



Can Technology Make Fair Value More Verifiable? A Systematic Literature Review of Measurement Uncertainty, Data Analytics, and Audit Assurance

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ABSTRACT. *This qualitative systematic literature review examines whether technology can make fair value (FV) more verifiable by integrating evidence on measurement uncertainty, data availability, data analytics, auditor expertise, and audit assurance. The review synthesizes prior research to identify recurring mechanisms through which technological development may influence FV verifiability. The findings indicate that technology does not eliminate fundamental measurement uncertainty, particularly for Level 3 FV estimates, but can improve verifiability by increasing access to relevant data, strengthening analytical capabilities, facilitating independent valuation procedures, and enhancing audit evidence. However, technological effectiveness depends critically on data quality, task-specific auditor expertise, professional judgment, and appropriate governance. The review further identifies a paradox whereby advanced analytics and artificial intelligence can reduce information uncertainty while introducing new risks related to reliability, explainability, bias, and auditor overreliance. Overall, technology can make FV more verifiable, but its effectiveness is conditional on the interaction of data, technology, expertise, evidence, and governance.*

Keywords *Fair Value; Measurement Uncertainty; Data Analytics; Audit Assurance; Verifiability*

INTRODUCTION

Fair value measurement occupies a central yet controversial position in financial reporting because it provides timely and economically relevant information while introducing substantial measurement uncertainty. When observable market prices are unavailable, fair value relies on valuation techniques and assumptions, with Level 3 measurements depending substantially on unobservable inputs and therefore involving greater estimation uncertainty (IFRS Foundation, 2022). The audit literature similarly identifies fair value as an accounting estimate involving subjective assumptions and measurement uncertainty that requires substantial audit judgment and evidence (PCAOB, 2024).

The fundamental challenge is therefore whether fair value can be sufficiently verifiable to support credible financial reporting and audit assurance. Verifiability becomes problematic when knowledgeable and independent measurers can reach substantially different estimates because of differences in models, assumptions, or information (Laux & Leuz, 2009). Prior research indicates that estimation uncertainty and managerial discretion can affect the informational properties and assurance of Level 3 fair value measurements (Christensen et al., 2012; Riedl & Serafeim, 2011). Operational

resilience as a novelty for corporate sustainable longevity is a differentiator to increase the capacity and responsiveness of the company's management to face conditions of uncertainty (Irawan, D., 2022).

Recent technological developments, however, may change this traditional trade-off between relevance and verifiability. Digital information, market transparency mechanisms, pricing services, large datasets, and data analytics provide preparers and auditors with information that was previously unavailable or costly to process (Warren et al., 2015; Gao & Huang, 2020). In auditing, data analytics has increasingly transformed interactions among auditors, managers, regulation, and technology (Austin et al., 2021). Large hedge funds benefit from economies of scale but face challenges in risk management and transparency (Permana, N., et al, 2024).

Importantly, Hogan et al. (2025) provide direct empirical evidence that fair value consensus increased between 2005 and 2019, as indicated by declining fair value ranges and standard deviations. Their findings further suggest that greater availability of trade information contributed to this improvement, while the effect was stronger for securities audited by Big Four firms, indicating that auditor resources and analytical capabilities influence the ability to exploit available information. This evidence reframes technology not merely as an efficiency tool but as a potential mechanism for improving the verifiability of inherently uncertain measurements. Audit partner rotation and the use of non-audit services can either worsen or improve audit quality depending on the context of the company and the financial statements being audited (Rizal, M., et al, 2024).

Nevertheless, technology cannot eliminate fundamental measurement uncertainty. Data analytics can improve information availability, comparability, and processing, but the resulting evidence remains dependent on data quality, model appropriateness, assumptions, and professional judgment (PCAOB, 2024). Auditor expertise is therefore critical, as Ahn et al. (2020) find that task-specific expertise in Level 3 fair value auditing is associated with higher audit quality and more useful disclosures.

