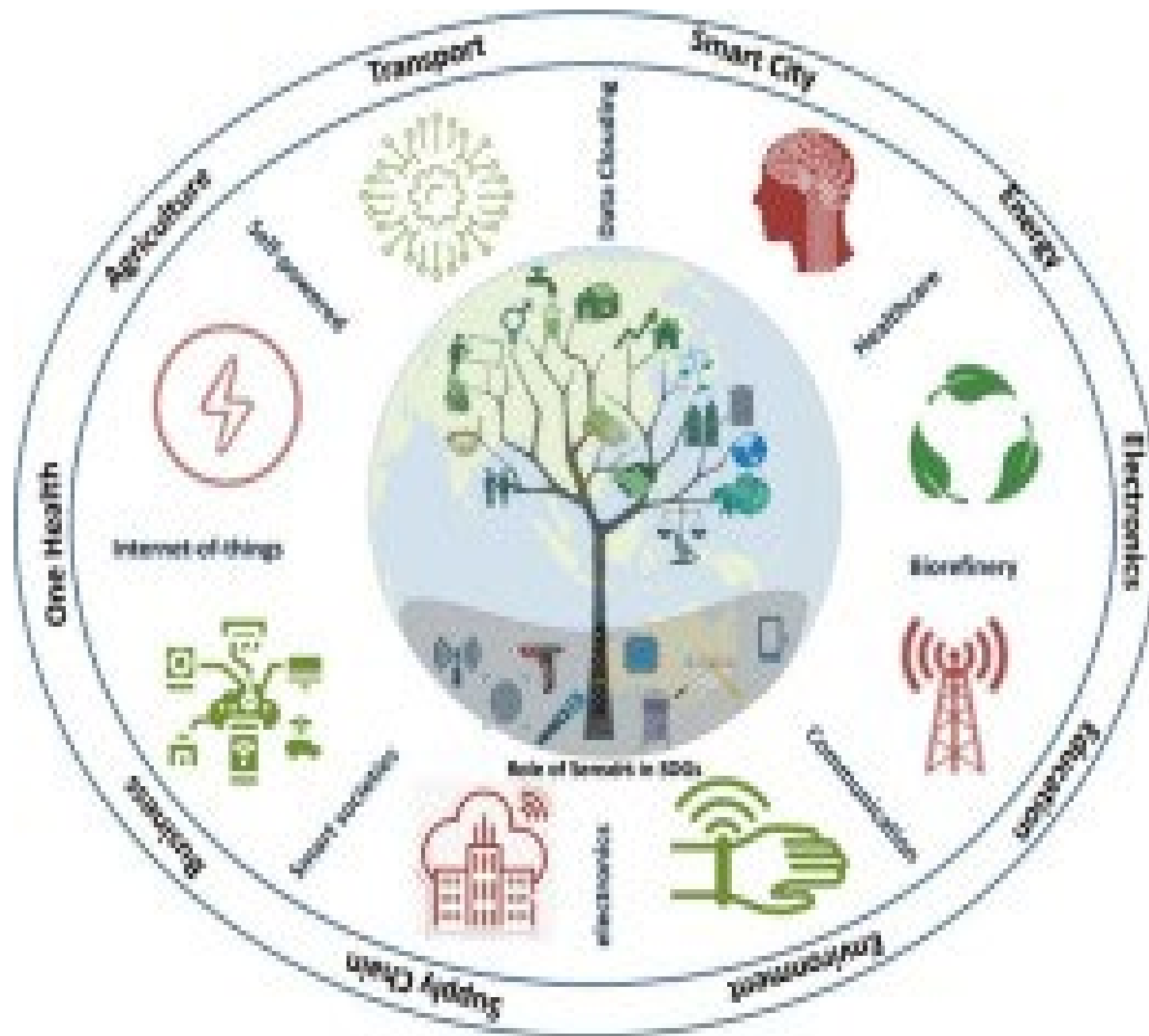


Sustainability commitments eventually become measurement, reporting, control, and assurance questions.



IoT, Measurement, & Resource Mgmt

Connected sensors drive sustainability by tracking resource use, cutting waste, and optimizing energy efficiency in real time across cities, buildings, and ecosystems.



