Artificial Intelligence for Internal Auditing

Challenges and Opportunities

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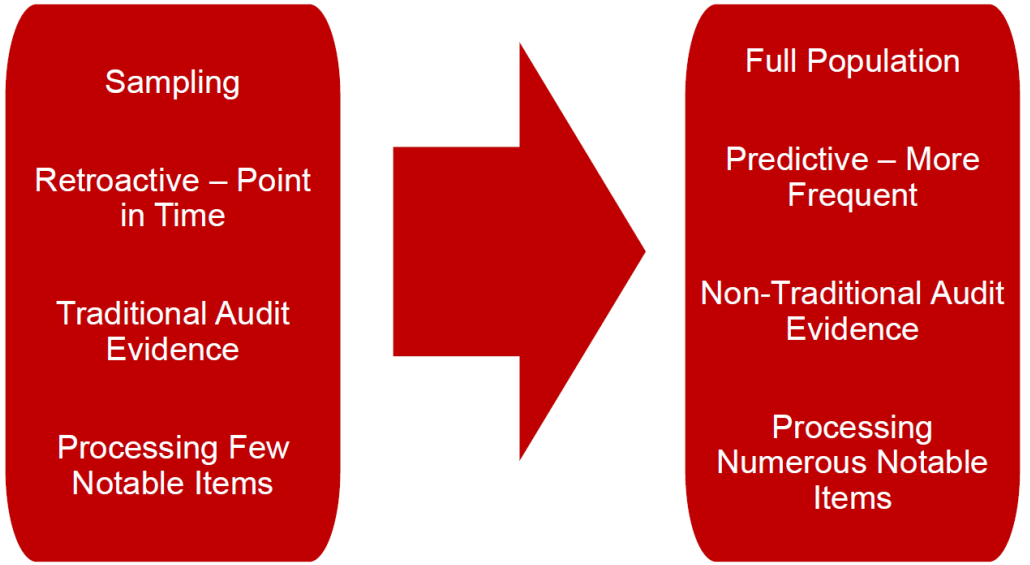
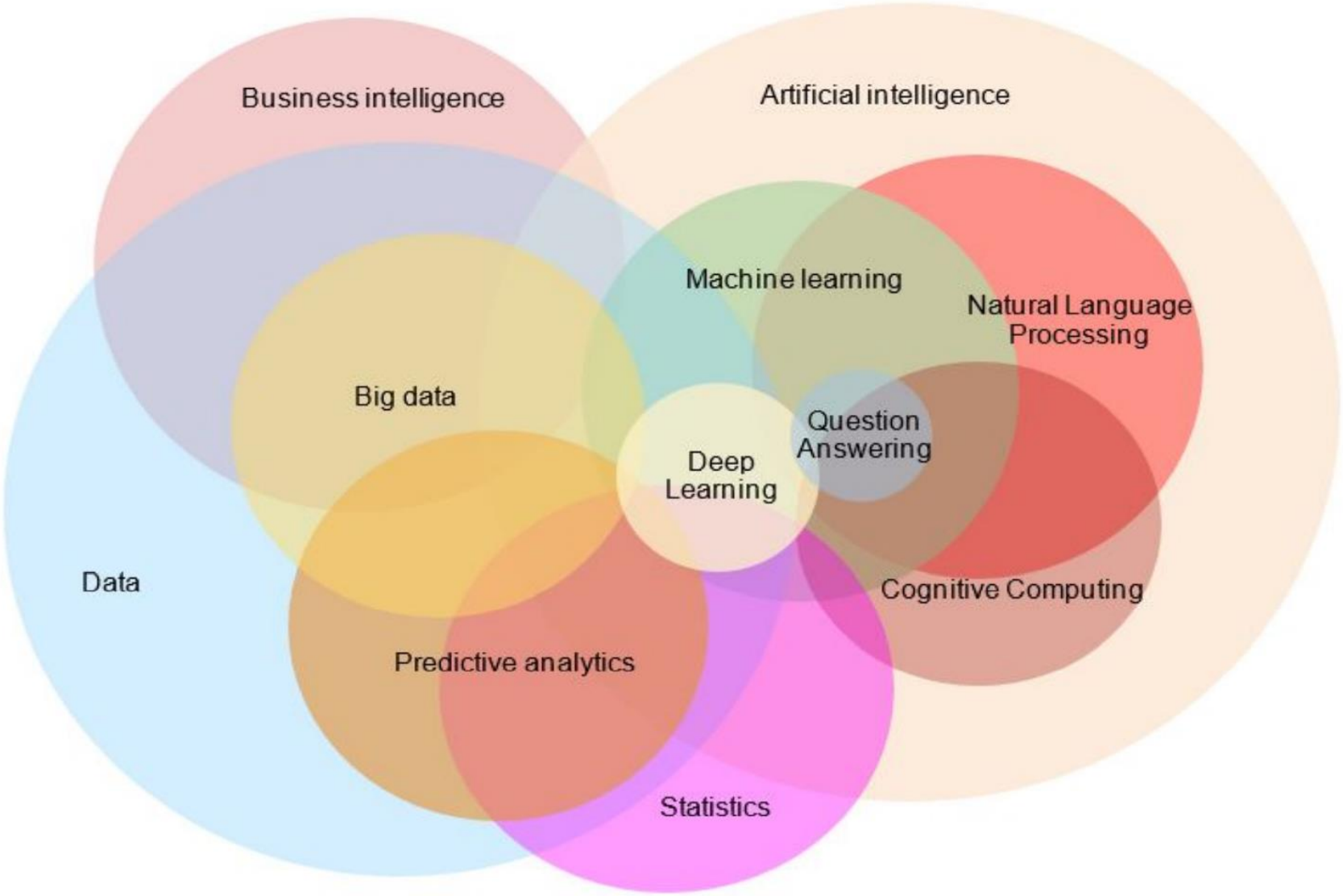
The Future of Audit?