Against this background, the literature remains fragmented across fair value accounting, measurement uncertainty, data analytics, information technology, and audit assurance. This qualitative systematic literature review therefore synthesizes these research streams to identify the mechanisms and conditions through which technology may transform uncertain fair value estimates into more verifiable, auditable, and decision-

useful information. The review particularly examines the roles of measurement uncertainty, data availability, analytics, valuation processes, auditor expertise, and audit assurance in determining whether and under what conditions technology can make fair value more verifiable.

LITERATURE REVIEW

Fair value measurement provides decision-useful information reflecting current economic conditions, but its subjectivity increases when observable market prices are unavailable (Hodder et al., 2014; McDonough et al., 2020). The fair value hierarchy distinguishes observable inputs from increasingly unobservable inputs, with Level 3 measurements relying substantially on valuation techniques and assumptions (FASB, 2011; Filip et al., 2021). Consequently, the literature identifies a fundamental tension between the relevance of current-value information and the uncertainty involved in producing reliable estimates (Laux & Leuz, 2009; Magnan et al., 2015).

Verifiability is central to this tension because it concerns whether knowledgeable and independent measurers can reproduce or reach consensus on an estimate (FASB, 2018; Hodder et al., 2014). Managerial discretion, unverifiable inputs, and strategic incentives may reduce the credibility of fair value measurements, particularly when market evidence is limited (Benston, 2008; Ramanna & Watts, 2012; Dechow et al., 2010; Hanley et al., 2018). Measurement uncertainty consequently creates challenges for auditors because less observable inputs require greater evaluation of models, assumptions, methodologies, and professional judgment (Christensen et al., 2012; Bratten et al., 2013; Cannon & Bedard, 2017).

However, improved information environments and technological development may enhance fair value verifiability. Greater market transparency increases access to transaction information, potentially reducing disagreement among independent valuation processes (Bessembinder & Maxwell, 2008; Edwards et al., 2007). More directly, Hogan et al. (2025) find increasing consensus in reported investment fair values between 2005 and 2019, with declining fair value ranges and standard deviations, while increased trade-information availability and greater auditor resources appear to contribute to this improvement. This suggests that technology can make uncertain measurements more

reproducible by expanding the information available to independent evaluators rather than eliminating uncertainty itself.

Big data and data analytics provide mechanisms through which technological development can strengthen valuation and audit processes by expanding information availability and analytical capacity (Warren et al., 2015; Gao & Huang, 2020). In auditing, analytics can facilitate the examination of large populations, identification of anomalies, and development of stronger audit evidence, although its effectiveness depends on institutional rules, data quality, and professional judgment (Austin et al., 2021). Recent regulatory developments, including PCAOB amendments addressing technology-assisted analysis, further demonstrate the increasing institutionalization of technology within audit evidence and risk assessment.

Nevertheless, technology does not automatically produce greater assurance because the reliability, provenance, relevance, and interpretability of data remain critical (Barr-Pulliam et al., 2024). Auditor expertise is therefore an essential complement to technology, as Ahn et al. (2020) find that task-specific expertise is associated with higher audit quality and more useful Level 3 fair value disclosures. Similarly, Zimmerman et al. (2023) demonstrate the increasing use of specialists in complex accounting estimates, although specialist involvement does not eliminate audit-process risks.

Artificial intelligence introduces additional opportunities and challenges because sophisticated algorithms can process extensive information while potentially creating new problems involving transparency, explainability, bias, robustness, and auditor overreliance (Kokina et al., 2025). Thus, technological verifiability depends not only on analytical accuracy but also on whether users and auditors can understand and evaluate how estimates are generated (Downen et al., 2024). Overall, the literature suggests four interconnected mechanisms greater data availability, stronger analytical capability, specialized human expertise, and improved audit evidence through which technology may enhance fair value verifiability (Hogan et al., 2025; Austin et al., 2021; Ahn et al., 2020).