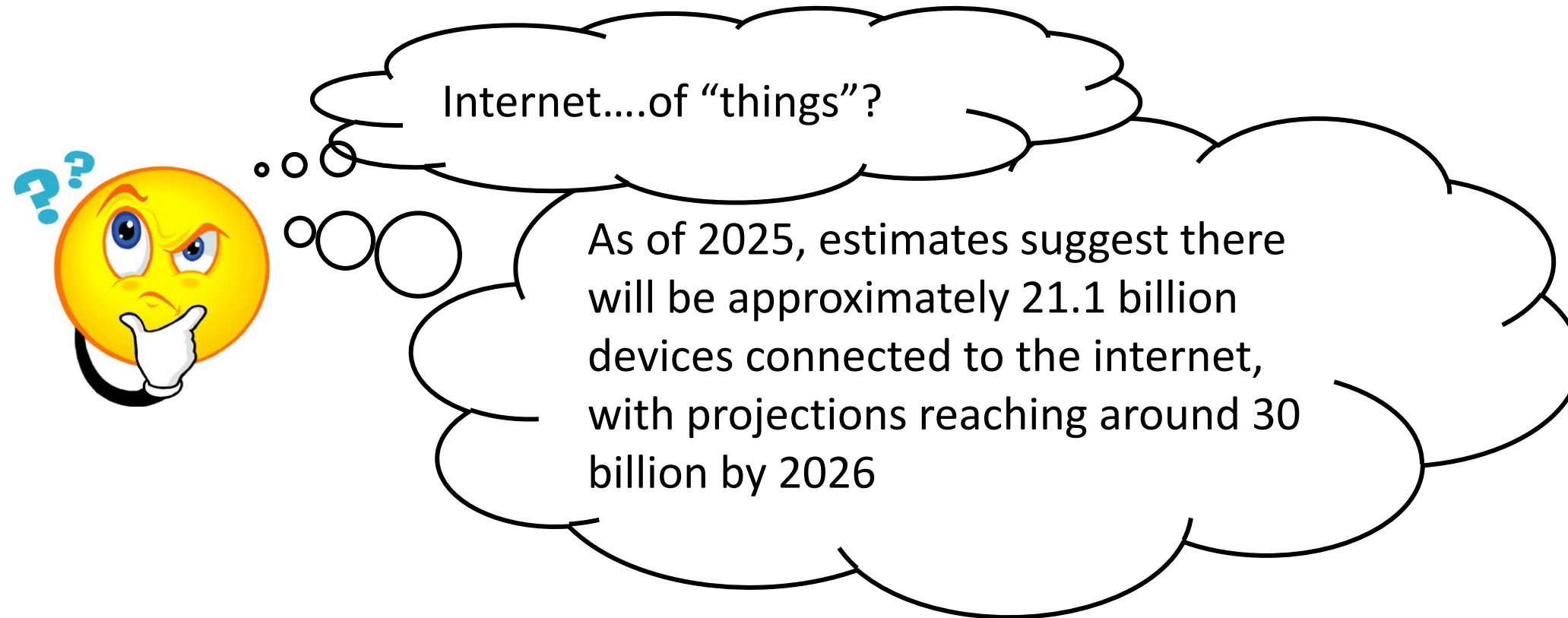
- Energy consumption
- Water usage
- Raw-material flows
- Equipment performance
- Waste
- Emissions
- Production conditions

CPA questions:

- Who owns the data?
- Is it complete and accurate?
- Can it be reconciled to financial and operational systems?
- Are environmental measures auditable?
- What controls exist over sensor-generated information?
- Can management substantiate its sustainability claims?

Technology creates the data. Trust depends on the controls around it.

IoT, Measurement, & Resource Mgmt.



A mid-sized data center uses about 300,000 gallons of water per day for cooling—roughly equivalent to the water use of 1,000 homes. ~Source: Joyce Foundation 8/6/2024



DeepSeek achieved a major milestone in January 2025, when it displaced ChatGPT to become the #1 app on the Apple App Store globally. Since then, ~173 million download apps worldwide by June 2025 ~Source: Trendmask.com

ESG & Sustainability Reporting

SEC Rule 3/26/2024 takes effect for 12/31/25 filers

Specifically, a registrant must disclose:

- Climate-related risks that have had or are reasonably likely to have a material impact on the registrant's business strategy, results of operations, or financial condition.
- The actual and potential material impacts of any identified climate-related risks on the registrant's strategy, business model, and outlook.



Circular Economy & New Biz Models

Benefits:

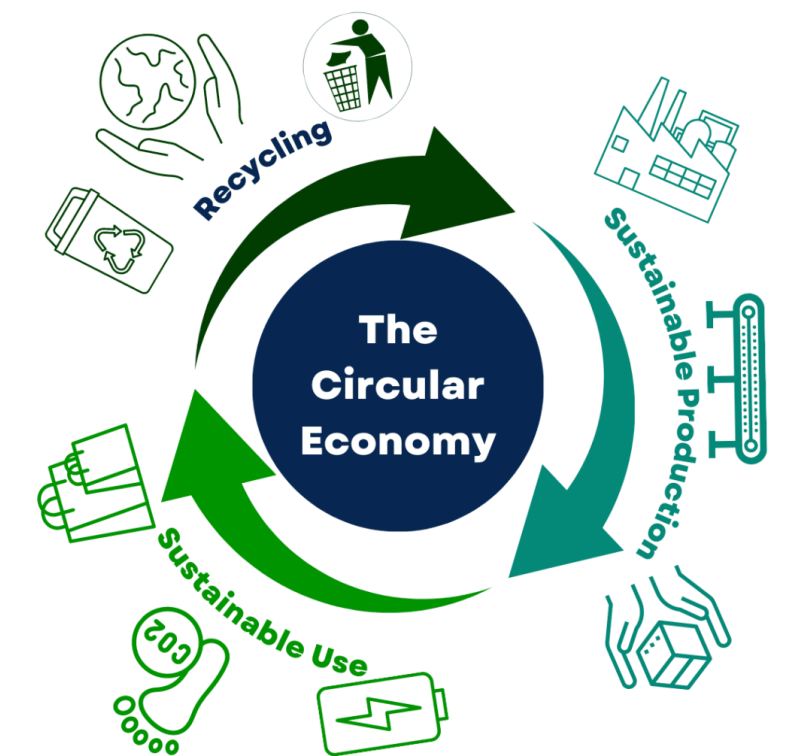
- **Environmental Impact:** Reduces pollution, conserves natural resources, and lowers carbon emissions.
- **Economic Growth:** Creates new business opportunities and jobs in recycling, repair, and remanufacturing sectors.
- **Resource Security:** Reduces dependency on finite resources by promoting the use of renewable and recycled materials.
- **Innovation:** Drives innovation in product design, materials science, and business models to create more sustainable solutions.
- **Consumer Benefits:** Offers consumers more durable, repairable, and sustainable products, often at lower costs.

Challenges:

- **Regulatory Barriers:** Navigating existing regulations that may not support circular practices.
- **Market Acceptance:** Encouraging consumers and businesses to adopt new consumption and production models.
- **Infrastructure Needs:** Developing the necessary infrastructure for recycling, repair, and remanufacturing.
- **Economic Viability:** Ensuring that circular business models are financially sustainable and competitive.
- **Technological Development:** Advancing technologies that enable efficient recycling, material recovery, and product tracking.

