
SMART TECHNOLOGY FOR
SUSTAINABLE BUSINESS:
Driving Growth through Intelligence and Innovation
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Abstract

This essay examines how smart technology can support sustainable business by aligning economic growth with intelligence, efficiency, resilience, and innovation. It argues that technologies such as artificial intelligence, the Internet of Things, data analytics, automation, cloud systems, and digital platforms are reshaping how firms create value, manage resources, and respond to environmental and market pressures. Rather than treating sustainability as a separate compliance agenda, the essay presents it as a strategic framework for long-term competitiveness, in which digital intelligence helps firms reduce waste, optimize energy and material use, strengthen supply-chain visibility, improve product lifecycle management, and support more transparent sustainability reporting. At the same time, the essay emphasizes that smart technology is not automatically sustainable. Its benefits are accompanied by real concerns related to electricity demand, raw-material intensity, e-waste, digital inequality, data governance, and the concentration of technological power. The discussion therefore adopts a balanced perspective: smart technology can become a major driver of sustainable growth only when it is embedded in responsible governance, workforce capability, inclusive innovation, and credible measurement systems. The essay concludes that the most future-ready firms will be those that integrate technological intelligence with ecological discipline, organizational learning, and strategic stewardship, thereby turning

innovation into a source of both competitive advantage and long-term sustainability. (IEA)

Keywords

Smart technology; sustainable business; artificial intelligence; Internet of Things; digital transformation; innovation; circular economy; supply-chain traceability; sustainability disclosure; intelligent growth.

Smart Technology for Sustainable Business: Driving Growth through Intelligence and Innovation

The contemporary business landscape is being reshaped by two forces that, until recently, were often discussed separately: digital intelligence and sustainability. The first is represented by artificial intelligence, the Internet of Things, cloud computing, data analytics, automation, digital platforms, and related technologies that allow firms to sense, predict, optimize, and respond with unprecedented speed. The second is represented by the growing realization that business growth can no longer be evaluated only in terms of short-term profit, market share, or scale. It must also be assessed in terms of environmental stewardship, social legitimacy, resilience, and long-term value creation. The central argument of this essay is that smart technology has become one of the most important bridges between these two worlds. Used wisely, it enables firms to grow not by wasting more resources, but by learning faster, coordinating better, reducing inefficiencies, increasing transparency, and inventing new forms of value.

This shift matters because the older industrial model is under strain. Businesses are expected to produce more with less energy, less waste, fewer emissions, more accountability, and higher adaptability. At the same time, competitive pressure has intensified. Customers want faster service, regulators want better disclosure, investors want measurable

sustainability performance, and supply chains are becoming more fragile and more scrutinized. In this setting, smart technology is not just a tool of convenience. It is becoming a strategic infrastructure for survival and renewal. Digital investment has outpaced many other forms of business investment across OECD economies, and the OECD notes that this acceleration has been especially visible since the mid-2010s, underscoring how central digital assets have become to productivity and competitiveness. (OECD)

Yet it would be naïve to treat technology as automatically beneficial. The digital economy itself has material costs. UNCTAD warns that digital technologies and infrastructures rely heavily on raw materials and that the production, use, and disposal of devices, together with rising energy and water needs, are placing increasing pressure on the planet. It further notes that digital devices, data centres, and ICT networks together account for an estimated 6% to 12% of global electricity use. That means the promise of smart technology must be evaluated in a disciplined way. The question is not whether technology is good or bad in itself. The real question is whether firms can design, govern, and deploy intelligent technologies so that productivity gains are aligned with environmental sustainability, social inclusion, and strategic resilience. (UN Trade and Development (UNCTAD))

To understand this relationship, one must begin with the meaning of "smart technology." In business practice, the term refers to technologies that do more than automate routine tasks. They collect data, learn from patterns, support decision-making, and increasingly operate in connected systems. A sensor that merely records machine temperature is useful, but a sensor linked to analytics that predicts breakdowns and schedules maintenance before failure becomes part of a smart system. A digital platform that merely stores transactions is helpful, but a platform that uses machine learning to forecast demand, optimize logistics, and reduce inventory waste becomes a driver of intelligent growth.

Smartness, therefore, lies not only in digitization, but in the capacity to transform data into insight and insight into action.

