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Reconstructing Traditional Accounting Theory in the Era of Artificial Intelligence, Machine Learning, and the Internet of Things

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Abstract

This article develops a conceptual-theoretical reconstruction of the traditional vision of accounting theory in response to the rise of Artificial Intelligence (AI), Machine Learning (ML), and the Internet of Things (IoT). Classical accounting theory built around principles of representation, verification, stewardship, conservatism, and periodicity is increasingly strained by the epistemic, ontological, and methodological consequences of technologies that generate real-time data, autonomous judgments, predictive computations, and algorithmic decision structures. This paper argues that AI and ML do not merely change the tools of accounting practice; they fundamentally challenge the assumptions about how accounting knowledge is produced, validated, and interpreted. IoT, as a pervasive data-generation infrastructure, further shifts accounting from an ex-post representation system to an ex-ante predictive ecosystem. Through conceptual analysis grounded in contemporary literature in accounting theory, information systems, and computational epistemology, this paper proposes a reconstructed theoretical model AI-Augmented Accounting Theory (A3T), which articulates new assumptions of ontology, epistemology, and methodology required for an AI-intensive accounting environment. The study contributes a clarifying framework for scholars attempting to reinterpret normative and positive theories of accounting under conditions of automation, autonomy, and real-time measurement, and outlines a comprehensive future research agenda for reconciling human judgment, algorithmic governance, predictive reporting, accounting ethics, auditability, and accountability.

Keywords: Accounting theory, AI, machine learning, IoT, epistemology, ontology, conceptual framework, prediction, automation, digital accounting.

INTRODUCTION

For more than a century, accounting theory has been shaped by the assumption that accounting exists primarily to record, classify, summarize, and report economic events in a reliable and verifiable manner. This conception present in classical works such as Paton (1922), Littleton (1933), and later Sterling (1970) rests on representational correspondence: accounting should faithfully represent economic phenomena through structured information. These assumptions persisted into the conceptual frameworks of major standard-setters such as the FASB and IASB.

However, the emergence of AI, ML, and IoT over the last decade has placed unprecedented pressure on these foundations. Technological systems can not only process much larger volumes of data but also create new data, infer latent variables, detect patterns inaccessible to human judgment, and generate predictions that increasingly influence economic decisions. In several fields including auditing, financial reporting, management accounting, risk assessment, and internal control AI systems already perform tasks traditionally requiring complex human reasoning.

Existing accounting theories were not designed for a world in which information is abundant, continuous, predictive, machine-generated, and autonomous. Classic principles such as prudence, periodicity, neutrality, and verifiability are tightly linked to the limitations of human cognition and the constraints of historical information. As these constraints diminish, many theoretical constructs begin to show structural incompatibility with digital environments.

This paper therefore asks a fundamental question: How must traditional accounting theory be reconstructed to remain conceptually coherent in an AI-intensive and IoT-enabled world?

The goal is not to propose incremental modifications, but to articulate a deeper theoretical reconfiguration. Accounting theory must address three interconnected transformations:

1. Ontological shift: economic reality becomes partially machine-generated through digital traces, sensor networks, and cyber-physical interactions.
2. Epistemological shift: accounting knowledge increasingly emerges from algorithmic inferences and predictive models rather than human judgment and historical evidence.

3. Methodological shift: accounting processes are automated, continuous, and embedded in technological infrastructures, leading to new modes of measurement, verification, and reporting.

This article extends earlier theoretical discussions by Vasarhelyi et al. (2015), Moll and Yigitbasioglu (2019), Warren et al. (2015), and Kokina & Davenport (2017), but goes beyond them by offering a deeper re-articulation of accounting theory's foundational structure and assumptions.

Traditional accounting theory: foundations and limitations

Traditional accounting theory comprises normative, positive, and conceptual-framework-based approaches. Through the 20th century, accounting theory developed around five foundational components:

a. Ontology of economic reality

   Accounting assumes a relatively stable economic reality transactions, events, obligations, and resources that exists independently of the accounting system. Accounting's role is representation, not creation.

b. Epistemology of evidence

   Knowledge in accounting emerges from documentation, verification, and professional judgment. Evidence is fundamentally backward-looking, with preference for historical cost due to its verifiability.

c. Methodology of periodicity and aggregation

   Financial reports are produced in discrete periods (monthly, quarterly, annually). This periodicity reflects technological limitations and human processing constraints.

d. Reliability, conservatism, and objectivity

   Accounting theory emphasizes neutrality, prudence, and avoidance of speculative estimates. Predictions and forward-looking information, while increasingly common, remain less authoritative.

e. Human-centered judgment

   Professional accountants and auditors serve as primary agents responsible for recognition, measurement, and assurance. Their expertise provides credibility.