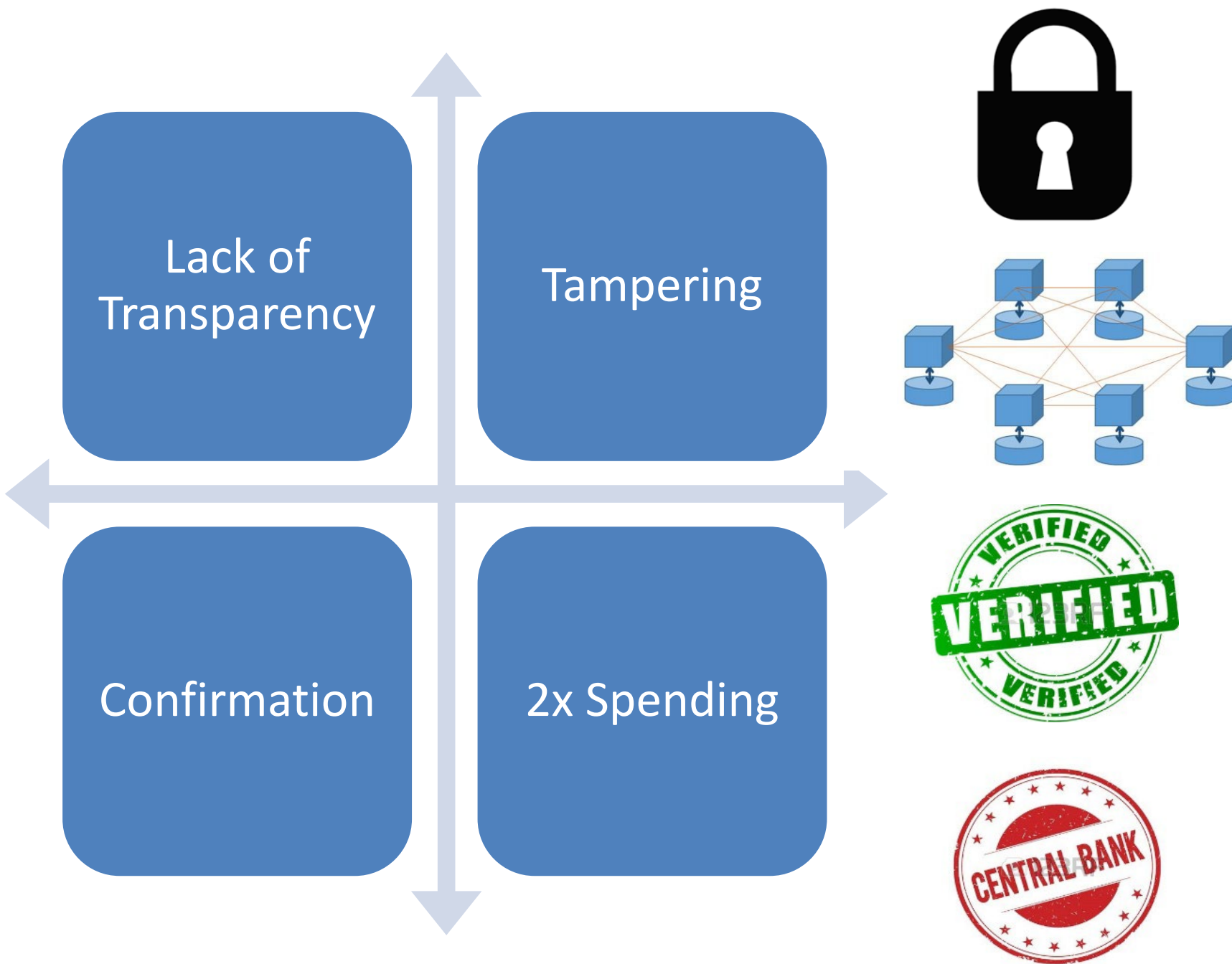
Linear economy: Take → Make → Use → Dispose

Circular economy: Design → Use → Maintain → Reuse → Refurbish → Recycle



Transparency, Blockchain, & Trust

Can we have a system where trust exists on the transaction and not the central authority?



Immutability → Crypto-technology

Provenance → Distributed Ledger

Finality → Verification e.g.) Proof of Work

Consensus → No Central Authority

Transparency, Blockchain, & Trust

137 countries, representing over 98 percent of global GDP, are exploring a Central Bank Digital Currency. Currently, 72 countries are in the advanced phase of exploration—development, pilot, or launch.



ALL of the G20 countries are exploring a Central Bank Digital Currency—with 13 already in a pilot stage including Brazil, Japan, India, Australia, Russia, and Turkey.



In the United States, 40 states have introduced or pending legislation regarding cryptocurrency, digital or virtual currencies and other digital assets in the 2025 legislative session.

Food Safety | Conflict Mineral | Personal ID | Blood Diamonds | Carbon Tracing

<https://www.atlanticcouncil.org/cbdctracker/>

<https://www.ncsl.org/financial-services/cryptocurrency-digital-or-virtual-currency-and-digital-assets-2025-legislation>

Can I “TRUST” the AI?



Can I trust the inputs?

AI systems depend on the quality of the data they receive, so inaccurate, incomplete, biased, or outdated information can undermine even the most sophisticated model.



Can I trust the method?

The analytical approach should be appropriate for the problem being solved and applied in a manner consistent with its intended purpose.



Can I trust the outputs?

Decision makers should evaluate whether the recommendation appears reasonable given the available information, business context, and organizational objectives.



Can I trust the outcome?