Sustainable business, similarly, should not be reduced to philanthropy or green branding. A sustainable business is one that creates economic value while preserving the ecological and social conditions on which future value creation depends. It seeks durability rather than mere expansion, efficiency rather than excess, legitimacy rather than image management, and adaptability rather than fragility. In that sense, sustainability is not opposed to business performance. It is increasingly becoming the condition for durable performance. The IFRS Foundation, through the ISSB, has formalized this shift by establishing IFRS S1 and IFRS S2 as a global baseline for investor-focused sustainability and climate-related disclosures, reflecting the reality that sustainability information is now material to strategy, governance, capital access, and long-term enterprise value. (IFRS Foundation)

The convergence of smart technology and sustainable business emerges because intelligence changes how firms use resources. Traditional growth often depended on more inputs: more labor hours, more inventory, more transport, more energy, more physical expansion. Smart growth, by contrast, depends more on precision, coordination, and learning. Digital technologies can reduce production costs, improve matching between demand and supply, foster economies of scale, widen market access, and expand innovation through better information flows. World Bank work on digitalization and trade emphasizes that digital technologies can function as engines of growth by increasing productivity, reducing trade costs, fostering innovation, and strengthening resilience. (Open Knowledge Bank)

This is particularly important because the business environment is no longer stable enough for slow and rigid organizations. A sustainable firm must now be a learning firm. It must know where its emissions come

from, where waste accumulates, where customers are changing behavior, where risks are emerging in the supply chain, and where new value pools are opening. Smart technology helps firms answer these questions in real time or near real time. In this sense, digital intelligence is not merely an efficiency device; it is an organizational sensing system. It makes firms more aware of themselves and their environments. That heightened awareness is the foundation of both innovation and sustainability.

One of the clearest ways smart technology drives sustainable growth is through operational efficiency. In manufacturing, for instance, AI, machine vision, predictive maintenance, and connected sensors allow firms to reduce downtime, detect anomalies, optimize energy use, improve throughput, and extend asset life. These gains are not trivial. They change the economics of production. The IEA reports that digitalization-enabled AI can help production operations and detect inefficiencies, while in a widespread-adoption case, AI could deliver energy savings of 8% by 2035 in light industry such as electronics or machinery manufacturing. (IEA)

This has deep sustainability significance. Waste in business is often invisible until it is measured. Machines consume excess power, warehouses overstock slow-moving goods, fleets idle unnecessarily, buildings are cooled when unoccupied, and water leaks remain undetected for months. Smart technologies turn these inefficiencies into visible and manageable variables. Once measured, they can be redesigned. Thus, a factory equipped with digital twins and IoT systems is not simply “more modern”; it can become more materially disciplined. It can lower emissions intensity, reduce scrap rates, use less water, and improve maintenance cycles. These changes strengthen margins while also improving environmental performance. Growth then comes not from consuming more resources blindly, but from using them more intelligently.

The energy sector offers another strong illustration. Power systems are becoming more complex because renewable generation is variable, decentralized resources are growing, and demand patterns are changing with electrification. AI is especially valuable in such environments because it can forecast demand, improve grid balancing, optimize power plant operations, and support maintenance. According to the IEA, AI applications in power plant operations and maintenance could yield potential cost savings of up to USD 110 billion annually by 2035 in a widespread-adoption scenario, while also helping integrate more renewable electricity into the grid; the agency also notes that AI could unlock up to 175 GW of additional transmission capacity from existing lines. (IEA)

This matters for business far beyond utilities. Every firm depends on energy, and energy is now becoming a strategic variable in sustainability and competitiveness. Rising electricity demand from data centres and AI systems adds pressure, but smart energy management can also offset costs and improve resilience. Buildings can use AI-based controls to optimize heating, cooling, and lighting. Industrial plants can shift loads in response to grid conditions. Retailers can manage refrigeration more efficiently. Transport fleets can optimize charging schedules for electric vehicles. In each case, intelligence is not replacing sustainability; it is operationalizing it. Smart systems make environmental goals measurable and actionable in everyday decision-making.

Supply chains are another critical domain. In the old model, supply chains were often optimized primarily for cost and speed. The weaknesses of that model became visible through disruptions, geopolitical shocks, climate stress, and growing stakeholder demands for traceability. Sustainable business now requires a supply chain that is not only lean, but transparent, ethical, and resilient. Smart technology helps firms map suppliers, trace materials, monitor logistics conditions, forecast disruptions, and identify sustainability hotspots. Data analytics

can reveal which suppliers carry the greatest carbon burden, which routes involve the highest risk, and which product designs generate hidden waste.