Audit 1.0	Audit 2.0	Audit 3.0	Audit 4.0
▪ Manual audit ▪ Tools: pencils, calculators	▪ IT audit ▪ Tools: Excel, CAAT software	▪ Inclusion of non-financial data in audit analytics ▪ Tools: analytical software	▪ Semi- and progressive automation of audit ▪ Tools: sensors, CPS, IoT/S, RFID, GPS



Source: Rutgers Business School –Jun Dai, Hussein Isa, & Miklos Vasarhelyi



Source: Combrinck, Rikus. "Big Data Dictionary Data Word Soup — What Does It All Mean?" South African Statistical Association (https://sastat.org.za/sasa2017/big-data-dictionary, 2017

Emerging Technology Adoption

	Already Adopted	Within The Next Year	In 1–2 Years	In 3–5 Years	In 5+ Years	Never	Don't Know
AI	23%	8%	14%	11%	5%	3%	35%
AR/VR/XR	9%	4%	6%	5%	5%	11%	61%
Bio feedback	5%	2%	4%	4%	3%	18%	64%
Bio hacking	3%	2%	3%	3%	3%	22%	66%
Blockchain/digital currency	10%	4%	10%	10%	6%	8%	53%
Cellular technologies	21%	6%	10%	7%	3%	7%	47%
Close radio communications	10%	3%	6%	6%	2%	9%	63%
Cloud-enabled technologies	59%	8%	9%	5%	2%	1%	16%
Edge computing	13%	5%	7%	6%	3%	7%	59%
IoT	26%	6%	10%	7%	3%	6%	42%
Quantum computing	3%	2%	4%	5%	6%	9%	70%
Robotics	25%	4%	8%	6%	4%	9%	44%
Wearable technology	10%	4%	5%	5%	4%	10%	61%

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The Pulse – Emerging Technology 2021

4541 respondents

High Adoption of Cloud technologies, IoT, Robotics, AI and Cellular.