AI-generated recommendations should be compared to actual results to determine whether the system is producing reliable and beneficial outcomes.



Can I trust it tomorrow?

Because business conditions, customer behaviors, regulations, and risks continuously change, organizations must regularly monitor AI systems to ensure that output remains accurate, relevant, and reliable over time.

Trust shouldn't be a one-time decision. Trust needs to be continually earned and validated.

Pillar 3: Resilience

What is resilience? Human-centric adaptability, robustness, and continuity in response to technological, economic, and environmental disruption. It highlights digital twins, predictive AI, risk management, and autonomous systems.

Resilience is the organization's capacity to:

- Anticipate disruption
- Adapt to changing conditions
- Maintain critical operations
- Recover effectively
- Learn from disruption

Move from reporting to what happened to help understand what is likely to happen, the impact, and be proactive.



CPA applications:

- Scenario analysis
- Going-concern assessment
- Capital budgeting
- Sensitivity analysis
- Risk-adjusted forecasting
- Business-continuity planning

Digital Twins and Scenario Planning

How do “Digital Twins” work?

- Apply sensors for the physical object (e.g. wind turbine) to capture performance data.
- Collect performance data is applied to virtual modal for simulations
- Capture insights to gain efficiencies that are applied back to the physical object.



Defined by IBM: A digital twin is a virtual representation of an object or system that spans its lifecycle, is updated from real-time data, and uses simulation, machine learning and reasoning to help decision-making

CPA applications:

- Scenario analysis
- Going-concern assessment
- Capital budgeting
- Sensitivity analysis
- Risk-adjusted forecasting
- Business-continuity planning

Key question: “What if we could test important decisions before experiencing their consequences?”

Predictive AI and Enterprise Risk

- Shift from reactive to proactive risk management
- Combine historical and real-time data to identify emerging risk patterns
- Detect early warning signals before risks fully materialize
- Continuously monitor changing business conditions and risk indicators
- Model scenarios and stress-test assumptions to evaluate potential outcomes
- Prioritize risks dynamically as conditions and exposures change
- Support faster, more informed human decisions, rather than replace professional judgment
- Move toward continuous risk intelligence instead of periodic risk assessment

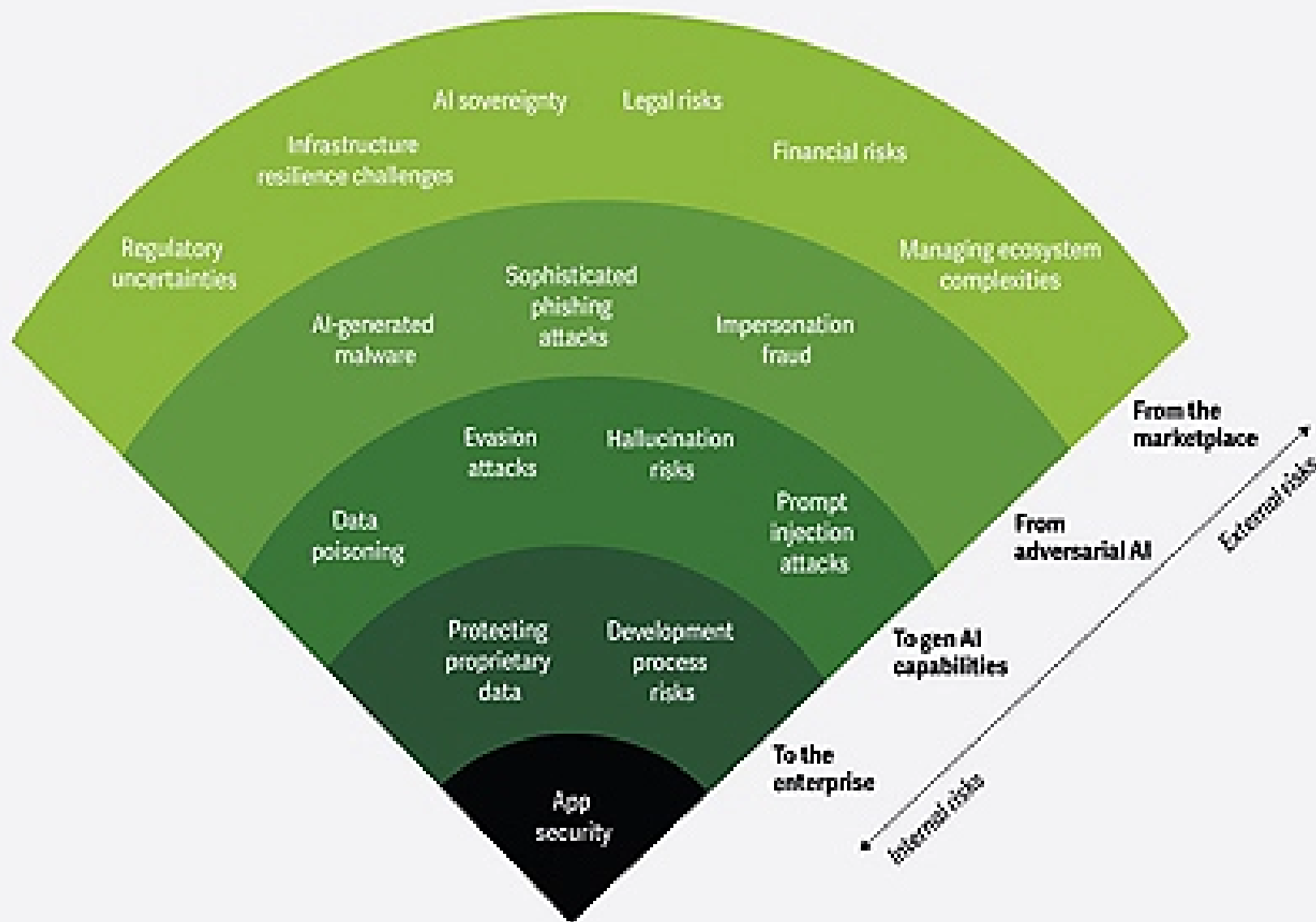
INSIGHT: Predictive AI can help us see risks sooner. But AI also creates an entirely new set of risks that organizations have to manage.

