Infosys®
Navigate your next

WHITEPAPER

AI TRUSTWORTHINESS IN THE AEROSPACE, FINTECH, AUTOMOTIVE, AND HEALTHCARE INDUSTRIES

Artificial intelligence is now an integral part of digital transformation. However, AI adoption and its integration with legacy systems is more complicated in highly regulated industries such as aerospace, fintech, autonomous vehicles, and health care. With data security and privacy paramount, along with customer safety, businesses in these four domains need to understand the rapidly evolving regulatory structures that will make or break AI initiatives.

Infosys® | Knowledge Institute

AI demand landscape

Many industries are utilizing AI. However, in this paper, we look at its applications in the aerospace, fintech, autonomous vehicles, and health care industries, where better AI hardware, software, solutions, and services are creating many opportunities. Data integrity, privacy policies, decision system guidelines, and holistic regulations are continuously evolving in these industries. This ecosystem is now ripe for service providers and system integrators to play their parts, with AI adoption achieving appreciable return on investment. Key applications of AI in this space include optimizing operational efficiencies, assuring robustness of systems, data and image interpretation, and human augmented decision-making. Other applications include automation of processes and workflows, better compliance, improved performance, and reliability platforms, unmanned derivative systems (in finance) and digital and virtual assistants. Figure 1 summarizes AI's importance across the four industries discussed in this paper.[1-36]

Figure 1. AI demand landscape across industries

Dimension	Aero	Fintech	Autonomous Vehicles	Healthcare
Market size	$1.8 Billion by 2025 CAGR of 45.3%	$247.4Billion by 2026 CAGR of 38%	$15.9 Billion by 2027 CAGR of 39.8%	$ 36.15 billion by 2025 CAGR of 50.2%
AI need	Moderate	Very high	High	Moderate – high
AI adoption	Moderate	Very high	High	Moderate – high
Product development	Moderate	Moderate	High	Low
Operations	High	Very high	Very high	High
Supply chain	Moderate	Moderate	High	Low
End-user experience	Moderate	Very high	Very high	High
AI in workforce	Moderate	Very high	Very high	Very high

AI drivers

The primary drivers of AI are data privacy, security, cost, risk, authenticity, guarantee and improved decision systems. Each driver has its own specific impact and relevance from a business adoption and operations perspective. The driver ensures that applications will have business significance and are attuned to regulations, while having close association with global and geography-specific ecosystems. Also, the drivers ensure quicker adoption to enhance operational efficiency, without compromising on the end-user experience.

Regulatory and government bodies play a vital role in assessing and formulating guidelines for adopting AI in the business value chain. In this setting, geography-specific consortiums of business entities, regulatory bodies, and other institutions are brought together to determine the rules for AI. This work then drives the adoption of AI technologies. The need for high data quality is just one aspect of this regulatory environment, enabling businesses to make smart decisions based on clearer interpretations of historical data. Enhanced efficiencies, better customer experience, and workflow optimization are three others.

> Better data privacy and security, along with lower cost and risk are driving AI adoption

Smart maintenance is a strong driver in the aerospace sector. This can be done by optimizing processes and workflows to achieve better fuel efficiencies. As the

industry is regulated by geography-specific authorities and statutory establishments, these bodies will have a direct bearing on the degree of AI adoption in the entire value chain. OEMs and aerospace industry suppliers will also play a vital role in adopting AI-enabled processes that digitize legacy systems. However, as of this writing, AI has mainly been used in aerospace industries for front-end applications to achieve better customer experiences (though it is slowly being adopted as a suggestive system).

Fintech is another industry that was an early adopter of AI-enabled platforms and services. Six significant drivers have enabled this industry to sit at the bleeding edge of AI, using the technology to transform both front and back office business processes. In this paradigm, the latest mobile and communication devices have made use of advanced IT technology stacks with AI-enabled digital platforms. Major stakeholders include regulatory bodies, statutory authorities, audit and compliance institutions, technology infrastructure providers, vendor partners, and servicing corporations. These entities drive AI initiatives in both upstream and downstream processes, with use cases including authentication, quicker credibility checks on the customer, wealth assessment, and faster audit trials (using a predefined rule engine with stronger encryption).

As unmanned technologies are used to ferry around people and materials, autonomous vehicles have become mainstream in many sectors. Operation models have shifted from ownership to as-a-service models, using AI to automate the entire value chain. AI implementation initiatives are driven by geography-specific authorities and statutory bodies. These organizations also have great influence from a political, social, economic, and technology standpoint. Using AI in inbound and outbound logistics have been given a leg up due to the electrification of vehicles, which enables virtual assistance through real-time streaming of data. The adoption of automated and remote guided vehicles and advanced driver assistant systems has made unmanned operations safer for both humans and the materials they transport. Society 5.0 and Industry 4.0 initiatives across the globe, along with geography-specific digital transformation themes are driving the AI aspect of autonomous vehicles. The costs of AI implementation, together with business viabilities, have been explored to arrive at the most affordable autonomous vehicle solutions and services for the end customer.

> Society 5.0 and Industry 4.0 initiatives are making AI in autonomous vehicles more important

Health care is a critical industry sector, housing many ecosystems that are ripe for AI transformation. Clinical trials, laboratory data sets, health records, data platforms, and data warehousing platforms all have strong AI elements. To get a leg up on their journey, healthcare providers must ensure their culture is AI-friendly. Also important are data privacy and data interpretation aspects of AI initiatives. Sensitive customer data makes health care more cautious about wide-ranging AI transformation, and has made AI-driven encryption that much more important when arriving at solutions.

Figure 2 brings these four sectors together in one framework. Note that regulatory bodies are important across all four domains, as are different elements of customer experience, quality assurance, data management, and operational efficiency.