The significance of this becomes clearer when one considers how regulation is evolving. The European Commission describes the Digital Product Passport as a key innovation under the Ecodesign for Sustainable Products Regulation, designed to store and share relevant information about a product's sustainability, durability, and other environmental aspects. This is more than a compliance tool. It signals a structural change in markets: value chains are being asked to become legible. Firms will increasingly compete not only on price and quality, but on the quality of their information and the credibility of their sustainability claims. (Internal Market & Industry)

A business that can digitally document product origin, materials, energy profile, repairability, and end-of-life pathways will be better positioned for a world of circular and accountable production. This has strategic implications for manufacturing, fashion, electronics, automotive, packaging, and consumer goods. Smart technology supports circularity because it makes products and flows more visible across their lifecycle. It can help firms design for reuse, improve reverse logistics, anticipate maintenance, and recover materials more efficiently. Circular business models depend on information. Without reliable data, reuse and refurbishment remain fragmented and costly. With digital systems, they become scalable.

The circular economy, therefore, is one of the most important meeting points between sustainability and digital innovation. In linear business systems, firms extract, produce, sell, and discard. In circular systems, they try to maintain value by extending product life, recovering materials, remanufacturing components, and rethinking ownership models. OECD work on digital tools in the circular economy highlights how digital

business models and technologies can improve environmental information and consumer engagement. This is crucial because circularity is not merely an engineering question; it is also a coordination question involving producers, consumers, logistics providers, recyclers, and regulators. (OECD)

Smart technology also changes how businesses innovate. Innovation used to be periodic, localized, and often slow. Firms would launch a product, collect delayed market feedback, then revise in the next cycle. Today, data-rich environments allow more continuous experimentation. Platforms gather behavioral data, sensors capture usage patterns, and AI helps firms simulate scenarios before large investments are made. This shortens the learning cycle. Sustainable innovation benefits from this because many sustainability problems are systems problems. They involve trade-offs among cost, user behavior, materials, emissions, logistics, and regulatory risk. Smart tools help firms explore these trade-offs with greater precision.

Consider product design. A sustainable product must increasingly be durable, repairable, energy-efficient, and resource-conscious. Smart design tools can simulate materials performance, optimize packaging, reduce excess components, and estimate lifecycle impacts earlier in the design process. This lowers the cost of experimentation and improves the chances that firms will innovate responsibly rather than reactively. A company that uses digital modeling to reduce material intensity in a product is not merely cutting cost; it is redesigning value creation around intelligence rather than bulk.

Marketing and customer strategy are also being transformed. Sustainable business growth depends increasingly on trust and relevance. Consumers are more aware of environmental claims, yet also more skeptical of vague promises. Smart technology allows firms to personalize communication, educate customers, and document

performance more credibly. Digital interfaces can show product provenance, repair options, recycling instructions, and energy-use information. Such transparency can strengthen loyalty. It can also shift firms away from purely transactional models toward service-based and relationship-based models.

This is why smart technology often supports the move from product sales to outcome-based models. Instead of merely selling equipment, a firm might sell uptime, energy savings, or performance guarantees. Instead of selling appliances, it might provide monitoring and maintenance services. Instead of pushing volume, it may extend product life and profit from service ecosystems. These models can be both commercially attractive and environmentally beneficial because they align profitability with efficiency and durability. When the producer retains more responsibility for performance over time, it has stronger incentives to reduce waste and improve design.

Agriculture offers another instructive example, especially for emerging economies. Farming has always been exposed to uncertainty—weather, pests, prices, soil conditions, and logistics. Smart technologies such as remote sensing, precision irrigation, digital advisory services, weather analytics, and mobile platforms can make agriculture more productive and more sustainable. World Bank and related development literature note that digital services can make agriculture "smarter" by improving access to information on soil, temperature, weather conditions, crop growth, livestock management, and markets, thereby reducing information and coordination costs. (Open Knowledge Bank)

This is significant because sustainability in agriculture is not only about reducing environmental harm. It is also about improving livelihoods, resilience, and food system efficiency. A farmer who receives timely weather alerts, uses sensor-guided irrigation, and gains digital access to market prices can reduce resource waste while making better economic

decisions. Here, smart technology supports sustainability not through abstraction but through practical intelligence. It reduces uncertainty, which is one of the major hidden costs of production systems.