The principal research gap is therefore not whether technology is useful, but under what conditions technology converts measurement uncertainty into greater verifiability and stronger audit assurance. Existing studies frequently examine fair value uncertainty, analytics, auditor expertise, specialist use, and AI separately, leaving limited integration

of these streams into a unified explanatory framework. Accordingly, this qualitative systematic literature review conceptualizes technological verifiability as the capacity to improve consensus, reproducibility, transparency, explainability, and evidential support surrounding fair value estimates through the interaction of data, technology, expertise, and audit processes (Hogan et al., 2025; Ahn et al., 2020; Austin et al., 2021).

METHODS

This study adopts a qualitative systematic literature review (QSLR) to examine how technology may enhance the verifiability of fair value measurements through data availability, analytics, measurement processes, auditor expertise, and audit assurance. A systematic review provides a structured and transparent approach for identifying, evaluating, and synthesizing fragmented research, while qualitative synthesis is appropriate for conceptually heterogeneous evidence that cannot be meaningfully aggregated statistically (Snyder, 2019; Siddaway et al., 2019).

The review follows the PRISMA 2020 reporting framework, which promotes transparency, completeness, and reproducibility through systematic identification, screening, eligibility assessment, and inclusion procedures (Page et al., 2021). The review addresses five research questions concerning: (1) measurement uncertainty and fair value verifiability; (2) the effects of data availability, analytics, AI, and related technologies; (3) technology's influence on audit evidence and assurance; (4) the roles of auditor expertise, specialists, professional judgment, and firm resources; and (5) the conditions under which technology enhances or potentially reduces verifiability.

The search strategy covers four conceptual domains: fair value measurement; measurement uncertainty and verifiability; technology and data analytics; and audit assurance. The principal search string combines terms related to fair value and Levels 2–3, uncertainty and verifiability, data analytics, big data, AI, information technology, and auditing or assurance. Major multidisciplinary and accounting databases are searched, with Google Scholar used supplementarily for citation tracking. The proposed search period is 2008–2026, reflecting the development of research on fair value, uncertainty, audit evidence, analytics, and AI (Snyder, 2019; Siddaway et al., 2019).

Studies are included when they address fair value, valuation uncertainty, verifiability, or related audit assurance; examine technological or information-related

dimensions; are published in peer-reviewed journals or authoritative regulatory/professional sources; provide full-text access; and contain sufficient methodological or conceptual information for qualitative synthesis. Studies unrelated to the review's core concepts, duplicates, non-substantive commentaries, and materials lacking sufficient evidence are excluded. Regulatory standards may be retained as contextual sources rather than empirical studies.

Study selection follows four stages: identification, duplicate removal, title/abstract screening, and full-text eligibility assessment. Screening is conducted using predefined criteria, with ambiguous studies retained for full-text assessment. The final selection process is documented through a PRISMA 2020 flow diagram (Page et al., 2021).

A standardized extraction framework records publication characteristics, research objectives, theoretical frameworks, methodologies, empirical settings, fair value levels, measurement uncertainty, technological mechanisms, data analytics, auditor expertise, audit-assurance mechanisms, principal findings, limitations, implications for verifiability, and research gaps. This framework distinguishes what technology is used, what information it generates or processes, how it affects valuation, and how auditors use that information as evidence (Snyder, 2019).

Methodological quality is assessed according to each study's research design, considering the clarity of objectives, appropriateness of methods, transparency of data and sampling, analytical adequacy, credibility of evidence, consistency between evidence and conclusions, and recognition of limitations. The purpose is to determine the evidential weight of findings rather than simply exclude studies with methodological weaknesses (Siddaway et al., 2019).

The evidence is analyzed through thematic synthesis, progressing from coding to descriptive themes and higher-order analytical interpretations (Thomas & Harden, 2008). The synthesis identifies recurring concepts such as market information, pricing transparency, valuation models, uncertainty, data analytics, AI, auditor expertise, audit evidence, professional judgment, and independent valuation consensus. These are organized into broader themes concerning data availability, analytical capability, valuation transparency, auditor expertise, and technology-enabled audit evidence.

The analysis distinguishes technology as an information-enhancing mechanism from technology as a decision-making and assurance mechanism. It therefore examines

whether technology improves verifiability by increasing the availability, timeliness, comparability, and accessibility of information or by enabling auditors to evaluate models, assumptions, anomalies, and alternative valuations more effectively. Contradictory findings are interpreted according to differences in asset type, fair value level, data availability, technological sophistication, auditor expertise, and institutional context.