These components form the backbone of both classical theory (e.g., Paton, Littleton, Sterling) and modern conceptual frameworks (IASB, FASB). However, AI and IoT disrupt each of these assumptions at a deep structural level.

Technological disruption : AI, ML, and IoT as theory challenging forces is AI, ML, and IoT do not merely enhance accounting processes they transform the nature of accounting information itself.

a. AI as an epistemic agent

   AI systems generate knowledge autonomously, infer causal structures, classify transactions, detect anomalies, and predict future events. Unlike traditional information systems, AI can derive new accounting-relevant insights beyond explicit inputs.

b. Machine learning and probabilistic inference

   ML constructs models that optimize predictions based on patterns in massive datasets. These models embody a fundamentally different epistemology—one built on prediction rather than representation (Agrawal et al., 2018). Accounting theory traditionally privileges representation, not prediction.

c. IoT as a data-producing infrastructure

   IoT devices generate continuous, granular, real-time data about physical assets, movements, environmental conditions, and operational processes. These data streams collapse the classical separation between operations and accounting, between event occurrence and event measurement.

d. Autonomous decision systems

   AI-driven enterprise systems perform accounting tasks such as journal entry generation, reconciliations, variance analysis, fraud detection, fair value estimation, and audit procedures. This challenges the traditional assumption of human-centric accounting.

e. Implications for theory Together, these technologies require rethinking:

   - What counts as an economic event
   - How evidence is produced
   - How measurement is justified
   - How accountability is defined
   - What role prediction plays in reporting
   - How verification is achieved (algorithmic auditability)

Theoretical shifts: redefining accounting's foundational assumptions The emerging environment requires re-examining accounting theory along three axes.

a. Ontological transformation: From stable events to dynamic data ecosystems In an IoT environment, events are not merely recorded, they are co-produced by digital systems. Assets "speak" through sensors; processes generate self-updating logs; cyber-

physical activities produce autonomous traces. Economic reality becomes partially machine-constructed.

b. Epistemological transformation: From representational truth to predictive coherence Traditional accounting epistemology relies on accuracy of representation. AI-driven accounting shifts toward predictive coherence information that allows optimal decisions through predictive accuracy, even if not strictly representational in the classical sense. Good accounting becomes not only true but useful in forecasting.

c. Methodological transformation: From periodic to continuous accounting IoT and AI enable continuous measurement, continuous control, continuous assurance, and real-time reporting (Vasarhelyi & Greenstein, 2003). Periodicity becomes a constraint rather than a necessity.

d. Cognitive displacement: Human to hybrid judgment AI does not eliminate human judgment but reshapes its role. Humans supervise algorithms, interpret outputs, and resolve ethical tensions. Judgment becomes meta-judgment: evaluation of algorithmic reasoning, not direct evaluation of raw evidence.

e. Verification becomes computational Auditing and assurance shift from testing samples to testing algorithms, data streams, and models. Verifiability becomes a question of transparency, explainability, and model governance.

Reconstructing accounting assumptions, this section extends the theoretical reconstruction toward a more formal articulation.

a. Ontological reconstruction traditional ontology: economic events precede accounting. AI-era ontology: accounting is part of the event-generation process, as digital infrastructures continuously create and shape the data that define economic states.
b. Epistemological reconstruction traditional epistemology: accounting knowledge arises from evidence verified by human judgment, grounded in documentation. AI-era epistemology: knowledge is codified statistically through ML models trained on vast datasets, with human interpretation focusing on reasonableness and governance.
c. Methodological reconstruction, traditional methodology: discrete, manual, rule-driven measurement.

   AI-era methodology: automated, continuous, real-time, hybrid human-machine accounting processes.

Proposed theory: ai augmented accounting theory (A3T) This article synthesizes the above transformations into a new conceptual model: the AI-Augmented Accounting Theory.

Core Principles of A3T

1. Accounting is an information ecosystem integrating human and artificial epistemic agents.
2. Accounting information includes both representational and predictive outputs.
3. Economic reality is partially constituted through digital infrastructures.
4. Verification relies on model governance, transparency, and explainability.
5. Reliability emerges from hybrid human-machine oversight.
6. Periodicity is contextual; continuous measurement is the default.