Logistics and mobility show a similar pattern. Transportation networks are major sources of emissions and inefficiency, but they are also highly amenable to data-driven optimization. Route optimization, dynamic scheduling, fuel management, warehouse robotics, and digital inventory systems can reduce idle time, avoid spoilage, lower emissions, and improve delivery reliability. In transport, the IEA notes that AI applications can improve vehicle operation and management and can reduce energy consumption. The logic is straightforward: better prediction reduces waste. A more accurate system is often also a greener system. (IEA)

At the organizational level, smart technology also enables a better integration of sustainability into management control. One of the major challenges in sustainable business has been that environmental and social performance often sit outside the core decision systems of the firm. Sustainability departments produce reports, but procurement, operations, finance, and strategy continue to work with different metrics. This separation weakens accountability. Digital systems can help close the gap. When emissions data, water intensity, supplier risk, waste levels, and safety indicators are integrated into enterprise dashboards, sustainability becomes part of operational management rather than a parallel narrative.

This integration has financial implications. Investors increasingly expect comparable and decision-useful sustainability information. The ISSB's standards explicitly aim to provide a globally consistent baseline for sustainability-related and climate-related disclosures. The benefits to companies include improved governance, better strategy, stronger investor communication, and potentially better access to capital. Smart

technologies are central here because high-quality reporting depends on data architecture, internal controls, and traceable information flows. In other words, digital maturity is increasingly a precondition for sustainability maturity. (IFRS Foundation)

Still, the case for smart technology should not collapse into technological determinism. Intelligence does not automatically produce wisdom. Many digital systems replicate bias, intensify surveillance, centralize power, or generate rebound effects. A company may reduce energy per unit while increasing total energy demand through rapid scale expansion. It may use AI to optimize advertising while encouraging overconsumption. It may digitize reporting while outsourcing environmental burdens to opaque suppliers. The real test is not whether technology is advanced, but whether it is governed in ways consistent with sustainable outcomes.

The energy and material footprint of digitalization is one of the clearest contradictions. AI promises efficiency, but AI infrastructure consumes electricity, cooling, chips, and water. The IEA's 2025 work on energy and AI highlights that the report includes projections for how much electricity AI could consume over the next decade, while UNCTAD warns of the growing planetary toll associated with digital infrastructure. This tension requires strategic discipline. Firms should not assume that because a system is digital, it is inherently sustainable. They need to ask where compute is located, how data centres are powered, how hardware is sourced, how models are trained, and whether digital gains exceed digital burdens. (IEA)

Another major risk lies in inequality. Smart technology can widen gaps between large and small firms, between digitally mature and digitally lagging regions, and between high-income and low-income countries. The World Bank's 2025 Digital Progress and Trends Report notes that AI can unlock access to knowledge, boost productivity, and open new

markets, but it also stresses that the benefits are uneven because many countries face major gaps in connectivity, compute, context, and competency. It further shows that high-income countries dominate notable AI models, start-ups, venture capital, and data-centre capacity. (World Bank)

This matters for sustainable business because a transition that excludes smaller firms or developing economies will not be genuinely sustainable. If AI and smart systems remain concentrated in a few regions and corporations, the digital transition may deepen dependency instead of promoting inclusive growth. UNCTAD's 2025 Technology and Innovation Report makes this point by framing AI as a development issue that requires inclusive policy design, worker empowerment, national strategy, and global collaboration. Smart technology must therefore be democratized, not merely celebrated. (UN Trade and Development (UNCTAD))

For managers, the practical question is how to translate these ideas into strategy. The first step is to stop treating technology and sustainability as separate agendas. In many organizations, one team pursues digital transformation while another handles ESG or sustainability reporting. This separation produces fragmented investments and missed opportunities. A better approach begins with a shared value map: where are the company's major resource losses, emissions hotspots, operational bottlenecks, compliance risks, and customer trust challenges? Once these are identified, smart technologies can be deployed selectively to address the most material issues.