Figure 2. AI drivers across the four industries

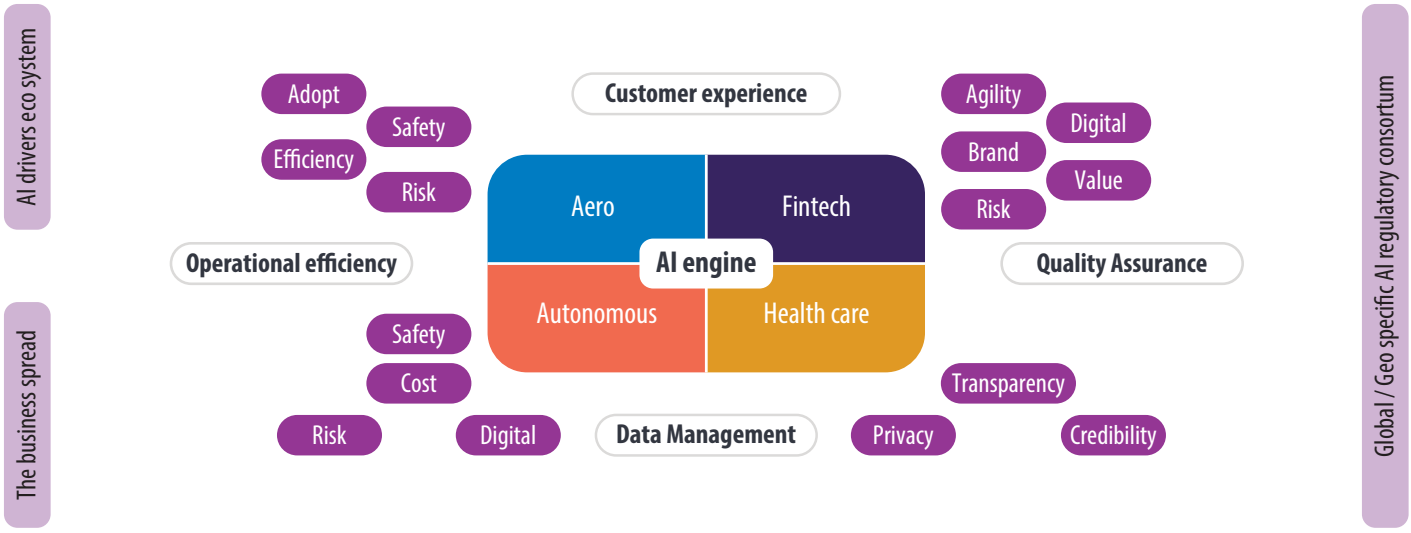


Figure 3. AI competency dimensions across the technology stack

AI competency

The business case for AI has grown rapidly over the last five years and will continue to increase. From 2019 until 2025, the CAGR of AI will increase by 46.2%. Much of this value will come from human-machine augmentation, powered by intelligent IT systems with natural response-based systems to assist human endeavors. With so much excitement around autonomous and robotic systems, the Infosys Center of Excellence for Artificial Intelligence provides capabilities to bring a complete digital experience to the market, navigating clients on their journey toward becoming AI visionaries.

Rapid advances in AI technology are driving high growth in the area of unmanned systems. These systems can respond to real-world conditions with real-time, AI-driven, decision systems without human intervention. Infosys has developed solutions around unmanned systems (with built-in AI) that drive automation and align well with industry 4.0 technologies such as robotics, cloud computing, computer vision, and cyber-machine-human interfaces. For each industry cited in this paper, Infosys has a solution focusing on adoption, trustworthiness, and value realization. Figure 3 introduces a framework used by Infosys, covering machine learning, smart vision, safety and security, data management and analytics, and decision systems, all areas where AI plays a significant role. Bringing these different elements together makes a system smart enough to make decisions based on both rules and business engines without forfeiting on compliance.

AI trustworthiness in the aerospace industry

AI trustworthiness in the aerospace industry is primarily driven by two perspectives. The first is safety; the second is explainability. Both aspects must be delivered without compromising on quality assurance, which is needed to guarantee a certain level of service. Figure 4 develops this thinking with a complete AI strategy and roadmap for both integrating and implementing AI in this sector.

Technical robustness and safety are the primary drivers here. The aerospace industry demands trustworthiness for all key outcomes from each respective process in the value chain. The transparency of data elements and machine decision systems enable systems to be both accountable and authenticated across different processes. Further, data privacy and governance mandates will evolve so that all captured data will be assessed from a fairness and discrimination perspective. Explainable AI is needed in each workflow and process to satisfy standards and regulations, along with a high degree of human safety in each AI implementation.

Figure 4. AI trustworthiness and strategies in the aerospace industry

	Present	Emerging	Next generation
	2019 – 2024	2025-2028	2028-2035
Levels	Level 1 AI-ML: Assistant to human	Level 2 AI-ML: Human-machine collaboration	Level 3 AI-ML: More autonomous machine
Sub levels	• Level 1A – Routine assistance • Level 1B – Reinforced assistance	• Level 2A – Human performs a function, machine monitors • Level 2B – Machine performs a function, human monitors	• Machine performs functions with no human intervention • Human is in the loop at design and oversight time

The European Aviation Safety Agency (EASA) has created building blocks for AI.[1] These include learning assurance, AI explainability, AI safety and mitigation, and the creation of a foundation layer for AI adoption in the aerospace industry. Within this framework, the key elements involve technical robustness and safety, accountability, privacy and data governance, and societal and environmental wellbeing. On the business process side, where human and machine-oriented processes will align and amalgamate, various competencies are in development, including how relevant AI is in the process, roadmaps to implementation, technology stacks, and safety.

To adopt affordable AI in the enterprise, key elements must be both predictable and standardized. The roadmap that drives multiple phases should include non-bias and variance-based machine learning applications, along with adaptive-based learning and simple algorithms for optimal performance. Phases of the roadmap include:

- Phase I — Exploration and first guidance development.
- Phase II — AI-machine learning framework consolidation.
- Phase III — Pushing barriers.