Components of the A3T Framework

Ontology: Digital-economic entanglement Accounting information emerges from interactions between physical phenomena, digital sensors, and algorithmic classification.

Epistemology: Algorithmic-Probabilistic Knowledge

Knowledge derives from ML inferences, predictive analytics, anomaly detection, and pattern modeling.

Methodology: Continuous-Computational Accounting Methodologies combine real-time IoT measurement, automated journal entries, algorithmic internal control, and AI-based assurance.

Accountability: Hybrid Governance Responsibility for outputs is distributed across organizational actors, algorithm designers, auditors, and regulators.

Implications for valuation and measurement AI-driven fair value estimates, impairment testing, risk measures, and going-concern assessments incorporate forward-looking models, shifting accounting from a primarily backward-looking discipline.

RESEARCH METHODOLOGY

This study employs a Systematic Literature Review (SLR) to synthesize and reinterpret existing research on accounting theory in the context of Artificial Intelligence (AI), Machine Learning (ML), and the Internet of Things (IoT). The SLR method was conducted through a structured process consisting of problem formulation, search strategy development, article identification, screening, and conceptual synthesis. Relevant literature was collected from Scopus-indexed journals published between 2013–2024 using keywords

such as accounting theory, artificial intelligence, machine learning, IoT, digital accounting, and algorithmic governance.

Articles were selected based on relevance, citation quality, conceptual contribution, and methodological rigor. The screening process followed PRISMA principles, removing duplicates and excluding papers that did not directly address theoretical implications of emerging technologies for accounting. The selected studies were then analyzed through thematic coding to map disruptions to traditional accounting ontology, epistemology, and methodology, which provided the analytical basis for developing the proposed AI-Augmented Accounting Theory (A3T). Through this SLR approach, the study integrates diverse streams of literature to build a coherent conceptual reconstruction of how AI-driven and IoT-enabled environments reshape the foundational assumptions of accounting theory.

ANALYSIS AND DISCUSSION

The findings of this study, derived from a Systematic Literature Review (SLR), reveal that AI, ML, and IoT collectively exert profound theoretical pressure on the foundational structures of accounting. The analysis shows that traditional accounting theory built on assumptions of historical representation, human-centered verification, periodicity, and document-based evidence faces conceptual limitations when confronted with digital environments characterized by automation, real-time data streams, and algorithmic inference. The literature indicates a consistent pattern across multiple domains: AI serves as an autonomous epistemic agent capable of generating knowledge beyond explicit human coding; ML shifts the basis of accounting information from representational truth to predictive accuracy and IoT collapses the temporal gap between event occurrence and measurement, rendering traditional periodic reporting increasingly obsolete. These disruptions challenge the classical ontological view in which economic events exist independently of accounting systems, highlighting instead a digitally mediated reality where sensor data, logs, and algorithmic classifications co-construct what is recognized and measured as an economic phenomenon.

The discussion further reveals that AI-driven systems reshape the epistemology of accounting by prioritizing probabilistic inference, anomaly detection, and model-based reasoning over the conventional reliance on documentation and manual judgment. This

epistemic shift implies that accounting information is no longer solely a reflection of past events but increasingly a product of algorithmic processing that synthesizes broad, high-frequency datasets to generate forward-looking insights. In this context, reliability must be reinterpreted not only as faithful representation but also as model explainability, transparency, and governance. The reviewed literature underscores that algorithmic outputs require new forms of assurance focused on model validation, bias detection, and continuous monitoring to maintain credibility in financial reporting and auditing. Hence, assurance moves from sample-based testing toward computational verification, where auditors examine the logic, assumptions, and training data underlying AI models.

Methodologically, the analysis shows that continuous accounting, automated journal entries, and real-time monitoring systems redefine how organizations measure, record, and report economic activities. IoT enabled environments support perpetual measurement, allowing accounting to evolve from a periodic system into a dynamic information ecosystem. This transformation demands hybrid governance structures that integrate both human expertise and machine intelligence. The literature also highlights emerging ethical challenges, particularly surrounding data bias, algorithmic opacity, and the potential erosion of professional judgment. As AI increasingly participates in decision-making, accounting must address issues of accountability, fairness, and transparency in algorithmic processes. These concerns indicate the need for expanded ethical frameworks that encompass data governance, model risk management, and technological stewardship.