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AI by Numbers

81%

81% dari Fortune 500 CEOs percaya bahwa Artificial Intelligence/Machine Learning akan menjadi sangat penting bagi masa depan perusahaannya[1]

60%

60% dari seluruh pekerjaan didunia memiliki paling tidak 30% kegiatan yang dapat di otomatisasi

$ 46 Billion

Belanja global pada solusi kognitif dan AI dipercaya mencapai lebih dari 46 miliar pada 2020[3]

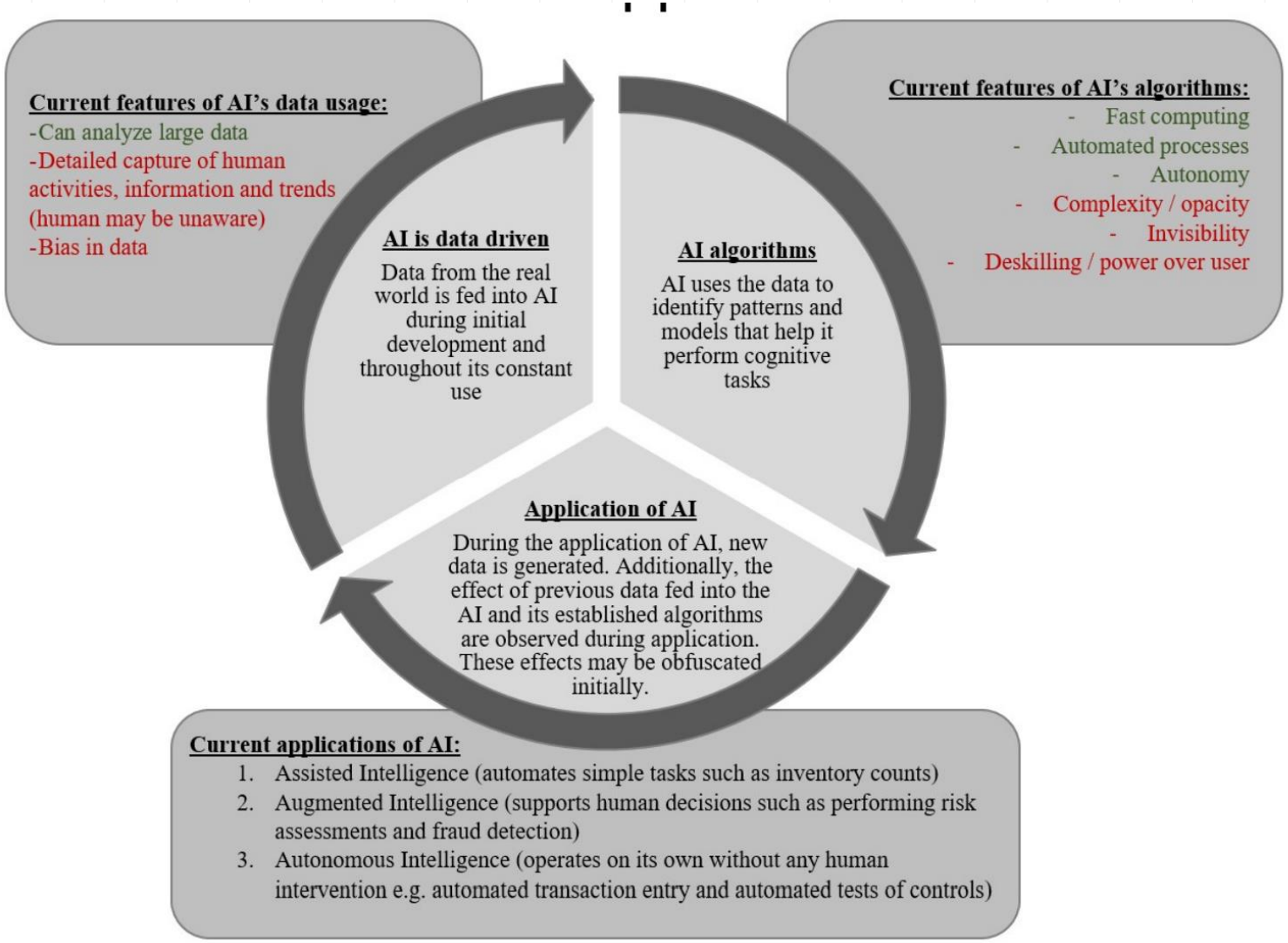
$ 89 Billion

Pendapatan software AI dipercaya tumbuh dari $3.2 miliar pada 2016 menjadi $89.9 miliar pada 2025[4]

1 http://www.isaca.org/Knowledge-Center/Research/ResearchDeliverables/Pages/Innovation-insights.aspx
3 http://www.idc.com/getdoc.jsp?containerId=prUS42439617