EASA released its first version of the AI roadmap for the aero sector in February 2020. The roadmap takes a human-centric approach to AI and creates a consistent and risk-based "AI trustworthiness" framework. The framework can be used to approve safety-critical AI/ML applications in any of the core domains of the agency by the end of 2025.

Assurance — Guidance on how to account for AI-machine learning in both system safety assessment processes and during design has a huge impact on system architecture. Quality assurance is derived from the definition of end-to-end processes for data lifecycle management and considerations of data quality.[1]

How AI learns — The training and verification data sets that are selected and validated will be assessed with respect to learning models. The model architecture and algorithms, and distribution of test versus training data will have a significant impact on how well the learned data makes decisions across the value chain in the aerospace industry. Bias can be mitigated by hyper parameter tuning and by analyzing performance in safety scenarios. This aspect is very critical in insuring trained data have the required performance, along with the necessary functional, safety, and redundancy elements for effective implementation.[1]

Business strategy — Applying AI research and service authentication will result in bringing AI to maturity in the aerospace industry, beyond applications tailored to the manufacturing process. Using humanistic AI versus rationalistic AI for survivability, along with methods such as structured randomness and "sufficability," will drive businesses to make important decisions scale and make AI more robust and predictable.[3]

AI safety risk mitigation — AI safety with its associated risk mitigation matrix is necessary to ensure human intervention is possible during an emergency. Key elements include human in command (HIC) or human in the loop (HITL), monitoring AI-machine output, AI recovery through a traditional backup system, and AI monitoring through an independent AI agent. Encapsulation of machines with rules-based approaches will drive safe and effective efforts to mitigate risk before implementation. Further, the notion of "licensing to an AI" is still being examined.[1]

Explainability — AI must be able to explain its results. The success in explainable AI (XAI) is driving the technology's relevance in the aerospace industry. The DEEL (dependable explainable learning)

industry and associated laboratories can be used to develop robust, certifiable, and dependable AI technological bricks for critical systems. These bricks are becoming more relevant as they provide industries with more mature AI layers to adopt. On the other hand, the U.S. Defense Advanced Research Projects Agency's (DARPA) XAI program aims to create a suite of machine learning techniques that produce even more explainable models. Maintaining a high level of learning performance (prediction accuracy) is another important mode to consider for adoption. The vital element here is for users to understand, trust, and effectively manage an emerging generation of artificially intelligent partners.[1]

Verification and validation — Verification, validation, and the ability to adapt are critical for AI adoption in the aerospace industry. The integration of AI- and machine learning-based systems with other systems (and with human operators) requires the need to mitigate outstanding risks. Currently, AI algorithms are extensively used and are adopted for accident and incident investigations. For this, the adoptability and usability of AI-based solutions depends on services that are at once robust and authenticated. Public trust in AI-based systems also needs to be validated before implementation can be carried out.[3,4]

AI trustworthiness in fintech

Fintech companies were among AI's early adopters, a natural outgrowth of the industry's data-oriented processes and embrace of digitization. These companies have found AI useful for data processing and synthesizing, and rules-based decision systems for business processes lower in the value chain. Common uses have included B2B, B2C, and back office and front office operations.

With their highly regulated and compliance-oriented processes, fintech's must be careful they don't compromise on data privacy. The use of encryption layers and policies at all levels is particularly important. Below are critical levers in fintech's adoption of AI and its future direction (Figure 5).

In the fintech sector, AI platforms play particularly important fraud prevention roles in business portfolios that include credit data and loyalty programs.[5] This is also a customer sensitive industry that deals with banking, trading, and commercial lending. Companies must provide a structured transition to AI use in the front-end and back-end of business operations.

Currently, 85% of financial firms use some form of AI; the technology is expected to become essential within two years. Financial businesses are also working with cross-company platforms to process payments and commercial transactions.

The digital revolution, robotics, and AI-based automation is transforming financial services. Companies are exploring new operating models to address digital disruption while still minimizing costs and increasing productivity. The financial sector's strategic roadmap moves from cognitive to self-managed to self-resilient systems. This should balance authenticity, ethical awareness, financial data monitoring, fair decision-making, and cognitive processes to authenticate critical decisions. To help the audit trail, it is also important to

Figure 5. Fintech's AI roadmap

	Present	Emerging	Next generation
	2014-2020	2020-2025	2025-2036
Levels	Fintech 2.0	Fintech 3.0	Fintech 4.0
State	Developed — Global adoption	Developed — Emerging globally	Yet to emerge
State	• Moderate AI, API-driven • Internet and application enabled • Collaborative platforms • Industry-specific platform services • Complete digitalization	• Integrated AI, bot integration • Internet and application enabled • Integrated platform as a service • Hybrid platform as a service • Co-created and collaborated APIs	• Fully AI-driven • Blockchain technology • Soft and hard bot integration • Intelligent platform as service • Shared API and integrated services

prioritize data privacy, data ownership, and data retrieval on demand.

AI regulations and compliance are governed by a fintech industry consortium with no defined regulatory standards. These rules are governed by geography specific institutions, regulatory bodies, and business organizations. AI-driven frameworks and solutions need to be aligned with those local regulatory and statutory bodies to ensure the trustworthiness of data. End users will accept this AI revolution if institutions align their frameworks with ethical guidelines, industry standards, and regulatory compliance.

