



Original Article

Dynamics of the Development of Philosophy of Science and Its Implications for Contemporary Management Theory

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Abstract:

The development of science in the 21st century has undergone significant transformations not only in the empirical and technical domains but also in conceptual and philosophical dimensions. Philosophy of science—concerned with ontology, epistemology, and axiology—has experienced dynamic shifts shaped by globalization, digitalization, and technological acceleration. These developments have had strong implications for contemporary management theory, which must address increasing complexity, ambiguity, and ethical challenges. This study aims to analyze the dynamics of philosophy of science in the last decade and their influence on management theory, with particular attention to leadership, innovation, ethics, and sustainability. Using a qualitative literature study, the research draws upon scholarly articles, books, and conference papers to construct a conceptual framework. Findings indicate four major transformations: (1) ontology has moved from positivist and mechanistic views toward complexity and context-dependence; (2) epistemology has shifted to pluralism, acknowledging the legitimacy of multiple methods; (3) axiology has increasingly emphasized value-laden inquiry, recognizing the ethical and social dimensions of scientific practice; and (4) technological advancement, particularly in artificial intelligence and data-driven systems, has challenged conventional standards of knowledge, fairness, and accountability. These philosophical shifts demand that management theory evolve into a more adaptive, value-sensitive, and contextually grounded practice. Practical illustrations, including responses to the COVID-19 pandemic and algorithmic bias in recruitment, demonstrate how philosophy of science can enrich management's responsiveness to global and local challenges. Ultimately, this study highlights the importance of philosophical literacy in sustaining management theory's relevance in contemporary contexts.

Keywords: Philosophy of Science, Management Theory, Epistemic Pluralism.

Introduction

The development of science in the 21st century demonstrates a paradigmatic transformation that accelerates not only in empirical and technical fields but also in conceptual and philosophical domains (Setiawan & Sauri, 2024). Philosophy of science, as a discipline that studies the principles, methods, and limitations of science, continues to experience significant dynamics, particularly since the emergence of challenges related to globalization, digitalization, and the Fourth Industrial Revolution (Ningsih, Yusnandar, Sipahutar, & Mujiatun, 2024). In this context, philosophy of science is no



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longer limited to classical ontological, epistemological, and axiological discussions but also addresses ethical, social, and technological aspects intersecting with human values and societal impacts ([Nabila & Mansur, 2025](#)). Contemporary management theory and practice are influenced by developments in philosophy of science, as management theories must be able to respond to environmental complexity, data ambiguity, business ethics, and sustainability demands, all of which require a strong philosophical foundation ([Manurung & Hendayana, 2023](#)).

Philosophy is a discipline that seeks to understand the nature of reality, knowledge, and values through rational, systematic, and critical thinking. Unlike empirical sciences that rely on direct observation, philosophy emphasizes conceptual reflection to answer fundamental questions such as "what is real?", "how do we know something?", and "what ought to be done?". Thus, philosophy functions not only as an intellectual endeavor to comprehend the world but also as a foundational framework for logical reasoning in the development of science and in everyday life practices ([Nagel, 2020](#)).

Moreover, philosophy plays an important role in shaping ethics, politics, art, and science, as it provides a normative foundation for evaluating human actions and the direction of scientific development. In the modern context, philosophy has become increasingly relevant in addressing global challenges such as environmental crises, artificial intelligence, and rapid social change. Philosophy is not only concerned with the pursuit of truth but also emphasizes wisdom in the use of knowledge. Therefore, philosophy serves as a critical foundation that enables humans to reflect on the meaning, purpose, and impact of every achievement attained ([Blackburn, 2019; Smith, 2022](#)).

Traditional management, rooted in positivist and rationalist paradigms, is now being questioned for its limited responsiveness to non-linear contexts, multi-stakeholder demands, and shifting social values ([Wati, 2024](#)). Emerging business research paradigms show that philosophy of science (ontology, epistemology, methodology, and axiology) provides an important framework for formulating methodologies and managerial practices relevant to the transformative age (ADHOGS: automation, digitalization, hyperconnectivity, obligations, globalization, sustainability) (Emerald Insight, 2023). Furthermore, developments in management theory such as transformational leadership, sustainable innovation, and ethical leadership cannot be separated from philosophical considerations, as they increasingly emphasize the importance of values and social responsibility in organizations ([Manurung & Hendayana, 2023](#)).

