

Revolutionizing Global Accounting Epistemology in the Era of Industry 5.0

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Abstract

The advent of Industry 5.0 marks a paradigm shift in industrial systems, focusing on human-centric innovation, sustainability, and ethical responsibility. Unlike Industry 4.0, which emphasized automation and efficiency, Industry 5.0 integrates human creativity and values with advanced technologies. This transformation requires a reevaluation of accounting's epistemological foundations. Traditional accounting, rooted in positivism and quantitative measurement, must adapt to a more pluralistic and ethical framework. In response to the evolving demands for non-financial disclosures, such as environmental, social, and governance (ESG) factors, accounting must integrate both financial and non-financial knowledge to support strategic decision-making. Additionally, with the rise of artificial intelligence (AI) and big data, the role of accountants is evolving from mere data processors to ethical interpreters and decision-makers. This article explores how Industry 5.0 impacts accounting theory and practice, highlighting the need for new epistemological models that incorporate social responsibility, technological ethics, and stakeholder engagement. The research suggests that accounting must become a tool not only for financial transparency but also for sustainable and ethical governance, ensuring it meets the complex demands of the modern industrial landscape.

Keywords: Industry 5.0, Accounting Epistemology, Sustainability, Artificial Intelligence, Ethical Accounting.

INTRODUCTION

The global industrial landscape is entering a new phase of development—Industry 5.0—which marks a significant departure from the efficiency-driven ethos of Industry 4.0. While the fourth industrial revolution focused on automation, connectivity, and the integration of digital technologies into production systems, Industry 5.0 reintroduces the human as a central figure in industrial innovation. It promotes a vision where technology serves humanity, rather than displaces it, and where sustainability, inclusiveness, and social value are as important as productivity and efficiency (Leng et al., 2022).

This shift is not merely operational—it is philosophical. It challenges the foundational assumptions of how knowledge is created, valued, and used across disciplines. In this context, one field that faces a profound epistemological reckoning is accounting. Historically grounded in positivism and empiricism, accounting has long been viewed as a neutral, objective tool for measuring financial performance and ensuring regulatory compliance. Its methodologies have been built on the assumption that value is measurable, facts are stable, and reporting can be standardized across time and geography.

However, Industry 5.0 reveals the limitations of these assumptions. Today, stakeholders demand more than just financial transparency—they seek

information on social impact, climate risk, ethical governance, digital trust, and human well-being. The evolution of integrated reporting, ESG disclosures, and AI-assisted auditing reflects this epistemic expansion. The question is no longer just “What happened?” but “What does it mean?” and “What should we do next?”—questions that challenge the very epistemological foundations of the accounting profession.

This growing complexity highlights a critical gap in traditional accounting thought: its narrow view of what constitutes valid knowledge. While conventional systems prioritize historical transactions and monetary units, Industry 5.0 encourages the integration of narrative, ethics, sustainability, stakeholder values, and even machine-generated intelligence into decision-making frameworks (Muravskiy et al., 2024). In such an environment, accounting cannot remain a closed, technocratic system. It must evolve into an open, reflexive, and human-centered epistemology—one that is capable of capturing both the tangible and intangible, the quantitative and qualitative, the certain and uncertain.

Importantly, this transformation is not only technical—it is epistemological. The very nature of accounting knowledge is changing. Where traditional accounting education and standards have taught accountants to observe, record, and verify, tomorrow’s practitioners will need to interpret, predict, and advise. They will operate in hybrid ecosystems where algorithms shape real-time valuations, stakeholders demand ethical transparency, and intangible assets such as reputation and sustainability define corporate value more than physical infrastructure.

As noted by Tavares et al. (2023), education systems are already lagging behind in preparing accountants for this shift. Curricula remain focused on historical methods and deterministic frameworks, while the profession itself is being pulled toward systems thinking, behavioral economics, and data ethics. The implication is clear: without a new epistemology, accounting risks becoming obsolete in a world that demands multidimensional, forward-looking, and socially responsible forms of knowledge.

The broader philosophical turn embedded in Industry 5.0 supports this transition. The rise of “technological anthropocentrism”—a view in which humans, technology, and nature are co-creators of value—aligns closely with emerging theories in critical accounting and integrated thinking (Muravskiy et al., 2025). In this view, accounting must move beyond simply “counting” and instead embrace its role as a translator of complex realities, as a storyteller, and as a guardian of ethical information flows.

What, then, does a future-ready epistemology of accounting look like? It must be pluralistic, accepting multiple modes of knowledge beyond the strictly empirical. It must be integrative, synthesizing data from financial, environmental, and social domains. It must be adaptive, able to evolve with technological and

societal shifts. And most importantly, it must be normative—concerned not only with what is, but with what ought to be.