Human-machine augmentation levers — Companies want to integrate AI, automation, and human-specific process-driven actions at all levels. Cognitive AI is used to increase productivity through better process automation and resolution of tickets. Process automation tellingly uses something called "time-driven process adherence," with services delivered as part of the flow. Adoption will be further accelerated by using bots in a "soft" manner, integrating them into workflows without compromising on end-user experiences. Fintech products and services need a personalized digital experience to elevate business strategies.[5,6]

Technology levers — This industry is pursuing important technology components, such as machine learning and robotic-based test automation, cloud-based digital financial services, big data and hyper processing systems, personal digital assistants, augmented intelligence, blockchain, and cryptocurrency migration. The sector is focused on the rapid development of unmanned services and solutions to enhance the digital experience for end users. The industry is also using platform-as-a-service — via shared APIs — to exchange data with multiple platforms across industries.[5,6]

Business levers — Business levers primarily focus on cost-centric to profit-centric processes within the value chain. Most solutions are available as pay-per-service models that enhance the customer experience. The self-managed digital wallet for personalized banking and unified automated solutions for resolving problems pushes AI into the core. Automation of the audit process, which is purely driven by standard operating procedures, is another fintech opportunity due to data intensive and preset rules for compliance verification. The smart decision-making systems for lending and credit, and automated validation of services, are other business elements that demand the consideration of AI.[5,6,7,8]

Validation levers — To avoid legal and liability issues, validation and verification are critical activities in the fintech industry. AI-driven validation focuses primarily on the low end of the value chain but needs to be moved up. Machines will continue to contribute more to the current human and machine augmentation of validation efforts. The industry is also looking to reduce cycle time with the use of physical bots and back-end configurations for end-to-end automation. The use of big data and dashboards can take human validation out of transactions and audit-based processes can handle credit history, loyalty programs, document validation, and intelligent reports.[5,6]

Decision levers — Decision assistive systems for self-managed and cognitive systems is becoming more prominent due to low risk AI and consistent performance through automation. The deep learning-based decision-making, with a fusion of images and data, is becoming more demanding. Companies need to have complete authentication to support 24-7 operations across the globe and satisfy customers. Hybrid systems with cross calibration is another important element, which needs to be evaluated with third-party platforms. These require encryption to protect data privacy and align with geographic regulations. Companies are also exploring scenario-based advisory systems and AI trained engines — using machine learning to improve efficiency — that can make decisions. Those are then followed by precise authentication systems.[5,6]

Implementation levers — Companies are paying attention to the return on investment as they implement AI across the value chain and across platforms. Platform flexibility is required for enhanced productivity and scalability. However, the implementation of digital banking and financial services is evolving in response to regulations and compliance. The adoptability and usability of AI-based solutions depend on guaranteed and authenticated services, especially in the financial sector. Also, AI engines are now developed with interfaces that feature strong encryption, privacy, and security across platforms and application-based frameworks.[5,6,8]

AI trustworthiness in autonomous vehicles

Autonomous systems are now a megatrend, which excites people on both the technical and business sides. Industry 4.0 and digitization trends demand greater productivity and safer unmanned operations, while addressing the desirability, feasibility, and viability of autonomous systems. These systems are also crucial for improving supply chain efficiency and insuring that goods meet specific quality standards and regulations.

AI technology is maturing when it comes to the unmanned movement of people and materials. Some examples are connected vehicles; platform services; compliance testing

Figure 6. AI roadmap for the autonomous vehicle industry

	Present	Emerging	Next generation
	2015-2020	2020-2025	2025-2035
Levels	Level 1 and level 2	Level 3	Level 4 and level 5
State	Developed — Global adoption	Developed — Emerging globally	Yet to mature, emerging
State	• Semi automation • Human-assisted controls • Manual safety systems • Traditional automation • Machine-assisted controls • Machine-assisted safety systems • Automation schema	• Smart automation • Machine-assisted controls • Machine-assisted safety systems • Smart automation schema	• Smart automation • Machine-assisted controls • Machine-assisted safety systems • Intelligent automation schema

for regional automotive safety and governmental standards; surveillance and monitoring; and secured communication and integration. The critical AI elements in the autonomous vehicle industry are seen above (Figure 6).

With autonomous vehicles, AI plays an important role in the human interface, system-based decision frameworks, interface, data integrity, and computational algorithms. High performance and rigorous safety measures require planning, mapping, and real-time modeling of surrounding environments through control and vision systems. Adoption is made safer and more secure through encrypted streaming with data analytics. Redundancy must also be built into systems to ensure safety. The AI framework houses the latest technology stack, which takes advantage of machine learning, sensors, and camera fusion technology. These optimize hardware and data to deliver self-managed and self-resilient models. The natural language processing, intelligent analytics, and cloud API-based automation increases the system's viability and makes autonomous vehicles a smarter computing platform.

What the decision system does and how compliant it is to regulations are all important when implementing AI-driven decision systems for autonomous vehicles. Different levels of the technology stack use AI, especially with regards to safety controls, driving behavior, response systems, and the vehicle interface. Implementation is made easier through automated decision system response, as taking humans out of the loop here makes the car safer. Also, redundancy layers always need to be integrated for risk mitigation and safer navigation. Data must flow seamlessly through all elements of the system to adhere to strict policies, and AI trustworthiness is found by ensuring the unmanned system can navigate many different scenarios and environments without failure.

There are currently no federal regulations related specifically to autonomous vehicle technology, although both the National Highway Traffic Safety Administration (NHTSA) and Research and Innovative Technology Administration are examining the issue.

Human factor elements — Autonomous vehicle technology requires many human interactions to be replaced with machine interactions. An important step forward is the transformation of the driver-vehicle interaction into an AI-based one. Ultimately, success means having a natural driving experience with machine control. Although the machine will drive with the assistance of AI, redundancy systems and human overrides are vital to success. Although challenging for AI architecture, the digital experience must provide a good in-person driving experience that aligns with Society 5.0 and Industry 4.0 frameworks. The digital mobility and augmented machine framework will be the next step to ensure human factors are aligned precisely.[10,11]

AI elements — Autonomous vehicle companies that want to be global AI frontrunners need to pursue a specific set of technologies. Those include machine learning, deep learning, big data and hyper processing systems,

digital mapping and positioning systems, pose estimation, navigation and path planning, vision systems and analytics, fusion, segmentation, and obstacle detection. [10,11]

Value chain elements — As unmanned operations are gaining ground in all sectors, the entire value chain is being assessed for effective implementation methods with seamless integration. The self-managed system includes recovery modules as well as vehicle-to-vehicle, vehicle-to-network, vehicle-to-infrastructure, and vehicle-to-pedestrian frameworks.