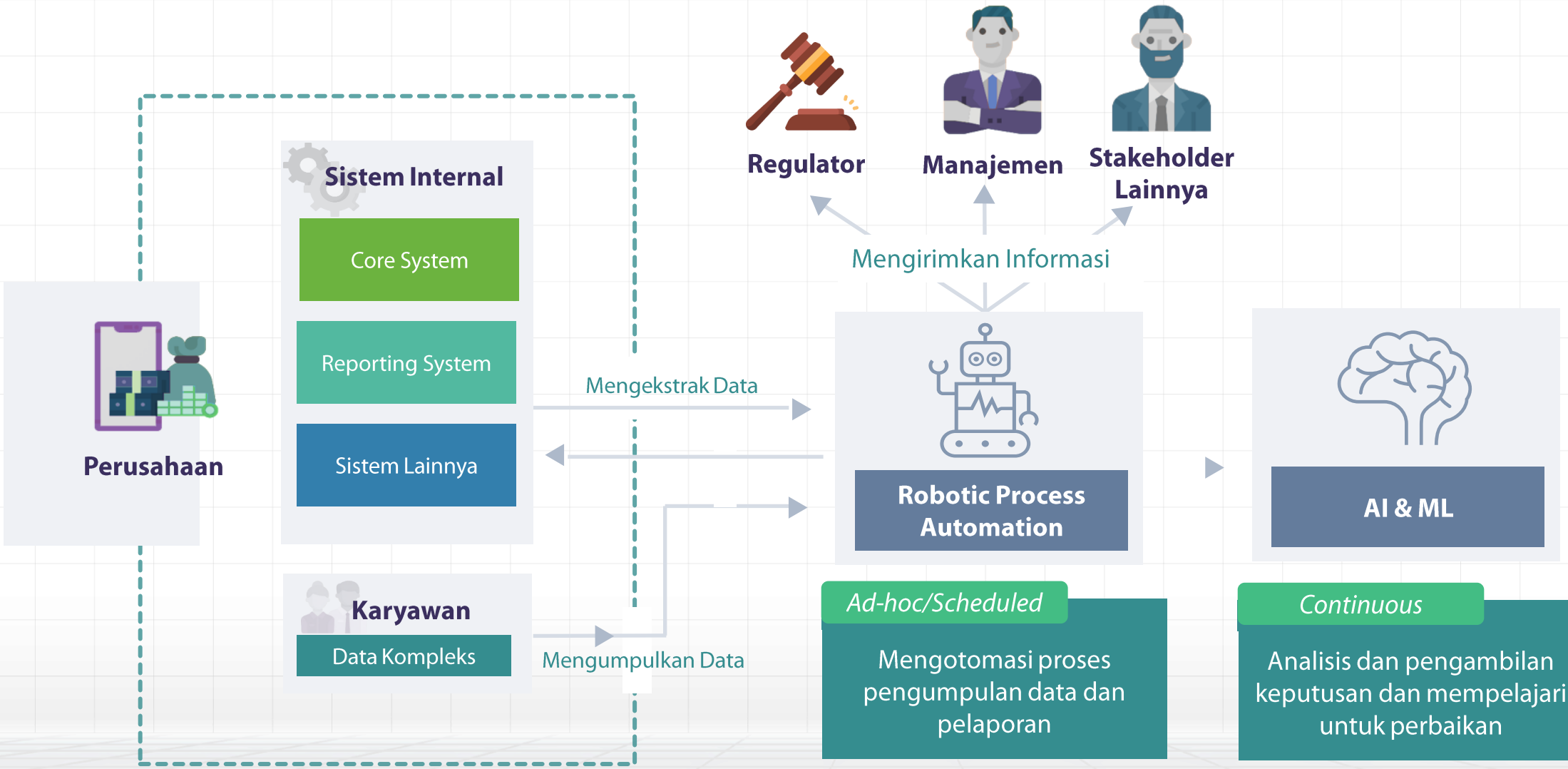
2 http://www.mckinsey.com/global-themes/digital-distruption/harnessing-automation-for-a-future-that-works
4 https://www.tractica.com/newsroom/press-releases/artificial-intelligence-software-market-to-reach-89-8-billion-in-annual-worldwide-revenue-by-2025