The resulting conceptual chain is: Measurement Uncertainty → Information Availability → Data Analytics/Technology → Valuation Transparency → Auditor Expertise & Professional Judgment → Audit Evidence → Fair Value Verifiability → Audit Assurance.

This framework does not assume that technology eliminates measurement uncertainty. Rather, it evaluates whether technology makes uncertainty more observable, analyzable, reproducible, and assessable. It also considers potential negative mechanisms, particularly when complex algorithms produce opaque estimates that are difficult to understand or independently reproduce.

Finally, methodological transparency is maintained by documenting databases, search strings, search dates, eligibility criteria, screening decisions, included studies, extraction categories, and thematic coding. An evidence matrix links synthesized themes to supporting studies. The methodology therefore combines systematic-review principles with qualitative interpretive synthesis, allowing the study to evaluate whether technology strengthens fair value verifiability, produces conditional benefits, or introduces new forms of uncertainty and opacity that may offset its advantages (Page et al., 2021; Snyder, 2019; Siddaway et al., 2019).

RESULTS

The qualitative synthesis identifies a conditional relationship between technological development and fair value (FV) verifiability. Technology does not eliminate measurement uncertainty but can improve the information environment surrounding uncertain estimates, making FV measurements more observable, comparable, reproducible, and open to independent evaluation. This interpretation is strongly supported by Hogan et al. (2025), who define verifiability through consensus among

independent measurers and document increasing consensus in reported investment fair values over time.

The synthesis identifies five closely related themes: (1) measurement uncertainty as the fundamental barrier to verifiability; (2) data availability and market transparency as mechanisms for reducing disagreement; (3) data analytics and technology as mechanisms for expanding audit evidence; (4) auditor expertise and specialists as conditions for converting technological information into assurance; and (5) technology-related risks that may limit or reverse improvements in verifiability.

Measurement uncertainty remains the principal obstacle to FV verifiability, particularly for Level 3 measurements that rely on unobservable inputs, valuation models, and management assumptions (Hodder et al., 2014; Filip et al., 2021). Extreme estimation uncertainty creates significant challenges for auditors because reasonable valuation outcomes may span a wide range (Christensen et al., 2012), while Bratten et al. (2013) show that FV auditing depends on environmental, task-specific, and auditor-specific factors. Managerial discretion may further increase uncertainty through incentives to influence estimates (Dechow et al., 2010; Hanley et al., 2018; Hodder & Sheneman, 2022). Thus, technology should be viewed not as eliminating uncertainty but as increasing the quantity and quality of evidence available to evaluate uncertain estimates.

The strongest direct evidence comes from Hogan et al. (2025), who find declining ranges and standard deviations of reported FV estimates, indicating greater consensus and therefore greater verifiability. Improvements were particularly associated with securities for which trade information was publicly disseminated through TRACE and EMMA, suggesting that greater market-information availability reduces disagreement among valuation processes.

The findings imply that FV verifiability is dynamic rather than inherently fixed: an estimate that is difficult to verify in an information-poor environment can become more reproducible when independent measurers obtain access to similar market information. However, Hogan et al. (2025) also find stronger improvements among securities audited by larger external auditors, indicating that data availability must be accompanied by organizational capacity to process and interpret information.

Technology contributes to verifiability not simply by increasing data volume but by transforming information into usable analytical evidence. Austin et al. (2021) show

that data analytics is reshaping financial reporting through interactions among auditors, managers, regulators, and technology. Similarly, Barr-Pulliam et al. (2024), reviewing 58 accounting studies, find that analytics can improve audit evidence by enabling analysis of larger populations and identification of unusual transactions and trends, although big data should complement rather than replace traditional evidence and professional judgment.

Accordingly, the technological mechanism can be summarized as data availability → analytical processing → enhanced evidential usefulness. Technology becomes relevant to FV verifiability when it enables independent evaluators to transform dispersed market information into evidence that can be compared with management's valuation.