Security elements — AI and its integration with autonomous vehicles requires the exchange of large amounts of data. At various layers of the technology stack, encryption and security is mandatory so that the system can resist cyberattacks. Companies also need to assess the risks of override if autonomous modules fail, compared to the real-time effectiveness and performance of the AI modules. These modules need to reliably perform without communication loss. The validation and certification of security modules are still evolving due to geography specific guidelines and regulations. Data assessments and PII need to be considered when the AI engine is integrated.[10,11]

> Autonomous vehicles must always guarantee that AI always considers human safety

Safety elements — The functional and non-functional safety of control systems need to be validated and authenticated by predicting failure modes. The assessment of failure probability, depending on who owns the vehicle, is another element of liability when AI is implemented. The liability and risks of ownership are evolving. To design a safe car with AI integration, self-managed systems need both diagnostics and prognostics. In this paradigm, the redundancy levels of the system, hardware, communication, and software elements are essential and need a three-layered approach. Also, the AI needs to assess system availability in lower performance and nonfunctional scenarios. As certification, regulation, and compliance are evolving, protocol standardizations are starting to emerge.[10,12]

Regulation and compliance elements — Regulation and compliance in this area are evolving, but there are no standards yet. An industry consortium and the NHTSA are the driving factors. On the other side, ownership of performance and failures are also evolving in line with adoptability and the usability of AI-based solutions. One important AI expectation in the autonomous vehicle industry is a guarantee that automation always considers human safety. AI is being adopted with hybrid platform and abstraction layer-based

frameworks across industries to ensure that it complies with these guidelines.[10,11]

AI trustworthiness in health care

The health care sector is going through a product and platform approach for adopting AI strategies across the value chain. The industry demands an assessment of historical data, data authentication, and real-time decision systems for faster execution. The social acceptance and authentication of the data is vital, since the traditional process believes the human touch of doctors more than machines. The health care sector moved cautiously in addressing lower value chain elements in processes that support doctors. Below is the health care industry's AI roadmap (Figure 7).

The health care sector has defined a three-layer strategy to nurture and curate AI while considering both human health and data privacy and protection. Descriptive, predictive, and prescriptive AI are the three layers that drives adoption at various levels. The data will drive vital elements as machine learning becomes more prominent. Big data will also provide pattern recognition, historical data mapping, deviation detection, and simulated representations. On the other hand, analyzing the root cause, data analytics, data interpretation, and extrapolation and probabilistic assessment makes prescriptive patterns for AI adoption. The diagnostics and prognostic models, powered by deep learning models, makes the technology much more relevant for health care adoption.

Successful ethical guidelines require cultural acceptance, defining acceptable behavior, data safety and privacy, explainability, consent, liability, data integrity, and algorithmic accountability.[25,26,27] However, robotics plays an important role in surgeries with support systems that safeguard cases where good perception is critical. Adoption of natural language processing, deep learning and knowledge representation with AI is necessary here. The non-bias and variance-based machine learning applications, along with data quality, consent and information governance will be key drivers for healthcare AI adoption. However, we are at a point where this machine-driven approach and a framework to imitate humans is frequently under question. AI adoption is expanding into areas of unstructured data, data interpretation, clinical data synthesis, standard medical procedures, and process driven workflows with predefined decisive systems.

Currently, there are no federal regulations related specifically to the health care sector. Policy groups, task forces, regulatory bodies, medical practitioners, researchers, industry bodies, and government and medical councils will form consortiums specific to each area. Currently they are drafting guidelines.

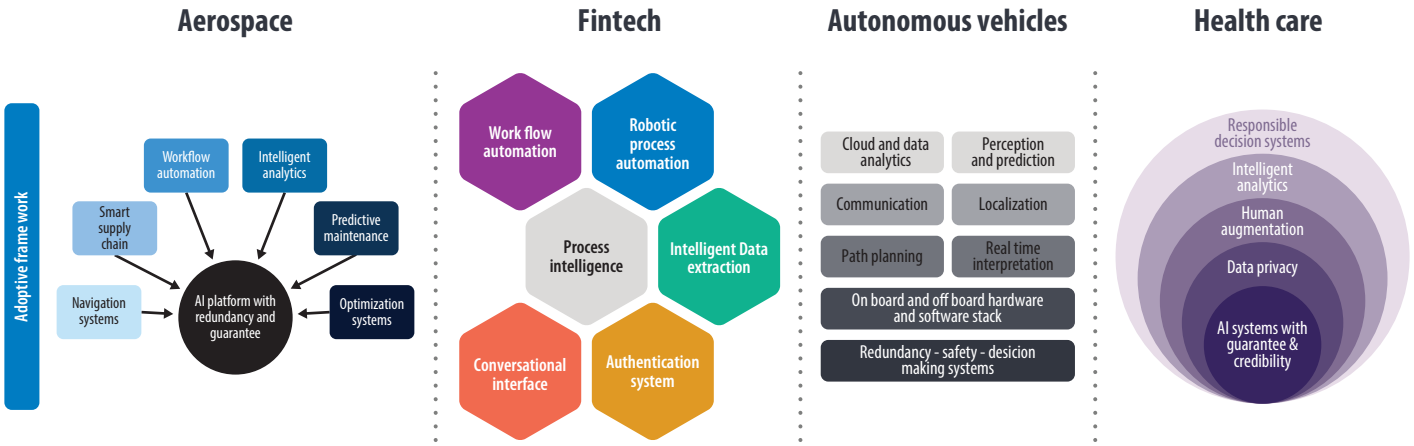
> AI adoption is expanding into clinical data synthesis, standard medical procedures and process-driven workflows