The second step is to move from technology-first thinking to problem-first thinking. A sustainable firm should not ask, "How can we use AI because AI is fashionable?" It should ask, "Where do we need better intelligence to reduce waste, increase resilience, improve transparency, or create new forms of customer value?" In one company, the answer

may be predictive maintenance; in another, it may be traceability; in a third, better demand forecasting; in a fourth, climate-risk analytics; and in a fifth, digital service models. Smart technology creates value when it is clearly linked to strategic pain points and long-term goals.

The third step is to build data governance as carefully as one builds technical capability. Sustainability claims without trustworthy data will increasingly be punished by markets and regulators. If environmental indicators are inconsistent, if supplier data cannot be verified, or if AI systems cannot explain their outputs, the company may suffer reputational and strategic harm. Good governance means clear data ownership, auditability, privacy protections, cybersecurity, model oversight, and defined accountability for decisions supported by algorithms. Intelligence without governance may accelerate mistakes.

The fourth step is workforce development. Smart sustainable business is not achieved by software alone. It requires people who can interpret data, question assumptions, redesign processes, and translate insights into action. The World Bank's emphasis on "competency" as one of the four foundations for inclusive AI is directly relevant here. A business that buys advanced tools but neglects workforce capabilities will underperform. Conversely, firms that combine digital skills with operational knowledge and sustainability literacy are better positioned to innovate continuously. (World Bank)

The fifth step is experimentation with discipline. Not every digital project should be large or expensive. In fact, the World Bank's discussion of "small AI" is especially relevant for firms, particularly SMEs. Lightweight, accessible AI applications running on ordinary devices can already improve agriculture, health, education, and small-business performance in developing contexts. For firms, this means digital transformation does not always require massive compute resources. Many practical

sustainability gains can begin with narrower, targeted tools that solve immediate operational problems. (World Bank)

Public policy also plays an important role. Businesses do not innovate in a vacuum. They respond to infrastructure, standards, finance, skills systems, energy prices, market rules, and regulatory clarity. OECD, World Bank, UNCTAD, and UNIDO sources all converge on one point: digital transformation and sustainable development require ecosystems, not isolated interventions. UNIDO's Industrial Development Report 2024 frames the present moment as a "new era of industrial policy," linking sustainable solutions to stronger industrial capabilities and strategic transformation. (UNIDO)

This ecosystem view is essential. Smart sustainable business depends on reliable electricity, connectivity, interoperable data systems, skilled labor, standards for reporting and traceability, and access to finance for technology adoption. It also depends on fair competition. If dominant players can hoard data or lock in customers and suppliers through proprietary ecosystems, innovation may become less inclusive. Sustainable growth, therefore, requires institutional design that encourages diffusion rather than excessive concentration.

For emerging economies, this discussion has particular urgency. Many developing countries face simultaneous pressures: urbanization, climate vulnerability, infrastructure gaps, and the need for productivity growth. Smart technology offers a chance to leapfrog certain stages of development, but only if the foundations are in place. World Bank analysis stresses connectivity, compute, context, and competency as the bedrock of effective AI ecosystems. That framework is useful not only for governments but also for firms. A company cannot become intelligently sustainable if it lacks connectivity, adequate computing resources, relevant local data, and human capability. (World Bank)

There is also a moral dimension to all this. A business model built solely on extracting more data, stimulating more consumption, and obscuring environmental costs may be digitally sophisticated yet strategically shallow. Smart technology becomes genuinely transformative only when it supports a different philosophy of value creation. That philosophy sees waste as a design failure, opacity as a governance risk, exclusion as a developmental weakness, and resilience as a competitive asset. Under that philosophy, intelligence is not merely computational power. It is the capacity of an enterprise to align profit, purpose, and adaptation.

That is why sustainable business should not be imagined as a restraint on innovation. It is a higher form of innovation. It challenges firms to create systems that are productive without being destructive, scalable without becoming brittle, and profitable without eroding their own ecological and social foundations. Smart technology is one of the most powerful means available for pursuing that challenge because it increases visibility, responsiveness, and coordination. But it must be embedded in good strategy, good governance, and a serious understanding of sustainability.