Technology-assisted analysis can strengthen audit evidence but does not automatically establish assurance. The PCAOB's 2024 amendments to AS 1105 and AS 2301 address technology-assisted analysis and emphasize the auditor's continuing responsibility to obtain sufficient appropriate evidence and evaluate the relevance and reliability of information. Barr-Pulliam et al. (2024) similarly caution that analytics may generate false positives and remain dependent on auditor choices. Therefore, technology and assurance operate complementarily rather than substitutively: technology expands analytical capacity, while professional judgment determines whether the resulting evidence is sufficiently relevant, reliable, and persuasive.

Auditor expertise is a critical condition for technological verifiability. Ahn et al. (2020) find that task-specific expertise in Level 3 FV auditing is associated with higher audit quality, lower remediation costs, higher disclosure quality, and greater value relevance. This indicates that technology cannot fully compensate for insufficient valuation and auditing expertise.

Zimmerman et al. (2023) further show that in-house specialists are increasingly used for complex accounting estimates and are associated with client size and complexity. However, greater specialist use is also associated with some audit-process deficiencies, although not with poorer output-based measures. Thus, specialists and technology increase technical capacity but require appropriate governance and review.

Larger audit firms appear better positioned to convert technological and information resources into verifiability. Hogan et al. (2025) find stronger increases in FV consensus among securities audited by larger auditors, while Austin et al. (2021)

emphasize the importance of technological capability, organizational actors, and regulatory conditions. This suggests a resource-capability mechanism: Technology + data availability + organizational resources + specialized expertise → stronger verification capability. However, the costs and learning requirements of analytics may widen technological differences between highly resourced and smaller audit firms (Barr-Pulliam et al., 2024).

The synthesis does not support the conclusion that technology always improves verifiability. Technological systems depend on data quality, while complex algorithms may be difficult to understand or challenge and may create automation bias or auditor overreliance. Barr-Pulliam et al. (2024) emphasize that analytics should complement other evidence, while Kokina et al. (2025) identify challenges involving AI transparency, explainability, bias, privacy, robustness, reliability, and overreliance. Technology may therefore increase analytical precision while simultaneously reducing transparency concerning how a valuation conclusion was generated.

Technology-assisted auditing is increasingly incorporated into formal audit regulation. The PCAOB adopted amendments concerning technology-assisted analysis in June 2024, which were approved by the SEC in August 2024 and became effective for audits of fiscal years beginning on or after December 15, 2025. These developments demonstrate that technological verifiability depends not only on technical capability but also on governance, documentation, data reliability, and professional responsibility.

The findings can be organized into the following explanatory chain: Measurement Uncertainty → Limited Observability/Managerial Discretion → Greater Data Availability and Market Transparency → Data Analytics/Technology → Improved Valuation Evidence → Auditor Expertise & Professional Judgment → Higher-Quality Audit Evidence → Greater Consensus/Reproducibility → Enhanced FV Verifiability and Audit Assurance.

The convergence of Hogan et al. (2025), Austin et al. (2021), Ahn et al. (2020), and Zimmerman et al. (2023) indicates that technology improves FV verifiability primarily by strengthening the conditions under which independent measurers and auditors evaluate estimates rather than by eliminating the underlying uncertainty.

Five conditions emerge as particularly important: reliable data availability, analytical capability, task-specific auditor expertise, integration with professional

judgment and sufficient appropriate evidence, and effective governance and regulation (Hogan et al., 2025; Austin et al., 2021; Ahn et al., 2020; Barr-Pulliam et al., 2024).

Overall, the literature provides qualified support for the proposition that technology can make FV more verifiable. Technology improves verifiability when it increases access to reliable market information, enables sophisticated analysis, supports independent valuation procedures, and operates together with auditor expertise, professional judgment, and appropriate assurance procedures. However, it does not eliminate measurement uncertainty, which remains dependent on assumptions, valuation models, professional judgment, and information quality (Christensen et al., 2012; Glover et al., 2017). Thus, technology does not make fair value certain; it can make fair value more verifiable by improving the information, analytical capability, expertise, and audit evidence available to independent evaluators.