This article explores these themes by analyzing how Industry 5.0 is reshaping the knowledge foundations of global accounting. It draws from recent literature on industrial transformation, accounting theory, epistemology, and digital ethics to argue for a new paradigm—one that aligns accounting more closely with the values and challenges of the 21st century. In doing so, it seeks not only to critique the limitations of the current system but also to offer a vision for how accounting can lead, rather than lag, in the era of human-centered innovation.

LITERATURE REVIEW

From Efficiency to Meaning: The Emergence of Industry 5.0

Several scholars agree that Industry 5.0 emerged as a response to the limitations of Industry 4.0, which—despite its significant technological achievements—was often criticized for dehumanizing work, exacerbating technological inequality, and lacking ethical foresight. Industry 4.0 focused on automation, cyber-physical systems, and operational optimization; Industry 5.0, by contrast, reintroduces human values, creativity, and ethics into industrial processes (Leng et al., 2022).

According to Barata and Kayser (2022), Industry 5.0 emphasizes technological humanism—the idea that industrial systems must align with social, environmental, and ethical imperatives. Their bibliometric analysis of 32 literature reviews revealed a shift toward interdisciplinary integration, where the lines between economics, engineering, sociology, and environmental science begin to blur.

Muravskiy et al. (2024) highlight ten defining characteristics of Industry 5.0 relevant to accounting: decentralization, ESG orientation, human capital valuation, deep tech integration, circular economy models, and intelligent self-management, among others. Each of these elements calls for new mechanisms of data interpretation, ethical accountability, and stakeholder engagement—domains historically outside the scope of traditional accounting models.

This reorientation is also evident in discussions around the role of artificial intelligence, LLMs, and collaborative robots (cobots) in decision-making. Rather than automating judgment, Industry 5.0 envisions technology that augments human wisdom (Gantayat et al., 2025), leading to more contextual, holistic, and ethically sensitive knowledge practices—accounting included.

Accounting in the Age of Transformation

The accounting discipline has historically aligned itself with industrial development. In the early 20th century, accounting was a tool of industrial capitalism, used primarily for cost control, financial reporting, and resource allocation. However, the epistemology of accounting—that is, the philosophical

assumptions about how accounting knowledge is created and justified—has remained remarkably stable, grounded in positivist and empiricist traditions.

Chua (1986) classifies mainstream accounting research as predominantly positivist, assuming that objective “truths” can be discovered through observation and measurement. This approach underpins most regulatory frameworks (e.g., IFRS, GAAP) and standard-setting bodies. However, such assumptions are increasingly ill-suited for environments characterized by non-financial complexity, real-time decision-making, and uncertain futures.

The emergence of sustainability accounting, integrated reporting, and non-financial disclosures has already begun to challenge this traditional epistemology. But as Özdemir and Hekim (2018) argue, a full epistemological transition requires more than new standards—it requires new ways of knowing that combine quantitative, qualitative, predictive, and ethical dimensions of knowledge.

Technological Anthropocentrism and Epistemic Pluralism

A key development in accounting literature is the integration of technological anthropocentrism—a concept that sees technology not as a substitute for human agency, but as a tool to amplify human ethics, creativity, and social responsibility. Muravskiy et al. (2025) emphasize that modern accounting must address the behavioral and informational needs of both internal actors (e.g., management) and external stakeholders (e.g., communities, regulators, civil society).

This implies a move toward epistemological pluralism in accounting—where multiple forms of evidence (financial, narrative, algorithmic, ecological) are accepted and interpreted together. Such an approach aligns with broader developments in post-normal science and reflexive governance, both of which reject the idea of a single, objective truth in favor of context-dependent, stakeholder-informed perspectives.

Moreover, the increasing use of AI and big data in accounting systems raises questions about how algorithmic outputs are validated. If a machine suggests a financial risk based on thousands of variables, what constitutes verification? Does human intuition override the machine, or vice versa? These are epistemological dilemmas, not just technological ones.

Implications for Accounting Education and Research

The literature also points to significant gaps in accounting education, where curricula remain focused on debits, credits, and regulatory compliance, while the real-world demands adaptive reasoning, ethical foresight, and data fluency. Tavares et al. (2023) argue for urgent reform in how accountants are trained, proposing interdisciplinary collaboration, scenario planning, and value-based reasoning as core components of future pedagogy.

In parallel, academic research must also evolve. Accounting journals and conferences often prioritize incremental, model-driven research that assumes economic rationality and stable systems. However, the emerging challenges of Industry 5.0—such as climate risk, AI ethics, stakeholder capitalism, and global uncertainty—demand research that is exploratory, theoretical, and normatively engaged.