Cash Flow | Fraud | Supply Chain | Cyber/Compliance

Predictive AI and Enterprise Risk

Figure 1

The four categories of gen AI risks affecting cyber leaders



Enterprise Risk

Data, applications, intellectual property, privacy and development processes

AI Capability Risk

Hallucinations, prompt injection, data poisoning and model manipulation

Adversarial RAI

AI increases the scale and sophistication of phishing, malware and impersonation attacks

Marketplace Risk

Regulation, infrastructure, third parties, legal exposure and financial

Source: Deloitte analysis.

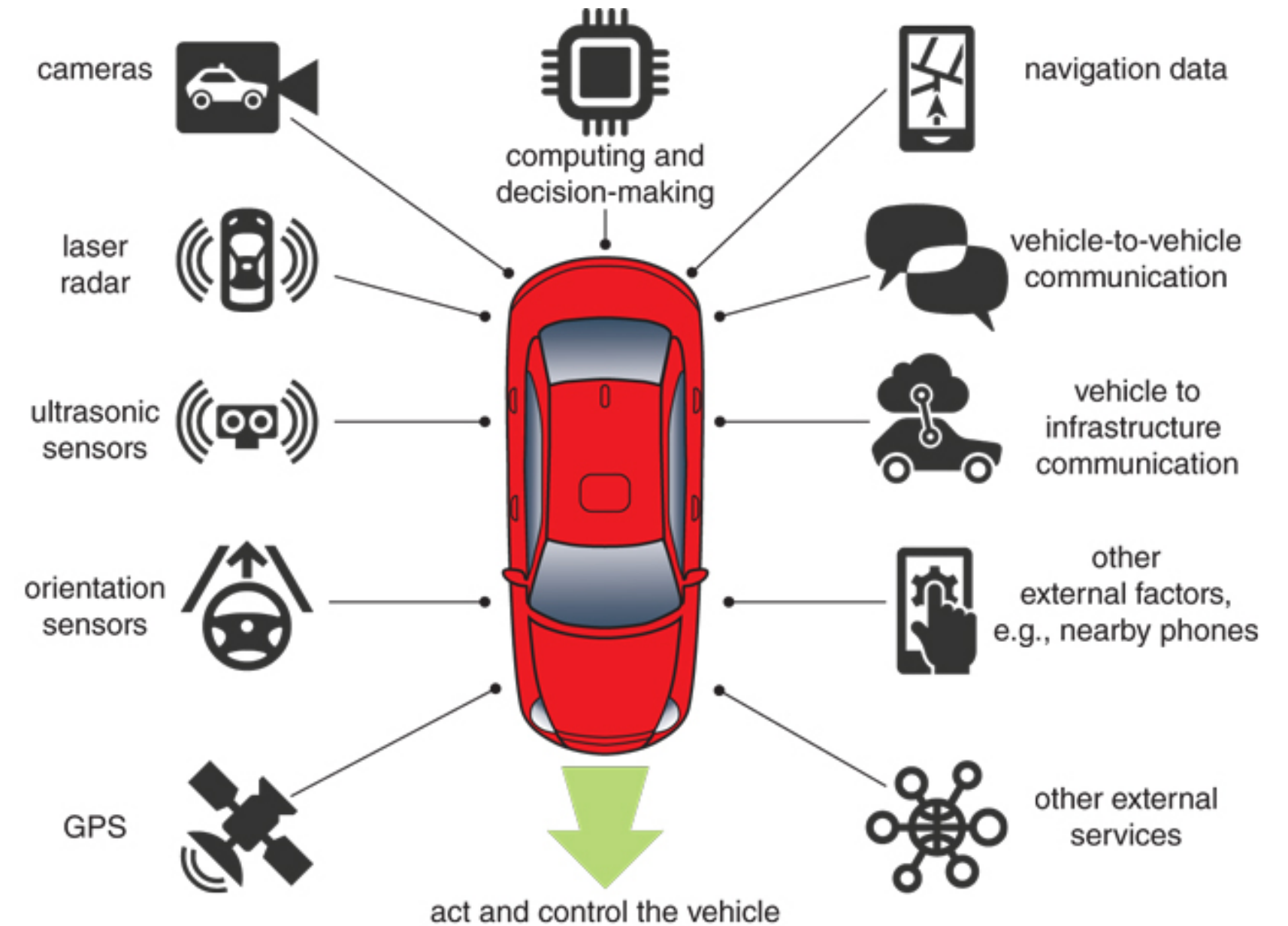
Deloitte | deloitte.com/us/en/insights/research-centers/center-for-integrated-research.html

Flexible and Autonomous Systems

Flexible systems can sense changing conditions, make decisions, and adjust operations.