Current Application of AI



Source: Rutgers Business School – Artificial Intelligence Perspective in Audit - Helen Brown-Liburd, Ivy Munoko, & Miklos Vasarhelyi

AI in Business Processes



AI in Auditing

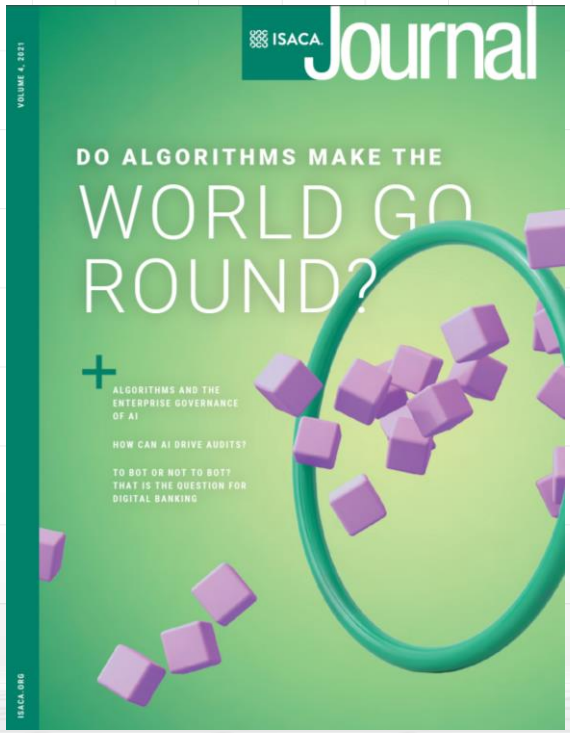
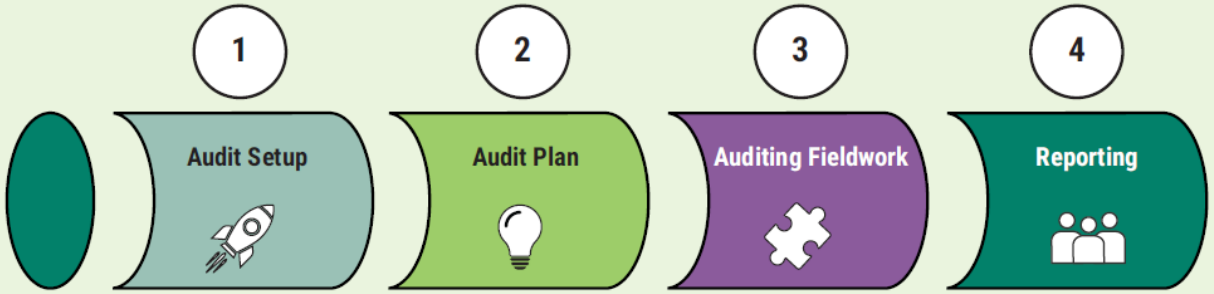


Figure 2—The Role of RPA and AI Within the Audit Life Cycle



1 Audit Setup	2 Audit Plan	3 Auditing Fieldwork	4 Reporting
Tasks: 1. Preselect audit candidates 2. Plan for audit 3. Identify risk and dependencies of associated business functions	**Tasks:** 1. Communication audit scope 2. Document key risk and controls 3. Understand the process landscape	**Tasks:** 1. Evaluate as-is working process 2. Identify issues and observations 3. Compare with designed processes and controls	**Tasks:** 1. Prepare audit report 2. Review issues 3. Audit debrief 4. Update risk profile of business unit/team
Automation Scope: 1. Ready view of similar audits of comparable business functions and audit type 2. Risk-based audit assessment reports 3. Continuous controls monitoring with regard to the business processes 4. Auto generation of checklists	**Automation Scope:** 1. Automate analysis and summary of wordy and document-heavy policies, standard operating procedures (SOPs) and others in the audit-scope 2. Prepopulate and share findings based on initial analysis of SOPs and other available documents 3. Keyword-based analysis 4. Rule engine to extrapolate outcome analysis	**Automation Scope:** 1. Automate audit tasks 2. Modeling of data 3. Data sample testing automation 4. Aggregating and interpreting data via rule engine 5. Fraudulent data detection	**Automation Scope:** 1. Automate text-based audit report 2. Data visualization of key issues and risk 3. Intelligent reporting of audit-based quantification of issues
Automation via: NLP, predictive analysis and RPA	**Automation via:** NLP, predictive analysis and RPA	**Automation via:** NLP, natural language generation, predictive analysis and RPA	**Automation via:** NLP, natural language generation, predictive analysis and RPA