Several authors call for a rethinking of the research agenda toward critical, interpretive, and design-based approaches that treat accounting not just as a mirror of reality, but as a tool for shaping it (Espina-Romero et al., 2023)

METHOD

This study adopts a conceptual-analytical approach, grounded in interpretive reasoning and interdisciplinary synthesis. Rather than collecting primary empirical data, it seeks to critically explore the epistemological implications of Industry 5.0 for the field of global accounting through a literature-based, theory-driven inquiry. This method is particularly suitable given the emergent nature of Industry 5.0, which is still evolving in both academic research and practical implementation.

The research process began by identifying and selecting peer-reviewed academic papers indexed in Scopus and other scholarly databases that focus on Industry 5.0, accounting theory, epistemology, and digital transformation. Emphasis was placed on recent publications (2022-2025), particularly those addressing human-centric innovation, sustainability reporting, technological anthropocentrism, and accounting education reform. Insights from these studies were not merely summarized, but critically analyzed to surface underlying philosophical assumptions and map paradigm shifts in knowledge production within the accounting discipline.

Rather than testing a hypothesis, the study develops a theoretical synthesis, linking fragmented discussions across multiple domains—including critical accounting, post-positivist epistemology, and innovation studies—into a coherent narrative. Through this method, the paper constructs an argument for epistemological reorientation: that the accounting profession must move beyond narrow positivism and adopt a more pluralistic, ethical, and human-aligned framework compatible with the principles of Industry 5.0.

In essence, this study is not descriptive or predictive—it is diagnostic and prescriptive, offering a conceptual map for navigating future directions in accounting thought and practice. Its methodological strength lies in its ability to frame accounting not just as a system of numbers, but as a dynamic epistemic architecture that both reflects and shapes societal values in an era of radical transformation.

RESULT AND DISCUSSION

The Collapse of Positivist Certainty in Accounting

Traditional accounting has long operated under the assumption that economic reality is objective, observable, and quantifiable, a stance aligned with positivist philosophy. This view has shaped everything from double-entry bookkeeping to financial reporting standards. However, in the context of Industry 5.0, this epistemological model is increasingly insufficient.

Emerging socio-economic phenomena—such as environmental degradation, intangible asset creation, algorithmic decision-making, and stakeholder capitalism—cannot be fully captured through conventional metrics. As Muravskiy et al. (2024) argue, traditional principles of documentation and valuation must be redefined to accommodate new informational realities. For example, "fair value" in financial statements must be expanded to reflect not only market transactions but social and environmental valuations.

Moreover, accounting information is no longer primarily intended for shareholders alone. Stakeholders such as local communities, regulators, NGOs, and even AI auditors now demand insights into non-financial dimensions—risk exposure to climate, ethical labor practices, digital security, and inclusivity. These multidimensional expectations push accounting toward a post-positivist epistemology, where context, narrative, and interpretation matter as much as data.

Human-Centric Epistemology and Ethical Imperatives

One of the cornerstones of Industry 5.0 is technological anthropocentrism—a model that places human well-being at the center of industrial systems. In this framework, accounting is no longer a neutral technical tool but a mechanism for advancing social and ethical accountability (Muravskiy et al., 2025).

This shift requires a reevaluation of the ethical foundations of accounting knowledge. Traditional epistemology treated ethics as external to accounting methodology; now, ethics must be embedded in the construction of accounting truth. For instance:

- a) What ethical principles guide which costs are internalized or externalized?
- b) How should future risks (e.g., climate, AI bias, data misuse) be recognized in today's financials?
- c) What is the epistemic status of stakeholder testimony, community feedback, or AI-generated forecasts?

As Özdemir and Hekim (2018) suggest, ethical foresight must now be considered an integral part of the knowledge system itself. Accounting in Industry 5.0 cannot rely solely on backward-looking verification—it must be forward-looking, precautionary, and normatively aware.

Furthermore, the human-centered paradigm reinforces the importance of subjectivity and perspective in accounting. Stakeholder narratives, organizational values, and socio-cultural meaning become epistemically relevant. This challenges the field to reframe materiality: not merely in terms of what is financially significant, but in terms of what is socially consequential.

Machine Intelligence and Algorithmic Knowledge in Accounting

Industry 5.0 introduces a hybrid epistemic regime where machine intelligence complements human judgment. Artificial intelligence (AI), machine learning, and big data analytics are no longer just tools—they are knowledge producers in their own right (Gantayat et al., 2025). This raises critical questions about the epistemological legitimacy of algorithmic output in accounting.

For example:

- 1) When an AI model flags a going concern risk based on thousands of unstructured data points, how is that knowledge verified or contested?
- 2) Can algorithms produce auditable knowledge? Who is accountable for the inferences they generate?
- 3) How do we ensure transparency, bias-resistance, and ethical integrity in AI-assisted financial forecasting?