At the same time, a gap exists between Western-based management theories and their applications in local contexts, especially in Indonesia, which are influenced by culture, social norms, and institutions. When studied within a local framework, philosophy of science opens opportunities to adapt management theories so that they align better with societal values and socio-economic complexities ([Ares Faujian, Ahmed, Shahzeb, & Sudrajat, 2024](#)). This adaptation is crucial to ensure that contemporary management theory is not only theoretically universal but also contextually sensitive and applicable ([Cahyono, Iskandar, Setyawati, & Pahrudin, 2024](#)). Overall, this background indicates that the dynamics of philosophy of science and its implications for contemporary management theory require systematic examination so that management theory remains relevant and responsive to changing times.

This study is urgent because contemporary management theory faces a dilemma between demands for efficiency and globalization on the one hand and the need for ethical responsibility, sustainability, and social justice on the other; without a strong

philosophical foundation, management theories risk losing normative and practical direction when confronted with complexity and uncertainty ([Emerald Insight, 2023](#); [Nabila & Mansur, 2025](#)). A lack of philosophical understanding in the development of management theory may result in methodological biases, neglect of local values, and failure to adequately respond to major transformations such as technological disruptions and social pressures ([Wati, 2024](#); [Ares Faujian et al., 2024](#)).

Several earlier studies have discussed these issues in partial ways. For example, Setiawan and Sauri (2024) examined the role of philosophy of science in the development of science, particularly in how philosophical approaches shape initial concepts, integrate new theories, and critique established frameworks. Meanwhile, [Manurung and Hendayana \(2023\)](#), in their literature review on the future of management theory, explored how innovation, transformational leadership, and sustainability have emerged as critical pillars in contemporary theory. However, few studies have explicitly linked the dynamics of philosophy of science with contemporary management theory within a comprehensive framework, especially in the Indonesian context where culture and local values play significant roles.

Based on the above background and urgency, this study aims to: (1) analyze the dynamics of philosophy of science in the past decade, particularly shifts in ontology, epistemology, axiology, and technological implications; (2) identify how these developments influence contemporary management theory, including leadership, innovation, ethics, and sustainability; and (3) formulate recommendations for the development of management theories that are philosophically grounded, locally sensitive, and adaptive to global and contextual challenges.

Methods

This study employs a qualitative approach with a literature study design, aiming to examine and analyze the dynamics of the philosophy of science and its implications for contemporary management theory. A literature study is considered appropriate because the research focuses on conceptual exploration, philosophical discourse, and theoretical development based on various relevant academic sources. According to [Creswell and Poth \(2018\)](#), qualitative research allows researchers to understand phenomena in depth through textual analysis and meaning-making, making it suitable for this study.

Data Sources

The data sources of this research consist of secondary literature, including scholarly journal articles, academic books, conference proceedings, and research reports relevant to the philosophy of science and contemporary management theory. The selection of literature prioritized recent publications from the last five years while also considering classical works that provide significant contributions to the discussion of philosophy of science and management theory ([Snyder, 2019](#)).

Data Collection Technique

The data collection technique was carried out through documentation, by identifying, collecting, and selecting relevant articles and books. Literature searches were conducted using academic databases such as Google Scholar, Scopus, and DOAJ to ensure the credibility and academic impact of the sources. The gathered materials were

then reviewed and evaluated based on thematic relevance, originality of ideas, and contribution to understanding the relationship between philosophy of science and management theory (Xiao & Watson, 2019).