Human augmentation — The human element is always considered in the health care industry, even with automation and AI elements that unify mind and machine through brain-computer interfaces. The development

Figure 7. AI's strategies in the health care sector

	Present	Emerging	Next generation
	Up to year 2019	2020 to 2024	2025 to 2034
State	Developed — Global adoption	Developed — Emerging globally	Yet to mature, emerging
Themes	Medical products	Medical platforms	Medical solutions
Sub Levels	• Equipment and hardware • Historic-based assessments • Evidence-based outcome management	• Smart wearables, robotics • Basic AI and AR • Big data and health analytics • Real-time outcome-based management	• Smart robotics • Autonomous deliverables • Advanced AI and AR • Virtual doctors • Intelligent health analytics • Preventive care-based management

Figure 8. AI trustworthiness and its relevance in the four industries



of the next generation of radiology tools aims to allow doctors to make quick, qualitative decisions with AI assistance. AI is also expected to help the health care industry by reducing the burden of electronic health records and in identifying patterns of infection through precise analytics for pathology images. AI can bring intelligence to medical devices and machines with built in redundancy systems and human overrides.[26-36]

AI and robotics integration — AI and robotics are aligned with automation through machine learning, big data, intelligent analytics, and self-aware learning systems. Wearables, smartphones, and other personal devices are powerful diagnostic tools for monitoring health. These will help doctors make remote diagnoses and more effective decisions.[26-36]

Responsible systems — The health care sector demands transparency. Operations must be visible to users for authentication followed by explainability for each decision reached. A responsible AI system in the medical field requires suitability, credibility, auditability, reliability, and recoverability.[26-36]

Data and logical layers — Data and logical interpretations are critical for effective decision systems. Combining AI with effective data categorization and augmentation will help make the case for complete authentication. Other drivers of AI adoption include virtual assistants working with high levels of data integrity and quality, often combed from clinical data, the diagnostics process and historical data points (provided they are reliable and consistent). Communication loss and data recovery will impact AI elements, which makes validation and certification data modules vital.[26-36]

Safety elements — With its important role in human lives, the health care industry requires validation and authentication of services with evidence and data-oriented, integrated systems. The redundancy levels of system, hardware, communication, and software elements is critically important. But the systems must be available in lower performance and nonfunctional scenarios. As AI certifications evolve, the protocol for common open frameworks, personal data safety layers, and PII management are essential. Historical data and interpretations, with authentication by AI, are elements needed for the next level of automation.[26-36]

Regulation and compliance elements — As AI becomes more prominent, regulations are evolving and the credibility of automation is continually refined. Evolving compliance and standardization from consortiums are driving AI adoption as it relates to ownership of data and non-bias-based decision systems. The adoptability and acceptability of AI-based solutions, working with a hybrid platform, is the driving element for automation application development and implementation.[26-36]

Moving forward with AI trustworthiness

AI is a prominent technology irrespective of the industry. All sectors are trying to improve efficiency, create effective decision systems, reduce cycle times, and enhance customer experience. AI allows these companies to interface multiple platforms for seamless data communications, align with digital transformations, and join in the journey toward Industry 4.0 and Society 5.0. The AI technology stack is becoming more standardized, while automation is advanced enough to create complete end-to-end digital experiences. AI-related standards are evolving globally, but at the same time, geography specific regulations and compliances are being formulated by consortiums. AI has become a requirement in the digital world. The technology is an essential part of industry's efforts to revisit business strategies and join a world defined by AI-driven intelligent systems.

This move leads to more questions about AI's trustworthiness, even as companies seek quicker integration into their digital and automation technology initiatives. The adoptive frameworks have custom elements that ensure successful implementations for each industry. Each sector is working on its own strategic objectives to ensure decision systems are authenticated and keep humans in the loop where possible. The common outcome of this framework is optimizing resources, increasing efficiency, and creating a reliable decision support system, with human augmentation as appropriate. As an outcome, a framework needs to ensure that the technology aligns with end user expectations without compromising on the in-person experience of the products, solutions, and services. Data privacy and processing with intelligent analytics will lead to quicker adoption by aligning with standards. Figure 8 below represents industry-specific adoptive frameworks.