AI in Auditing

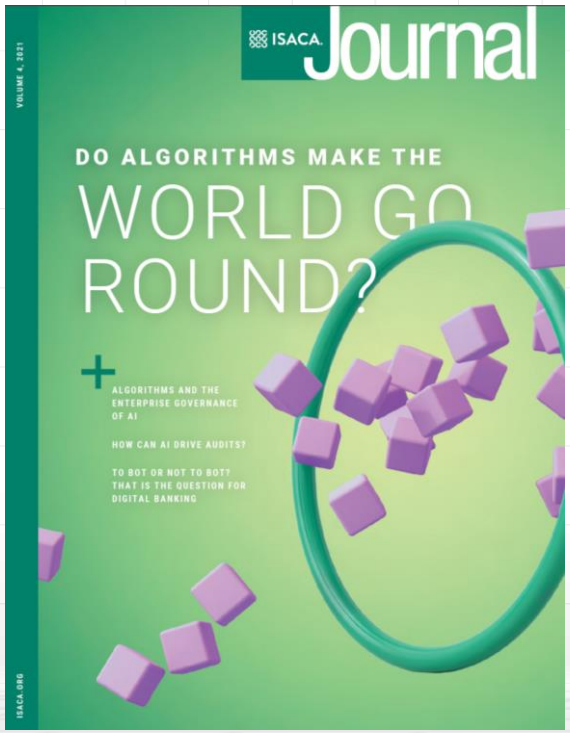


Figure 3—Suggested AI/ML Techniques for Use in Auditing

AI or ML Techniques	Application/Use Cases	Usage
Document classification	Application of classification models (e.g., decision trees, Bayesian classifiers, nearest neighbors) to assign documents or text segments to a specific topic or label	• Understanding SOPs, policies and other deliverables reviewed during auditing • Inference from previous similar audit reports
Text summarization	The process of combining frequently used words, phrases and topics to generate a natural language summary of a text or a document set	• Helpful to generate audit observations and inferences • Auto-generation of audit checklists
Topic analysis	Analysis performed across documents, groups of documents or document texts to identify unique topics that link documents or sections of documents	• Data analytics • Building keyword rule engine for audits
Search and retrieval	The process of searching a database or repository of processed information to retrieve documents that align with the topics or themes that are entered in the search criteria	• Similar audit report inferences
Statistical analysis	A basic statistical analysis technique that evaluates the term, phrase or topic trends	• Aggregating data • Interpreting data
Sentiment analysis	The ability to extract and analyze text or groups of text in documents to understand author's sentiment	• Identifying key issues and risk • Intelligent inferences in audit reports