In conclusion, smart technology is changing the grammar of business growth. Growth is no longer simply a matter of expansion; it is increasingly a matter of intelligent coordination, resource discipline, transparency, and resilience. AI, IoT, analytics, platforms, and digital infrastructures can help firms reduce waste, optimize energy use, strengthen supply chains, improve disclosure, support circular models, and design more adaptive products and services. At the same time, these technologies bring material and governance risks that cannot be ignored, including rising electricity demand, resource extraction, exclusion, cyber vulnerability, and the concentration of digital power. (IEA)

The strategic task for business leaders, therefore, is not to choose between growth and sustainability, or between innovation and responsibility. It is to integrate them. The firms that will matter most in the coming decade are likely to be those that treat smart technology not as a decorative layer added to existing models, but as a deep capability for rethinking how value is created, measured, delivered, and renewed. In such firms, intelligence becomes a means of stewardship as well as performance. Innovation becomes not just a race to do more, but an effort to do better. And sustainability becomes not a compliance burden, but the architecture of enduring competitive advantage.

Glossary

1. **Smart technology**
   Smart technology refers to connected digital systems that can collect data, process information, generate insights, and support or automate decisions in real time or near real time. In business, this usually includes AI, sensors, analytics, cloud tools, and digital platforms. (OECD)
2. **Artificial intelligence (AI)**
   AI refers broadly to computational systems that perform tasks associated with learning, prediction, reasoning, pattern recognition, or decision support. In business settings, AI is often used for forecasting, optimization, personalization, and automation. (NIST)
3. **Internet of Things (IoT)**
   IoT refers to internet-connected devices, including sensors and controllers, that interact with the physical world and exchange data with digital systems. In industry, IoT helps monitor assets,

processes, equipment, and environmental conditions. (NIST Computer Security Resource Center)

4. **Data analytics**
   Data analytics is the process of examining structured and unstructured data to identify patterns, improve decisions, forecast outcomes, and optimize business performance. Within sustainable business, analytics is essential for measuring waste, emissions, demand, and operational inefficiencies. (OECD)

5. **Predictive maintenance**
   Predictive maintenance is the use of data, sensors, and analytical models to anticipate equipment failure before breakdown occurs, allowing firms to reduce downtime, extend asset life, and improve resource efficiency. (IEA)

6. **Digital twin**
   A digital twin is a digital representation of a physical object, process, or system that can be used to simulate, monitor, and improve real-world performance. It is especially useful in manufacturing and infrastructure because it allows testing and optimization before intervention in the physical system. (OECD)

7. **Sustainable business**
   Sustainable business refers to a model of value creation that seeks economic performance while preserving environmental integrity, social legitimacy, and long-term resilience. It treats sustainability not as a side activity, but as part of strategy and risk management. (IFRS Foundation)

8. **Circular economy**
   The circular economy is an economic model aimed at extending product life, improving reuse, repair, refurbishment, and recycling,

and reducing waste by keeping materials and value in circulation for as long as possible. (OECD)

9. **Supply-chain traceability**
   Supply-chain traceability is the ability to track and verify the origin, movement, composition, and status of products or materials across the value chain. It is increasingly important for sustainability, compliance, and consumer trust. (World Bank)

10. **Digital Product Passport (DPP)**
    A Digital Product Passport is a digital mechanism for storing and sharing information about a product's sustainability, durability, and related environmental characteristics, making that information accessible to businesses, consumers, and authorities. (Internal Market & Industry)

11. **Sustainability-related risks and opportunities**
    These are risks and opportunities connected to sustainability matters that could reasonably be expected to affect an entity's cash flows, access to finance, cost of capital, or broader business prospects over time. (IFRS Foundation)

12. **Climate-related risks**
    Climate-related risks include both physical risks, such as extreme weather or heat stress, and transition risks, such as policy shifts, technological change, or market adjustments associated with the move to a lower-carbon economy. (IFRS Foundation)

13. **Materiality**
    Materiality, in the sustainability disclosure context, refers to information that is significant enough to influence decisions by users of general purpose financial reports. Material sustainability information is therefore not peripheral; it is financially and strategically relevant. (IFRS Foundation)

14. **Twin transition**

The twin transition refers to the combined digital and green transformation of economies and industries. It captures the idea that digital innovation and environmental sustainability are increasingly intertwined rather than separate agendas. (OECD)

15. **Responsible AI**

Responsible AI refers to the design, development, deployment, and use of AI systems in ways that manage risk, improve trustworthiness, and reduce harm to individuals, organizations, and society. (NIST)

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