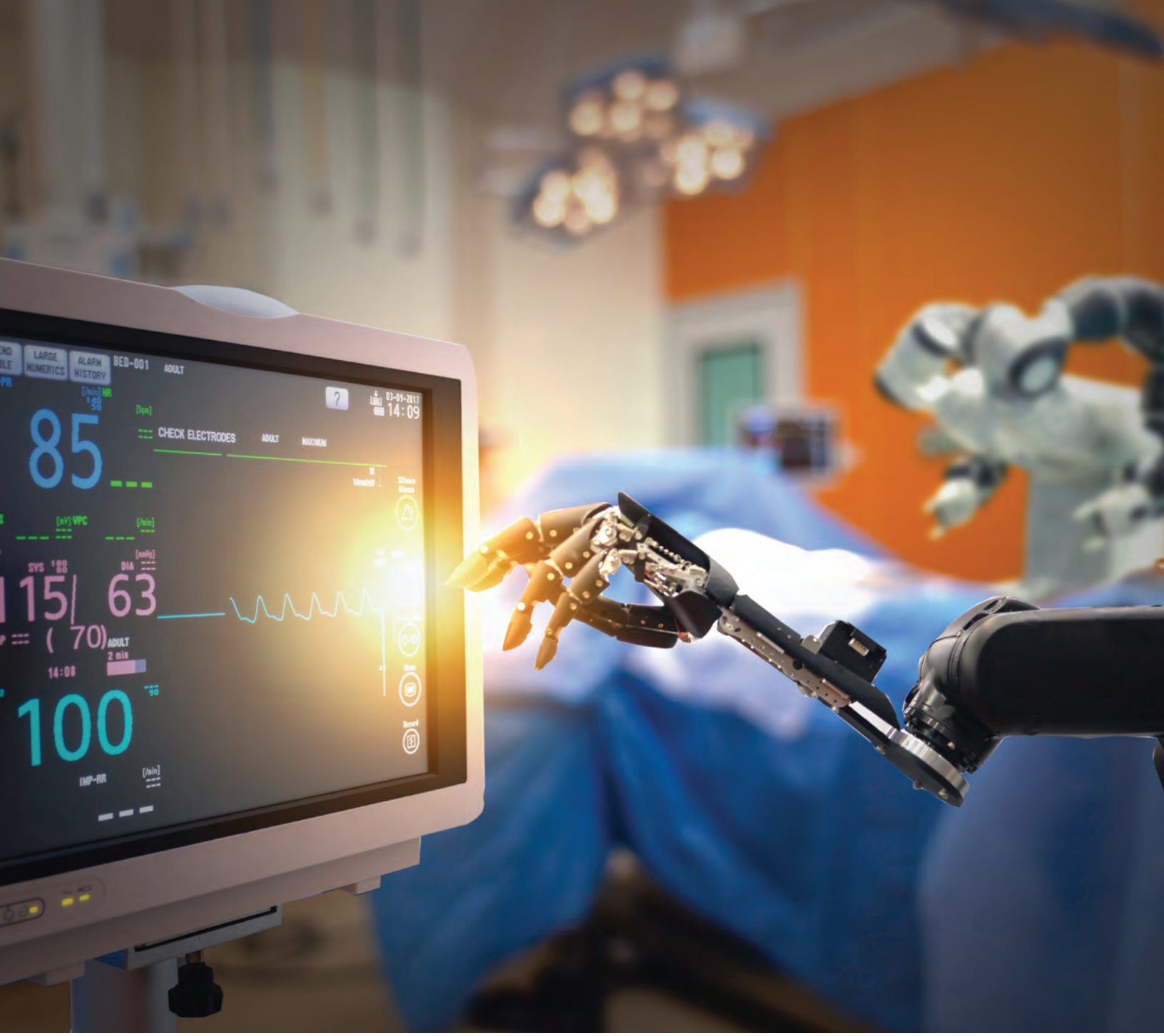
Ecosystem and AI trustworthiness

All ecosystem partners must work closely with regulators, certification agencies, and professional bodies to develop standards, guidelines, and best practices for AI. For example, the Infosys team contributes to SAE international standards development as part of technical committees. Other organizations where corporates can contribute are NIST, ISO, IEEE, ISA. Infosys utilized its own facility data — from chillers, compressors, and solar power plants — to develop AI predictive maintenance models and demonstrate how the technology can help in improving efficiency and cost. AI platforms, tools, and utilities should be made available for regulators, certification agencies and professional bodies to help them develop and demonstrate AI's trustworthiness. Organizations need to participate and build ecosystems for AI trustworthiness along with regulators, certification agencies, professional bodies, research labs, partners, and universities. AI can play a vital role in tomorrow's industry, unleashing the potential of humans and leading to comprehensive and sustainable growth.

> All ecosystem partners must work with regulators, agencies and professional bodies to develop AI best practices

Figure 9. Summary of AI strategies across industries and alignments

Dimension	Industry			
	Aerospace	Fintech	Autonomous vehicles	Health care
AI trustworthiness	• Assurance • Guarantee • Risk, safety, and security • Decision systems	• Security and service • Authentication • Validation and safety • Compliance	• Function and service • Decision systems • Security and safety • Regulations	• Transparency and security • Credibility, privacy and consent • Explainability and reliability • Regulations
AI roadmap	• Three-level approach • Augmenting autonomous with adaptive learning	• Four-level approach • Cognitive to self-resilient systems, collaborative and cross-platform	• Five-level approach • Human control to machine control • Hybrid automation with intelligent analytics	• An evolving strategy having no specific level approach • Descriptive to prescriptive AI • Collaborative human augmented intelligent analytics for expert decisions
Regulations	Global AI regulatory	Geography-specific AI consortium	Global AI consortium	Geography specific AI consortium



Conclusion

AI technology, products, solutions, and services have created a great deal of momentum in digital transformation, automation, and autonomous initiatives. As AI becomes a requirement in every industrial sector, it has moved from technology-oriented initiatives to framework-based solutions with multiple derivative modules. This demands that each industry takes care of human values when building AI systems, and ensure they align with regulatory principles. Industry-specific value chains can be built without bias using AI trustworthiness principles in a matured technology stack. Before fully autonomous operations can be realized, derivative AI services can be built that factor in risk, authentication and guarantees so that human-augmented frameworks mature in the right way. On the other side, AI's market opportunity is expected to increase by an average compound average growth rate of 43.5% by 2025. That provides incentives for companies to follow through with a quicker AI adoption strategy. AI trustworthiness must have assurance, security, risk, and safety layers with guaranteed services at various levels of industry-specific value chains. Figure 9 shows the summary of AI strategy across industries and its alignments.