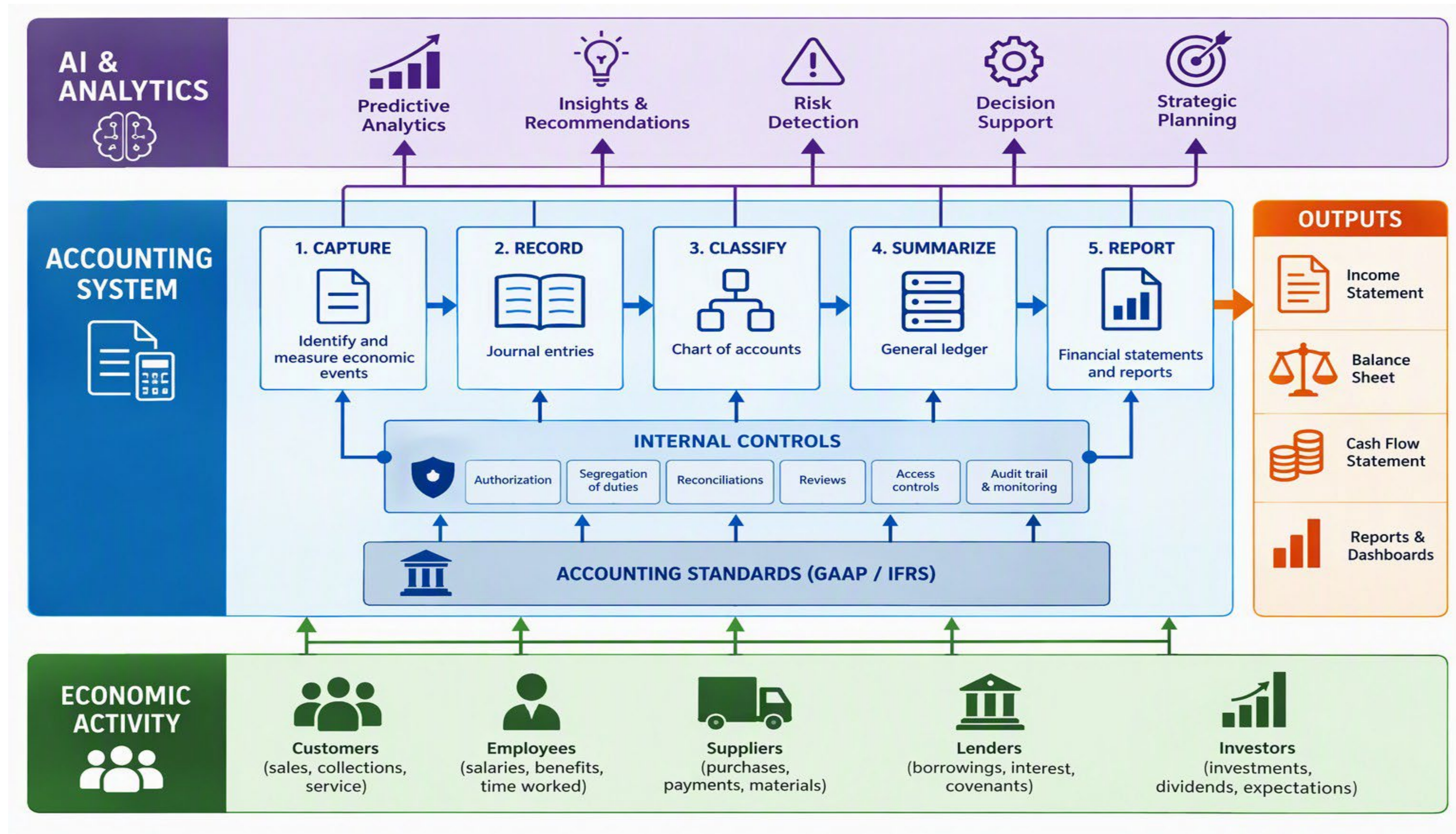
Examples include:

- Rerouting supply chains
- Adjusting production schedules
- Changing inventory levels
- Reallocating resources
- Escalating compliance exceptions
- Revising forecasts



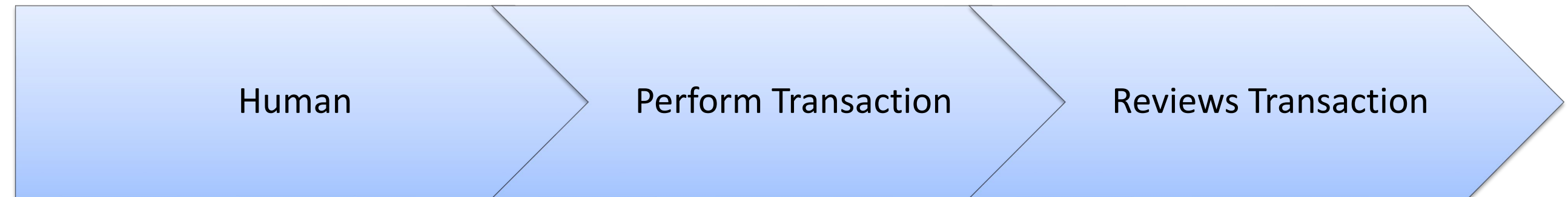
When a system changes its own behavior, how does the organization determine whether the modified behavior remains authorized, reliable, and compliant?