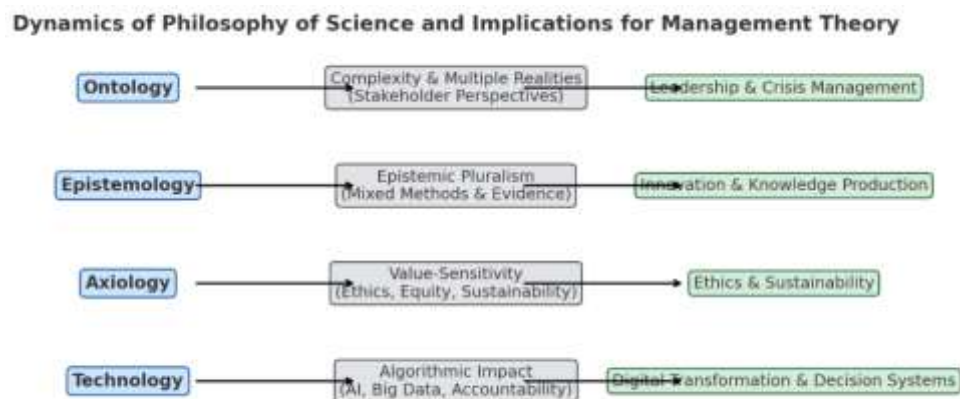
Data Analysis Method

The data were analyzed using content analysis, which involved organizing the literature, categorizing findings into major themes (philosophy of science, contemporary management theory, and their implications), and synthesizing results comprehensively. Content analysis is suitable for identifying patterns, differences, and relationships among concepts across various sources (Krippendorff, 2019). The results were then interpreted critically to highlight the dynamics of the philosophy of science and their implications for the renewal of contemporary management theories. This method enabled the development of a systematic, relevant, and academically accountable conceptual framework.

Results

Dynamics of the Philosophy of Science in the Last Decade

Over the last decade the philosophy of science has undergone a series of conceptual shifts that have important ramifications for how scholars and practitioners conceive of knowledge, reality, and value in organizational settings. Where much of twentieth-century social science and management research rested on a broadly positivist ontology that treated reality as single, stable, and discoverable through neutral measurement, more recent philosophical work emphasises complexity, emergence, and context dependence; this ontological reorientation treats organizational phenomena as constructed, relational, and often multiply real in the sense that different stakeholders inhabit and enact different “realities” within the same social setting (Frederiksen & Kringelum, 2021). That ontological move has practical consequences: managers and researchers are increasingly prompted to recognize that a single, one-size-fits-all intervention or metric will often fail to capture the layered and context-bound nature of organizational life, and that managerial knowledge must therefore be sensitive to multiple perspectives and levels of analysis (Mingers, 2014; Frederiksen & Kringelum, 2021).



Linked to ontological reframing is a marked epistemological pluralism that has

come to prominence in recent philosophical literature. Epistemic pluralism—the idea that different methods, models, and types of evidence can legitimately coexist when investigating the same phenomenon—has been defended both on theoretical grounds and with respect to urgent practical problems where monocultures of evidence proved inadequate ([Zangwill, 2020](#)). The COVID-19 pandemic makes this point immediately palpable: as commentators have shown, an exclusive reliance on any single methodological tradition (for example, narrow randomized controlled trials or purely model-based epidemiology) led to blind spots in policy making, whereas a pluralist approach that combined epidemiology, social science, economic modelling and local experiential knowledge produced more robust and contextually attuned responses ([Lohse et al., 2020](#)). For management theory this epistemological turn means that research programmes and managerial decision-making must allow for triangulation across qualitative case studies, computational models, historical analysis, and stakeholder knowledge rather than enforcing a rigid hierarchy of evidence; in short, theory and practice benefit when multiple epistemic routes are admitted as legitimate contributors to managerial knowledge ([Zangwill, 2020; Serino et al., 2024](#)).

Axiology—the role of values in science—has arguably seen one of the most consequential revisions. Once idealized as value-free, the production and application of scientific knowledge are now widely acknowledged to be suffused with ethical, political, and economic values that influence problem selection, model construction, and interpretation ([Douglas, 2009; Elliott & Korf, 2024](#)). Philosophers and historians of science have documented how choices about research priorities, funding, and acceptable risk are normative decisions with downstream consequences for who benefits and who is harmed; this recognition has led to explicit calls for reflexive, value-sensitive research practices ([Douglas, 2009; Rolin, 2015; Elliott & Korf, 2024](#)). For management, the axiological turn foregrounds that organizational metrics, performance indicators, and technology adoption decisions are not neutral technicalities but normative acts that instantiate values—whether efficiency, equity, sustainability, or profitability—and must therefore be deliberated and justified in ethical terms rather than left implicit ([Rolin, 2015; Elliott & Korf, 2024](#)).