AI in Auditing

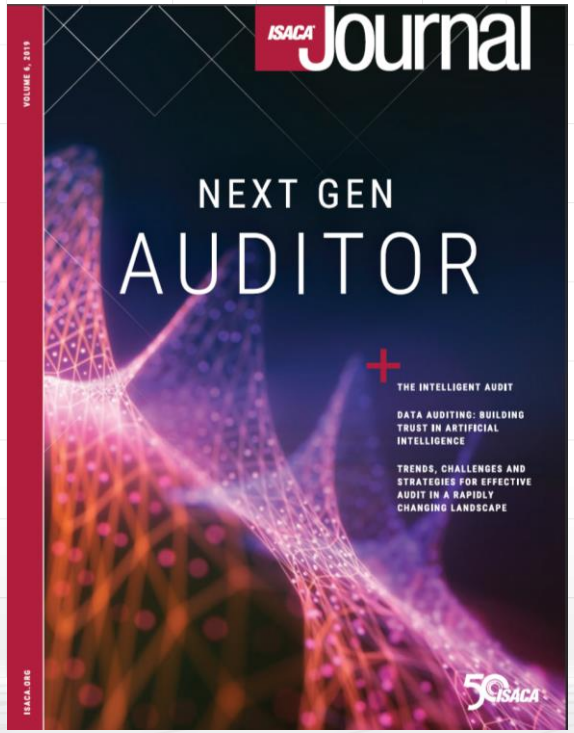
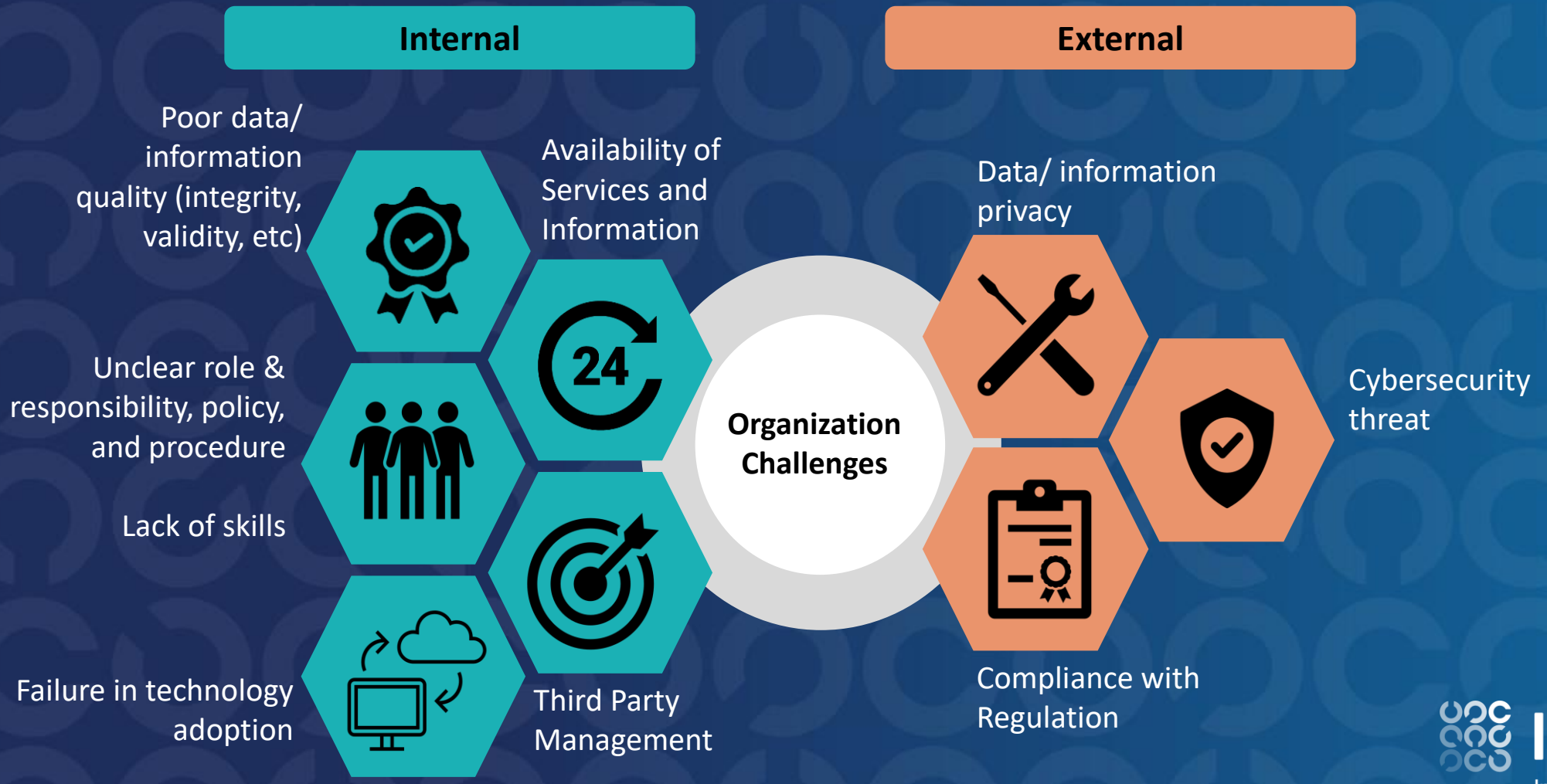