Accounting as an Information Capture System

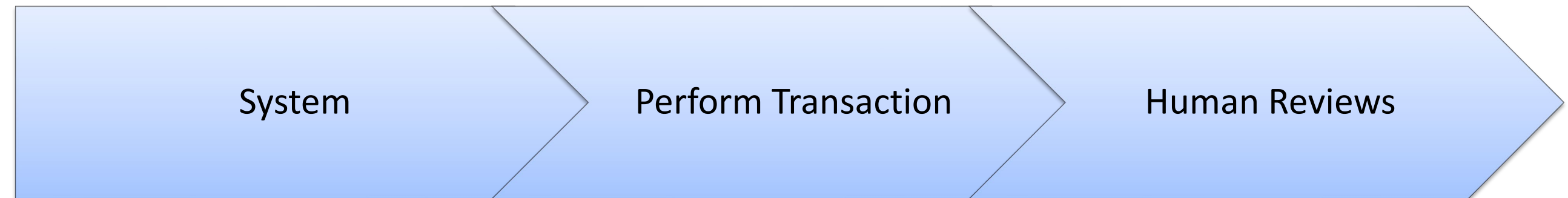


CPA's Role in Industry 5.0

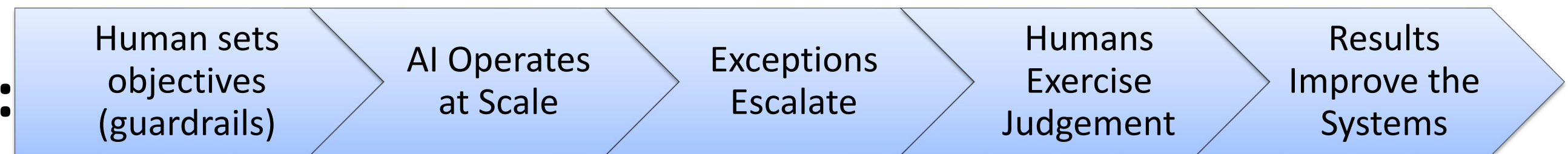
Old model:



Automation model:



Industry 5.0 model:



Industry 4.0 was largely about taking humans out of repetitive processes. Industry 5.0 isn't about putting humans back into every transaction. It is about placing human judgment at the points where context, ethics, skepticism, creativity, and accountability matter most.

A Practical Framework for CPA's

Industry 5.0 gives CPAs a practical lens for evaluating emerging technology.



Rather than asking simply what the technology can do, consider how it affects people, long-term value, and organizational resilience



Human centrality

- Does the technology improve work or merely eliminate labor?
- Is professional judgment preserved?
- Are employees properly trained?
- Are decisions fair and explainable?

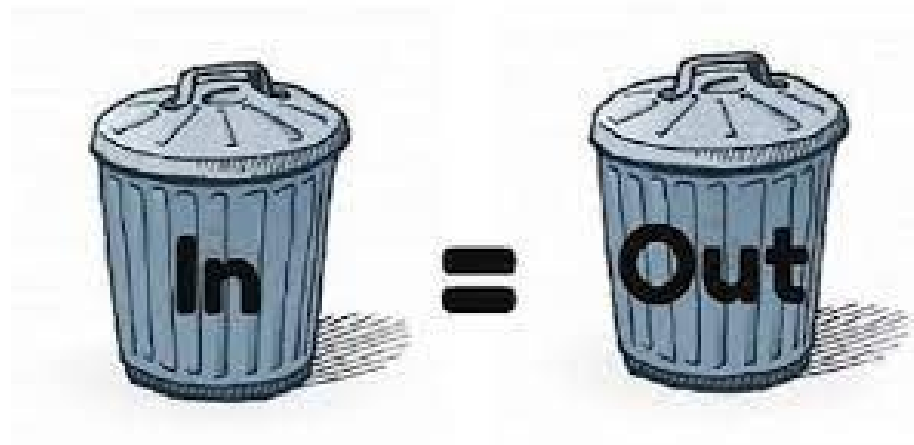
Sustainability

- Are claims measurable and supportable?
- Are operational and financial data connected?
- Can information be independently verified?
- Does the initiative create long-term value?