Technological developments—most notably advances in data science, machine learning, and large language models—have acted as accelerants for these philosophical shifts while simultaneously posing fresh conceptual puzzles. The capacity of algorithmic systems to uncover patterns at speed and scale challenges traditional accounts of explanation, causation, and human understanding: automated models can produce accurate predictions without yielding human-readable causal explanations, prompting philosophers to reconsider what counts as knowledge and what epistemic standards should apply when humans cede parts of inference to machines ([Floridi et al.; PT-AI proceedings, 2021](#)). The managerial implications are profound. When firms deploy algorithmic decision-support systems in hiring, credit scoring, or supply-chain optimization, the organization faces questions not only about predictive performance but also about interpretability, accountability, and the social distribution of harms and benefits; these questions require philosophical tools for assessing trade-offs between accuracy, fairness, and transparency ([Fazelpour & Lipton, 2021; Raghavan et al., 2020](#)).

Two concrete cases illustrate how the intertwined ontological, epistemological, axiological, and technological shifts actually play out. First, the COVID-19 crisis exemplified the need for epistemic pluralism and value-sensitive science. Early public-health decision-making suffered where narrow reliance on particular epidemiological

models or laboratory metrics overlooked social behaviours, economic constraints, and local care practices; where governments and agencies integrated multiple evidence streams—clinical trials, social-behavioural surveys, local clinician insight, and computational models—responses could be calibrated to both effectiveness and social acceptability ([Lohse et al., 2020](#)). This case shows that contemporary management problems (e.g., crisis leadership, remote work policy, supply-chain resilience) similarly require plural evidence and value reflection to support decisions that are both effective and ethically defensible.

Second, the Amazon hiring algorithm episode demonstrates how unexamined data practices and technological optimism can reproduce social injustices. Amazon's experimental resume-screening tool learned patterns from a historical applicant pool and ended up downgrading applications from women for technical roles; the algorithms encoded past biases and amplified them when deployed at scale ([Dastin, 2018; Raghavan et al., 2020](#)). Scholarly analyses of algorithmic hiring have since shown that technical fixes alone are insufficient: addressing algorithmic bias requires attention to data provenance and representativeness, careful selection of outcome variables, continuous auditing, and, crucially, deliberation about the values that the system should instantiate—fairness, diversity, or utility—and how to operationalize them ([Raghavan et al., 2020; Chen et al., 2023](#)). For managers this case is a cautionary tale: adopting machine learning tools without philosophical scrutiny of ontological assumptions (what the model treats as “applicant quality”), epistemic status (how reliable the training data are), and axiological commitments (which outcomes the firm privileges) can lead to legal, reputational, and moral harms.

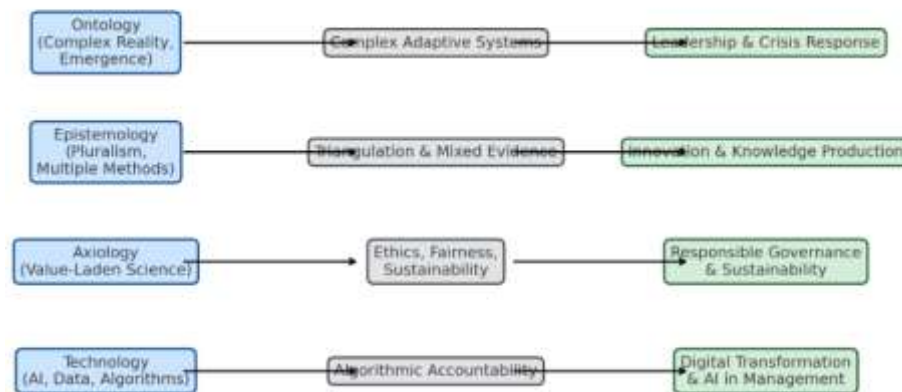
Taken together, these developments argue for a reconceptualization of management theory as philosophically literate practice. The ontological move toward complexity recommends managerial frameworks that recognize emergent properties and multiple stakeholder realities; the epistemological embrace of pluralism legitimizes mixed-method research and participatory forms of knowledge-production in organizations; the axiological turn demands that values be made explicit and deliberated rather than hidden behind technical jargon; and the technological turn requires ongoing critical engagement with the limits and affordances of algorithmic tools. Practically, these philosophical shifts suggest that contemporary management scholars and practitioners should co-design research and decision processes with stakeholders, implement continuous algorithmic auditing regimes, and institute institutional mechanisms for articulating and negotiating value trade-offs—steps that will make management theory and practice both more robust and more socially responsible in an age of rapid technological and social change.