The conceptual synthesis from the SLR supports the development of the AI-Augmented Accounting Theory (A3T), which offers a coherent framework to reconcile traditional accounting principles with the realities of AI-intensive environments. A3T positions accounting as a hybrid information system in which human and machine agents jointly construct, validate, and interpret accounting information. The theory integrates predictive analytics, algorithmic governance, and continuous measurement as core elements of modern accounting practice. The discussion concludes that while classical accounting theory remains foundational, it must evolve to accommodate predictive epistemologies, digital ontologies, and computational methodologies. Without such theoretical reconstruction, accounting risks conceptual obsolescence in a world where economic activities and their representations are increasingly shaped by autonomous, interconnected technologies.

CONCLUSION

This study concludes that the rapid advancement of Artificial Intelligence (AI), Machine Learning (ML), and the Internet of Things (IoT) fundamentally challenges the foundational assumptions of traditional accounting theory. Through a Systematic Literature Review (SLR), the analysis reveals that classical constructs such as representational correspondence, periodic reporting, human-centered judgment, and document-based verification are no longer fully compatible with digital, autonomous, and data-intensive environments. AI and ML introduce predictive-probabilistic epistemologies that shift accounting away from historical representation toward forward-looking insights, while IoT generates continuous streams of real-time data that blur the boundary between economic events and their measurement. These technological transformations disrupt accounting ontology, reshape the nature of evidence, and introduce methodological paradigms such as continuous accounting, algorithmic auditing, and hybrid human–machine governance.

Based on these findings, this study proposes the AI-Augmented Accounting Theory (A3T) as a reconstructed conceptual foundation suitable for AI-intensive ecosystems. A3T recognizes accounting as an integrated information environment where human and algorithmic agents jointly produce, validate, and interpret financial information. It redefines core principles by incorporating predictive analytics, real-time measurement, model governance, explainability, and algorithmic accountability. While traditional accounting theory remains valuable, it must be expanded to address the epistemic and operational characteristics of digital infrastructures.

The study contributes theoretically by offering a structured reorientation of accounting assumptions and practically by providing a conceptual roadmap for researchers, standard-setters, and practitioners adapting to AI-driven transformations. Nevertheless, the study is limited by its conceptual nature and dependence on secondary literature; thus, future research should empirically test the components of A3T, develop industry-specific frameworks, and examine how regulatory bodies can incorporate algorithmic assurance, data ethics, and predictive reporting into formal standards. Overall, the findings underscore the need for accounting theory to evolve in harmony with technological realities so that the discipline remains relevant, reliable, and capable of supporting decision-making in an increasingly automated and data-rich world.

REFERENCES

Agrawal, A., Gans, J., & Goldfarb, A. (2018). Prediction Machines: The Simple Economics of Artificial Intelligence.

Alles, M. (2015). Drivers of the use and facilitators and obstacles of the evolution of big data by the audit profession. Accounting Horizons.

Appelbaum, D., Kogan, A., & Vasarhelyi, M. (2017). Big Data and analytics in the modern audit engagement. Journal of Accountancy.

Bhimani, A., & Willcocks, L. (2014). Digitisation, 'Big Data' and the transformation of accounting information. Accounting and Business Research.

Byrnes, P., et al. (2018). Evolution of auditing in accounting: From traditional to data-driven audit. Journal of Information Systems.

Earley, C. (2015). Data analytics in auditing: Opportunities and challenges. Accounting Horizons.

Kokina, J., & Davenport, T. (2017). The emergence of AI in accounting: Opportunities and challenges. International Journal of Accounting Information Systems.

Lombardi, R., et al. (2021). Artificial intelligence in accounting: A systematic literature review. Meditari Accountancy Research.

Moll, J., & Yigitbasioglu, O. (2019). The role of internet-related technologies in shaping accounting research. British Accounting Review.

O'Leary, D. (2013). Artificial intelligence and big data in accounting. Intelligent Systems in Accounting.

Quattrone, P. (2016). Management accounting and the digital era: A shift in representational assumptions. Accounting, Organizations and Society.

Sutton, S., Holt, M., & Arnold, V. (2016). The transformation of corporate reporting with cloud and mobile technologies. International Journal of Accounting Information Systems.

Vasarhelyi, M., Kogan, A., & Tuttle, B. (2015). Big data in accounting: An overview. Accounting Horizons.

Warren, J., Moffitt, K., & Byrnes, P. (2015). How big data will change accounting. Accounting Horizons.

Yoon, K., Hoogduin, L., & Zhang, L. (2015). Big data as a source of evidence in auditing. Accounting Horizons.