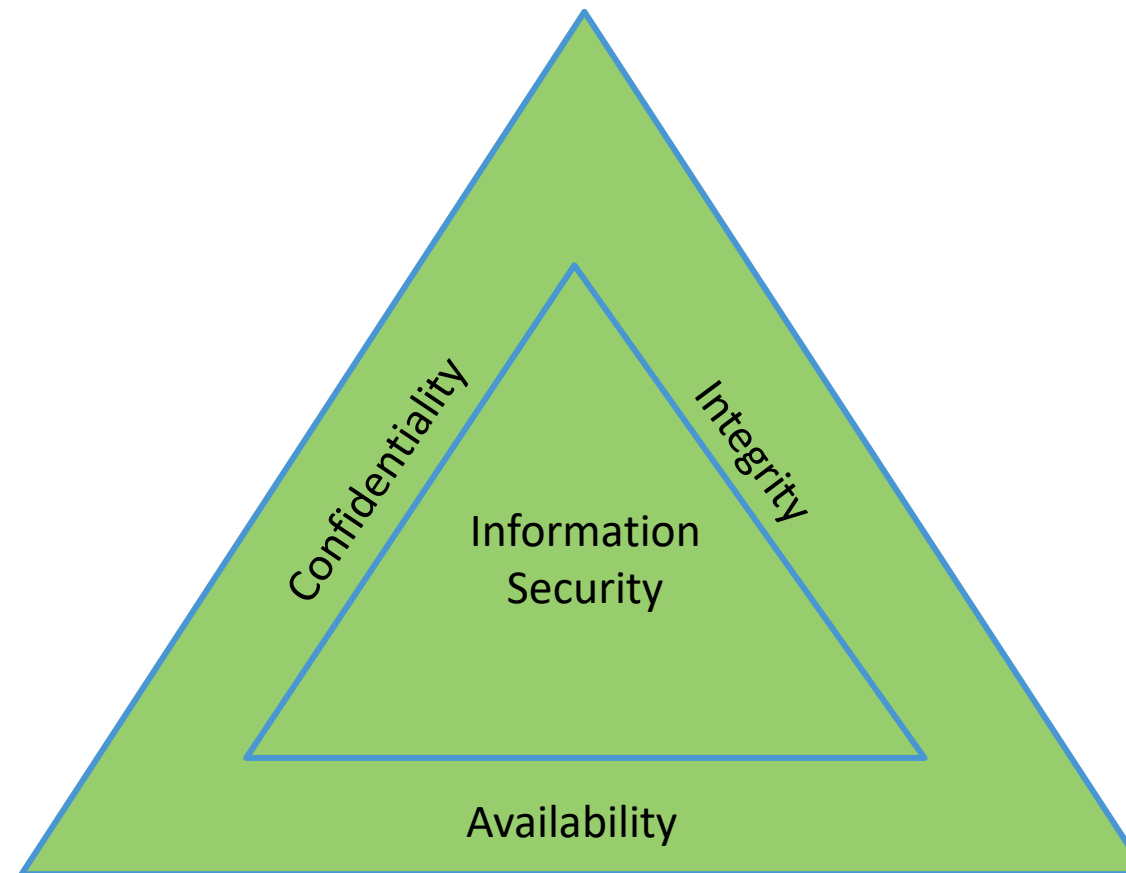
Resilience

- Has the organization modeled disruptions?
- Are contingency plans tested?
- Are systems secure and recoverable?
- Is there a manual fallback?
- Are critical third parties monitored?

Data Challenges



How to verify and validate all pieces of data are accurate, reliable, and consistent?

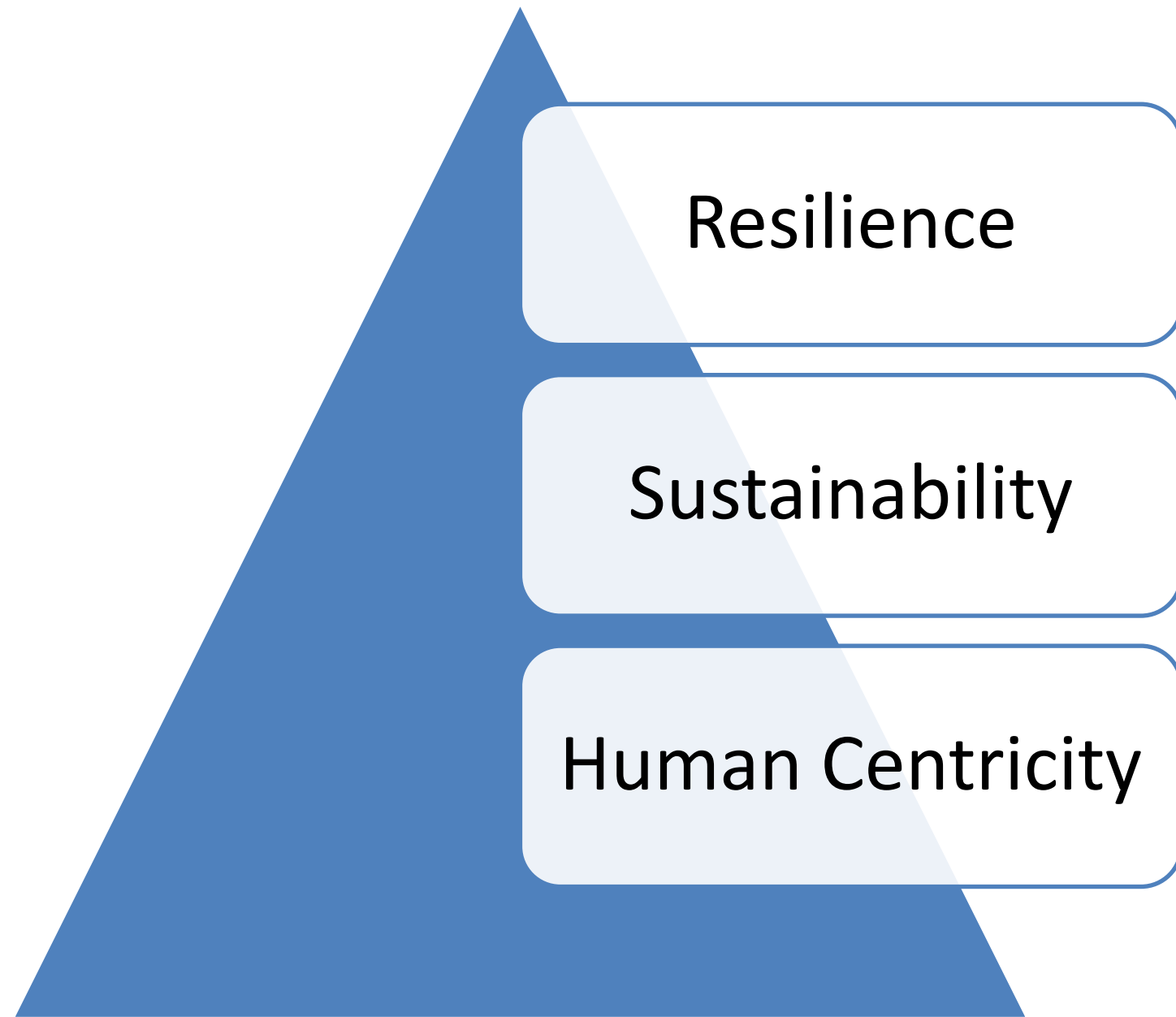


CPA role:

- Data ownership
- Data definitions
- Data lineage
- Integrity controls
- Reconciliations
- Access controls
- Retention policies
- Validation and assurance

INSIGHT: LLMs can be “overly agreeable or sycophantic,” sometimes affirming users even when they are wrong

Profession's Contribution to Industry 5.0



Central Question

- Can the organization anticipate and adapt to disruption?
- Does technology support have lasting and responsible value?
- Does technology amplify human capacity?

CPA Contribution

- Risk management, scenario analysis, continuity
- Measurement, reporting, analysis, assurance
- Judgement, ethics, controls, accountability

CPAs do not need to become software engineers. They need sufficient technological fluency to ask better questions, evaluate evidence, design controls, and protect trust.

Industry 5.0

Essentials for CPA's Beyond Automation



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