Implications for Contemporary Management Theory

The recent reconceptualization of the philosophy of science—from a posture that once assumed a single, objective reality knowable by neutral methods to one that recognizes complexity, situated knowledges, and value-laden inquiry—has produced direct and subtle shifts in how management scholars and practitioners theorize organizations and lead them in practice. Where mid-twentieth century management theory often treated organizations as machines whose behaviour could be predicted and optimized through narrow metrics and centralized command, contemporary thinkers increasingly conceive organizations as complex adaptive systems in which patterns

emerge through interactions among multiple actors and contextual forces; this ontological reframing encourages managerial attention to relationships, emergence, and the situated nature of organizational “facts,” and it undercuts confidence in one-size-fits-all recipes for intervention ([Uhl-Bien, Marion, & McKelvey, 2007](#)).

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That ontological turn is matched by an epistemological opening: epistemic pluralism has become a normative principle in both the philosophy of science and applied fields, arguing that different kinds of evidence and explanatory strategies—qualitative case studies, computational models, ethnographic observation, participatory local knowledge—can legitimately coexist and jointly inform decisions. Management problems are frequently “wicked” in the sense that no single method captures the whole; accepting plural sources of evidence therefore leads organizations to combine quantitative metrics with narrative, stakeholder testimony, and historical/contextual analysis when designing strategy or evaluating outcomes ([Zangwill, 2020](#)).

Axiological developments—explicit recognition that values permeate choice of questions, methods, and metrics—further transform managerial reasoning. Management decisions about what to measure, what counts as “performance,” and which innovations to prioritize are not neutral technical choices but normative acts that instantiate particular values (efficiency, growth, equity, sustainability). This insight requires managers to make value trade-offs explicit, to institutionalize mechanisms for ethical deliberation, and to build accountability structures that allow stakeholders to contest and reshape organizational priorities; failure to do so turns ostensibly “rational” practices into sources of social harm because they occlude the normative assumptions embedded in algorithms, KPIs, or incentive schemes ([Douglas, 2009](#); [Floridi et al., 2018](#)).

Technological acceleration—especially large-scale data systems, machine learning, and automated decision tools—both amplifies and complicates these philosophical shifts. On one hand, powerful analytics and AI systems can reveal patterns previously invisible to managers and can support rapid, data-driven decision making; on the other, algorithmic systems often operate as “black boxes,” producing high predictive accuracy without human-readable explanations, and these systems can reproduce historical biases present in their training data if no epistemic or axiological safeguards are applied. Consequently, contemporary management theory must incorporate critical reflection on

the epistemic status of algorithmic outputs, on the provenance and representativeness of data, and on institutional designs that enforce transparency, auditing, and remedy when harms occur ([Raghavan, Barocas, Kleinberg, & Levy, 2020](#)).

These abstract shifts are visible in concrete episodes. The COVID-19 pandemic exposed how single-track epistemologies and narrowly technical decision rules can lead to suboptimal or unjust outcomes; early pandemic responses that privileged particular modelling traditions without adequate integration of social-behavioural knowledge, economic impact assessment, and local clinical experience produced policies that were sometimes ineffective or socially unsustainable. Scholars have used the pandemic as a prominent example of why epistemic pluralism and value-sensitivity are essential for evidence-based public health and organizational crisis management: robust responses combined epidemiological modelling with social research, frontline practitioner insight, and stakeholder consultation in order to calibrate interventions that were both effective and socially legible ([Lohse et al., 2020](#)).