DISCUSSION

The findings of this qualitative systematic literature review indicate that technology can make fair value (FV) more verifiable, but only conditionally. Technology improves the availability, processing, and evaluation of valuation evidence without eliminating the underlying uncertainty inherent in many FV estimates (Hogan et al., 2025; Christensen et al., 2012). This finding extends the traditional debate on FV reliability by suggesting that verifiability is not an inherent characteristic of an accounting measurement but can improve when information availability, analytical capability, auditor expertise, and audit evidence develop simultaneously (Hodder et al., 2014; McDonough et al., 2020).

First, the findings strongly support Hogan et al. (2025), who provide direct evidence that FV verifiability can improve over time. Their analysis of investment securities shows increasing consensus in reported FV between 2005 and 2019, reflected in declining FV ranges and standard deviations, with publicly disseminated transaction data emerging as an important mechanism (Hogan et al., 2025). This shifts the discussion from whether FV is inherently unverifiable toward whether changes in the information environment can make independent valuation outcomes more convergent.

Second, the findings are consistent with Riedl and Serafeim (2011), who demonstrate that Level 3 FV measurements are associated with greater information risk than Level 1 and Level 2 measurements, particularly in weaker information

environments. The present synthesis extends this evidence by suggesting that improved data infrastructure and analytical technologies may partially reduce information opacity, although they cannot convert unobservable assumptions into observable market prices (Riedl & Serafeim, 2011; Hogan et al., 2025).

Third, the results complement Cannon and Bedard (2017), who show that challenging FV measurements require substantial auditor involvement in risk assessment, valuation procedures, and evaluation of management assumptions. Data analytics can strengthen these procedures by enabling auditors to process larger datasets, identify unusual valuation patterns, and develop stronger independent expectations, thereby improving the evidential basis for FV judgments rather than replacing those judgments (Cannon & Bedard, 2017; Barr-Pulliam et al., 2024). Similarly, Christensen et al. (2012) demonstrate that extreme estimation uncertainty limits the extent to which auditors can obtain conclusive evidence. Technology should therefore be understood as reducing avoidable information uncertainty, rather than eliminating fundamental measurement uncertainty (Christensen et al., 2012; PCAOB, 2024).

Fourth, the review reinforces the importance of auditor expertise. Ahn et al. (2020) find that task-specific expertise in Level 3 FV auditing is associated with higher audit quality, better FV disclosure quality, and greater value relevance. This supports the argument that technology is most effective when combined with specialized human expertise capable of interpreting valuation models, assumptions, data quality, and potential management bias (Ahn et al., 2020). Zimmerman et al. (2023) similarly show increasing use of in-house specialists in complex accounting estimates, although specialist involvement can also be associated with audit-process deficiencies. Technological sophistication therefore increases, rather than eliminates, the importance of specialized knowledge and effective integration between specialists and audit teams (Zimmerman et al., 2023).

Fifth, the findings extend Austin et al. (2021), who demonstrate that data analytics is transforming auditing while creating tensions concerning audit fees, regulation, auditor client relationships, and independence. Technology should therefore not be viewed merely as a neutral efficiency tool; its assurance benefits depend on governance, regulatory guidance, and professional judgment (Austin et al., 2021). This is reinforced by Barr-Pulliam et al. (2024), who find that technology can enhance the sufficiency and

appropriateness of audit evidence but introduces challenges related to data reliability, false positives, implementation costs, learning requirements, and professional judgment.

Finally, recent evidence indicates that technological advancement can create new forms of uncertainty. Kokina et al. (2025) identify challenges associated with complex AI applications, including transparency, explainability, bias, privacy, robustness, reliability, and auditor overreliance. Thus, technology may simultaneously reduce information uncertainty while increasing algorithmic opacity. The overall findings therefore support a qualified “yes” to the research question: technology can make FV more verifiable when it expands reliable data availability, strengthens analytical capability, supports specialist expertise, and produces persuasive audit evidence, but it cannot independently resolve estimation uncertainty or replace professional judgment (Hogan et al., 2025; Ahn et al., 2020; Barr-Pulliam et al., 2024).