Muravskiy et al. (2024) stress the need for new principles of accounting such as simultaneity, adaptability, and algorithmic independence. The role of accountants is thus evolving from data processors to AI interpreters and ethical stewards—a significant epistemic repositioning.

Importantly, the integration of machine epistemology introduces non-human forms of reasoning into accounting. AI systems may find patterns that humans cannot see, yet lack moral judgment. Accounting standards must evolve to bridge this gap, ensuring that algorithmic knowledge is integrated responsibly into financial systems.

Toward Pluralistic and Integrated Epistemologies

The future of accounting lies in epistemological pluralism—an approach that accepts multiple forms of knowledge, reasoning, and representation as valid. This includes not only financial metrics, but also:

- 1) Environmental indicators (e.g., carbon emissions, biodiversity impact)
- 2) Social performance (e.g., inclusion, labor equity, community engagement)
- 3) Predictive analytics (e.g., scenario models, climate risk stress tests)
- 4) Qualitative insights (e.g., stakeholder dialogue, ethical narratives)

Espina-Romero et al. (2023) emphasize that Industry 5.0 demands an integrated research agenda that links environmental, social, and financial performance through holistic models. Accounting must move from disciplinary silos to systems thinking, from historical data to real-time impact monitoring.

This evolution is already visible in frameworks such as the International Integrated Reporting Framework (IIRC) and Sustainability Accounting Standards Board (SASB), which encourage firms to disclose strategy, governance, performance, and prospects in a way that reflects the interconnectedness of business and society. However, as Barata and Kayser (2022) note, current adoption is fragmented, and the epistemic foundation remains contested.

Pluralism also implies reflexivity: the ability of accounting systems to self-assess, evolve, and learn. In a world of uncertainty and complexity, static knowledge systems become liabilities. Future accounting must be adaptive, self-correcting, and inclusive of diverse worldviews—including indigenous knowledge systems, feminist economics, and ecological ethics.

Educational and Institutional Implications

The epistemological transformation described above cannot be realized without a parallel revolution in accounting education and institutional norms. As Tavares et al. (2023) argue, universities and professional bodies must redesign curricula to equip future accountants with:

- a) Critical thinking and ethical reasoning
- b) Interdisciplinary fluency (e.g., climate science, data ethics, sociology)
- c) AI and data literacy
- d) Communication and storytelling skills

Institutions such as the International Federation of Accountants (IFAC) and IASB must also expand their standard-setting processes to involve diverse stakeholders, incorporate non-financial data logic, and respond more quickly to emerging ethical and technological dilemmas.

Ultimately, the success of accounting in Industry 5.0 will depend not just on technical adaptation, but on institutional courage: the willingness to question long-held assumptions, challenge power structures, and embrace a future in which accounting serves people, planet, and prosperity—not just profit.

Table Summary of Key Insights

Theme	Insight
Collapse of Positivism	Accounting must move beyond objectivity to include ethical and interpretive forms of knowledge.
Human-Centric Knowledge	Ethical considerations must become core to how accounting knowledge is produced and applied.
Algorithmic Epistemology	AI is a legitimate but complex source of accounting knowledge requiring human oversight.
Pluralism	Future accounting must embrace multiple epistemologies—quantitative, qualitative, predictive, ethical.
Institutional Reform	Education and standards must evolve to support a more reflexive and socially responsive profession.

CONCLUSION

Industry 5.0 represents a transformative shift in industrial and technological paradigms, emphasizing human-centered innovation, sustainability, and ethical responsibility. This change significantly impacts the epistemology of accounting, which traditionally relied on positivist assumptions of objectivity and quantification. In the context of Industry 5.0, accounting must evolve from a mere tool for financial reporting to a comprehensive system that integrates social, environmental, and ethical considerations into decision-making.

One of the key findings of this study is the need for epistemological pluralism in accounting. Traditional models, which focus primarily on financial metrics, must be expanded to include qualitative, predictive, and normative knowledge that captures the full spectrum of value in modern economies. This shift requires accounting to embrace ethical foresight and consider broader stakeholder interests, including environmental impacts and social welfare.

Another critical point is the role of technology in shaping future accounting epistemology. With the growing use of AI and big data, accounting is increasingly driven by machine-generated insights. However, these technologies must complement human judgment, not replace it, to ensure that ethical principles guide decision-making.

Finally, the accounting profession must undergo significant institutional and educational reform to prepare future professionals for the complexities of Industry 5.0. Accountants must be equipped with interdisciplinary knowledge, data literacy, and ethical reasoning to navigate an increasingly complex world.

In conclusion, Industry 5.0 provides a unique opportunity for accounting to reinvent itself as a tool for sustainable development and social accountability. By adapting to these new epistemological demands, accounting can remain relevant and impactful in an era of rapid technological and societal change.

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