References

1. Artificial Intelligence Road map - A human-centric approach to AI in aviation by EUASA, European Union Aviation Safety Agency, 2020
2. EUASA and Daedalean report on use of AI in aviation /Europe/Innovation/News/Technology, Sam Lewis, April 3, 2020 / EU: EUASA publishes AI roadmap for aviation sector, Feb 10, 2020
3. Intelligent Systems For Aerospace Engineering - An Overview, K. KrishnaKumar, Neuro Engineering Laboratory - NASA Ames Research Center
4. Safely Implementing AI - Artificial intelligence and machine learning are coming to aviation — is the industry ready? EASA sets out initial guidelines, Aaron Karp, Feb 28, 2020
5. The Growing Impact of AI in Financial Services: Six Examples, Arthur Bachinskiy, Feb 21, 2019
6. 5 Ways AI is Transforming the Finance Industry, Maurti Techlabs, 2020
7. AI leaders in financial services - common traits of frontrunners in the artificial intelligence race, Nikhil Gokhale, Rob Kaye, Ankur Gajjaria, Dave Kuder, Deloitte, Aug 13, 2019
8. How artificial intelligence is transforming the financial ecosystem - the new physics of financial services, Gurpreet Johal, Neil Tomlinson, Deloitte
9. FinTech 2.0: A new era of financial inclusion, Shekhar Lele, PWC, 2018 /2020
10. NHTSA Issues First-Ever Proposal to Modernize Occupant Protection Safety Standards for Vehicles Without Manual Controls, NHTSA, March 17, 2020
11. Autonomous Vehicle Technology - A Guide for Policymakers, James M. Anderson, Nidhi Kalra, Karlyn D. Stanley, Paul Sorensen,Constantine Samaras, Oluwatobi A. Oluwatola, RAND Corporation, 2016
12. Technology Based Innovations for Regulatory Compliance ("RegTech") in the Securities Industry, THE FINANCIAL INDUSTRY REGULATORY AUTHORITY, Sept, 2018
13. Emerging technologies disrupting the financial sector, Vivek Belgavi, Ashootosh Chand, Arvind V Arryan, Avneesh Narang, PWC, May, 2019
14. Report of the Steering Committee on Fintech Related Issues 2019, Department of Economic Affairs, Ministry of Finance, Government of India, 2019
15. Financial Services Artificial Intelligence Public-Private Forum: Terms of Reference, Financial Conduct Authority, Bank of England, 2019
16. Global FinTech Adoption Index 2019 - As FinTech becomes the norm, you need to stand out from the crowd, EY's global FinTech team, Sep, 2019
17. The future of the Automotive Value Chain - 2025 and beyond, Deloitte, March, 2017
18. Ensuring American Leadership in Automated Vehicle Technologies Automated Vehicles 4.0, NATIONAL SCIENCE & TECHNOLOGY COUNCIL and the UNITED STATES DEPARTMENT OF TRANSPORTATION, Jan, 2020
19. The Future of the Automotive Value Chain | Supplier industry outlook 2025, Deloitte, Dec, 2017
20. Automotive Artificial Intelligence Market by Offering, Technology, Process, Drive, and Region - Global Forecast to 2027, ResearchAndMarkets.com, April, 2020
21. Artificial Intelligence in BFSI Market by Offerings (Hardware, Software, and Services), Solution (Chatbots, Fraud Detection & Prevention, Anti-Money Laundering, Customer Relationship Management, Data Analytics & Prediction, and Others), Technology (Deep Learning, Querying Method, Natural Language Processing, and Context Aware Processing): Global Opportunity Analysis and Industry Forecast, 2019–2026 by Allied Research, Nov, 2019
22. Global Artificial Intelligence in Aviation Market Size By Offering, By Technology, By Application, By Geographic Scope And Forecast by verified research, Sep, 2018
23. Trustworthy-ai-is-a-framework-to-help-manage-unique-risk, MIT Technology review
24. Global artificial intelligence industry whitepaper, Deloitte China, 2019
25. ARTIFICIAL INTELLIGENCE THE NEXT DIGITAL FRONTIER?, McKinsey & Company
26. Artificial Intelligence in Healthcare, Academy of Royal Medical Colleges, Jan, 2019
27. Top 12 Ways Artificial Intelligence Will Impact Healthcare, Jennifer Bresnick, April, 2018
28. Use of Artificial Intelligence in Healthcare Delivery, Sandeep Reddy, Nov, 2018
29. State of AI in the enterprise - 2nd annual survey highlights, Deloitte, 2018
30. Artificial Intelligence in Health care, Michael Matheny, Sonoo Thadaney Israni, Mahnoor Ahmed, Danielle Whicher, National Academy of Medicine
31 The roadmap to introducing AI and Robotics in Healthcare, PWC, April, 2018
32. Introduction Map of Artificial Intelligence in Health Care and Medicine, Nordic Artificial Intelligence Institute, Nov, 2017
33. Artificial Intelligence in the Healthcare Industry in India, Yesha Paul, Elonnai Hickok, Amber Sinha, Udbhav Tiwari, The Centre for Internet and Society, India, 2017
34. Five distinct trends are converging to determine how artificial intelligence (AI) and robotics will define New Health, PWC team, 2016 / 'Transforming healthcare through artificial intelligence systems, Frost & Sullivan Year, 2016
35. Artificial Intelligence in Healthcare Market, Markets and Markets, 2019
36. 20-Year Community Roadmap for Artificial Intelligence Research in the US, Computing Community Consortium Catalyst, May, 2019

Authors

Dr. Ravi Kumar G. V. V.

Associate Vice President – Infosys
ravikumar_gvv@infosys.com

Dr. Sreekanta Guptha B. P.

Principal Consultant – Infosys
sreekanta_gupthabp@infosys.com

Producers

Jeff Mosier

Senior Consultant – Infosys
Knowledge Institute
jeff.mosier@infosys.com

Harry Keir Hughes

Senior Consultant – Infosys
Knowledge Institute
harrykeir.hughes@infosys.com

About Infosys Knowledge Institute

The Infosys Knowledge Institute helps industry leaders develop a deeper understanding of business and technology trends through compelling thought leadership. Our researchers and subject matter experts provide a fact base that aids decision making on critical business and technology issues.
To view our research, visit Infosys Knowledge Institute at infosys.com/IKI

For more information, contact askus@infosys.com

Infosys®
Navigate your next