Figure 1—Audit Procedures Comparison With and Without AI Technologies

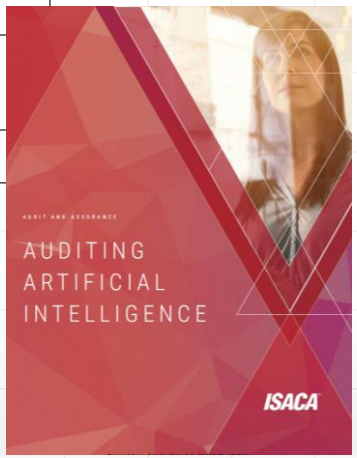
Phase	Procedures Without AI	Procedures With AI	Types of Technology	Impact of AI on Accomplishing Phase Tasks
Planning	The auditor: • Learns industry and business environment through meetings with client management and review of BoD meeting minutes • Examines client's enterprise to estimate a level of risk	The AI computer performs the following tasks: • Produces risk assessment based on prior-year documents, business environment and industry trends for auditor's review • Records, summarizes and produces meeting minutes	• NLP • ML • Voice recognition	Moderate impact
Evaluation of internal controls	The auditor: • Reviews internal controls, policies and procedures • Interviews process owners and records details for workpapers • Performs operational test of controls by observing employees, reperforming processes and inspecting documents	The AI computer performs the following tasks: • Prepares workpaper references, including flowcharts and risk/control matrices, from recorded interview information • Analyzes screen captures of computer processes and flags those that are questionable and needing additional review • Digitally inspects documents, looking for adequate approvals	• Voice recognition • NLP • ML	High impact
Substantive procedures	The auditor: • Manually observes inventory count • Sends and manages confirmation requests • Inspects supporting documents of sales orders and cash receipts • Reviews select journal entries that fit circumstances that may reflect fraud • Analytically compares auditor's estimates and industry averages of sales and other metrics to actual enterprise performance	The auditor leverages the following technologies: • Digital/mobile applications, barcodes and QR codes, and drones assisting in inventory counts • Encrypted online platform, accessed by both auditors and customers, to manage confirmation requests The AI computer performs the following tasks: • Imports and automatically reconciles cash receipts and sales orders while comparing for discrepancies • Flags all transactions that are potential fraud cases • Creates estimation of sales and other metrics based on industry and competitor data	• NLP • Voice recognition • Drones • ML • Encryption • Internet of Things (IoT)	High impact

Our Challenges, and Opportunities?



Challenges of AI Implementation

CHALLENGES FOR THE AUDITOR OF AI	KEYS TO THE SUCCESSFUL AUDITING OF AI
1. Immature auditing frameworks or regulations specific to AI	1. Adopt and adapt existing frameworks and regulations.
2. Limited precedents for AI use cases	2. Explain and communicate proactively about AI with stakeholders.
3. Uncertain definitions and taxonomies of AI	3. Explain and communicate proactively about AI with stakeholders.
4. Wide variance among AI systems and solutions	4. Become informed about AI design and architecture to set proper scope.
5. Emerging nature of AI technology	5. Become informed about AI design and architecture to set proper scope.
6. Lack of explicit AI auditing guidance	6. Focus on transparency through an iterative process. Focus on controls and governance, not algorithms.
7. Lack of strategic starting points	7. Involve all stakeholders.
8. Possibly steep learning curve for the AI auditor	8. Become informed about AI design and engage specialists as needed.
9. Supplier risk created by AI outsourcing to third parties	9. Document architectural practices for cross-team transparency.



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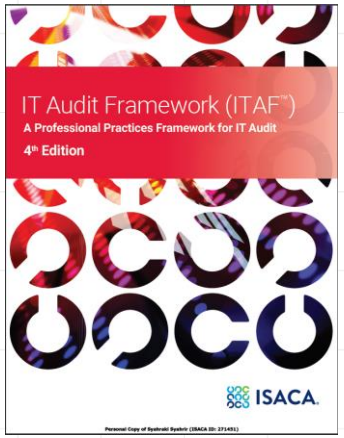

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