The Amazon hiring-algorithm episode offers a complementary cautionary case within organizational practice. Amazon's experimental resume-screening system—trained on an historical applicant pool skewed toward male candidates—learned to prefer patterns correlated with male applicants and therefore downgraded female applicants for technical roles; the episode demonstrated that, without careful scrutiny of data provenance and explicit value choices about fairness definitions, algorithmic decision tools reproduce and amplify existing social biases at scale ([Dastin, 2018](#)). Subsequent scholarly work on algorithmic hiring has shown that purely technical “debiasing” methods are insufficient in isolation: what is needed are socio-technical procedures that combine careful dataset curation, continuous auditing, stakeholder participation in defining fairness metrics, and institutional accountability mechanisms so that epistemic, ontological and axiological dimensions are all addressed ([Raghavan et al., 2020](#)).

Taken together, these developments require a reconception of management theory as philosophically literate practice. Leadership theories that foreground emergence and enabling conditions (complexity leadership) complement older directive models by equipping managers to foster adaptive spaces where novelty can emerge and be integrated into formal structures; epistemological pluralism legitimizes mixed-method research designs and participatory knowledge production inside organizations; axiological awareness mandates that value-based governance and deliberative mechanisms become central design features rather than afterthoughts; and a critical stance toward technology insists that managerial adoption of algorithmic tools be accompanied by transparency, auditability, and remediation procedures. In practical terms, organizations need institutionalized processes for co-designing interventions with stakeholders, for ongoing algorithmic auditing and impact assessment, and for embedding ethical deliberation into strategy and performance metrics—steps that collectively make management both more effective and more socially defensible in an era of complex problems and powerful technologies ([Uhl-Bien et al., 2007](#); [Raghavan et al., 2020](#); [Floridi et al., 2018](#)).

Recommendations for Developing Philosophically Grounded Management Theories

A philosophically informed approach to management theory must be concise yet deeply grounded in the evolving discourse of science. The recognition that organizations

are complex and context-dependent underscores the need for pluralistic frameworks that integrate multiple ontological and epistemological perspectives rather than privileging a single model of knowledge (Zangwill, 2020). This requires management theories that can flexibly combine global insights with local wisdom, enabling leaders to respond effectively to dynamic challenges. Equally important is the axiological turn, which makes clear that managerial decisions about innovation, performance, and governance are inseparable from ethical and social commitments (Douglas, 2009). For instance, the adoption of sustainability practices in multinational corporations illustrates how ethical responsibility has become a core driver of strategy, not merely an external obligation (Eccles & Klimenko, 2019). At the same time, rapid technological advances demand a critical stance: while artificial intelligence offers efficiency and predictive power, cases such as algorithmic bias in hiring reveal the risks of deploying technology without ethical safeguards (Raghavan et al., 2020). These lessons point to a central recommendation: management theory should evolve into a more philosophically literate, value-sensitive, and contextually adaptive framework, capable of addressing global challenges while remaining responsive to local cultural and ethical realities.

Conclusion

The study reveals that the philosophy of science has undergone fundamental shifts in ontology, epistemology, axiology, and its relationship with technology. These changes directly influence contemporary management theory, requiring it to move beyond mechanistic and universalist approaches toward frameworks that are pluralistic, ethically responsible, and context-sensitive. Philosophy thus serves not merely as an abstract discipline but as a foundation for shaping adaptive, socially responsible, and technologically aware management practices.

Organizations and managers should integrate philosophical insights into decision-making by recognizing the plurality of knowledge sources, institutionalizing ethical deliberation in performance metrics, and implementing continuous auditing of technological tools. Leaders must embrace complexity leadership, foster participatory knowledge creation, and embed sustainability and fairness as central organizational values.

This study is limited by its reliance on secondary literature, which, although comprehensive, does not include empirical fieldwork. The conceptual analysis is therefore more interpretive than data-driven, and its contextual application, particularly in non-Western societies, remains partly theoretical.

Future research should extend this conceptual foundation by conducting empirical studies that examine how philosophical principles are operationalized in real organizational contexts. Comparative research across cultural settings would deepen understanding of how local values intersect with global management theories. Furthermore, interdisciplinary approaches combining philosophy, management, and technology studies are essential for addressing the ethical and epistemic challenges posed by artificial intelligence and algorithmic decision-making in organizations.

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