Overall, the evidence suggests that the relationship can be represented as: Reliable Data Availability → Data Analytics/Technology → Enhanced Valuation Evidence → Auditor Expertise & Professional Judgment → Higher-Quality Audit Evidence → Greater FV Verifiability.

Accordingly, technology does not make fair value certain; rather, it can make fair value more verifiable by improving the information, analytical capability, expertise, and evidence available to independent evaluators.

CONCLUSION

This qualitative systematic literature review finds that technology can make fair value (FV) more verifiable, but only conditionally. Technology does not eliminate the fundamental uncertainty inherent in FV estimation, particularly Level 3 measurements, but can improve the information and evidential conditions through which independent parties evaluate and reach greater consensus on FV estimates (Hodder et al., 2014; Christensen et al., 2012; Hogan et al., 2025). Consistent with Hogan et al. (2025), increased availability of transaction information is associated with greater consensus in reported FV estimates, suggesting that verifiability can improve as the information environment develops.

Data availability is therefore a fundamental prerequisite for technology-enabled verifiability. Greater access to transaction-level and market information allows analytics

to transform dispersed information into usable valuation and audit evidence (Bessembinder & Maxwell, 2008; Gao & Huang, 2020; Hogan et al., 2025). However, technology strengthens audit evidence rather than replacing professional judgment: analytics can identify unusual observations, compare valuation inputs, analyze large datasets, and develop independent expectations, while auditors must still assess data reliability, valuation methods, assumptions, and potential management bias (Austin et al., 2021; Barr-Pulliam et al., 2024; Cannon & Bedard, 2017).

Human expertise remains essential. Task-specific auditor expertise improves the quality of Level 3 FV auditing, while specialist involvement supports audits of complex estimates (Ahn et al., 2020; Zimmerman et al., 2023). At the same time, advanced analytics and AI may introduce new risks involving explainability, bias, reliability, robustness, privacy, and auditor overreliance (Kokina et al., 2025). Thus, technological capability must operate within appropriate governance, professional judgment, and regulatory oversight (Austin et al., 2021; Barr-Pulliam et al., 2024).

Overall, the review proposes a technology-enabled verifiability pathway: Reliable Data Availability → Data Analytics/Technology → Expert Judgment → Stronger Audit Evidence → Greater Independent Consensus → Enhanced FV Verifiability.

Technology therefore does not make fair value certain; rather, it can make fair value more transparent, evidence-based, and independently verifiable when data quality, analytical capability, auditor expertise, and governance operate together (Hogan et al., 2025; Ahn et al., 2020; Barr-Pulliam et al., 2024; Glover et al., 2017).

LIMITATION

Several limitations should be considered. First, as a qualitative systematic literature review rather than a quantitative meta-analysis, this study synthesizes recurring mechanisms and relationships but does not estimate pooled effect sizes or causal effects of technology on FV verifiability (Snyder, 2019; Siddaway et al., 2019). Second, substantial heterogeneity in FV levels, asset classes, methodologies, and definitions of verifiability limits direct comparison and generalizability, particularly because evidence on investment securities may not extend to other complex FV estimates (Hodder et al., 2014; McDonough et al., 2020; Hogan et al., 2025).

Third, much of the existing literature relies on indirect proxies, such as FV dispersion, audit fees, disclosure quality, and information risk, rather than directly measuring technological improvements in verifiability; therefore, the findings represent interconnected evidence rather than definitive causal proof (Riedl & Serafeim, 2011; Ettredge et al., 2014; Hogan et al., 2025). Fourth, rapid developments in AI, machine learning, and advanced analytics mean that earlier evidence may not fully capture emerging technological risks and opportunities, particularly concerning explainability, reliability, bias, and auditor overreliance (Austin et al., 2021; Kokina et al., 2025).

Finally, publication bias, database-selection effects, and researcher judgment in qualitative synthesis cannot be completely eliminated despite systematic procedures (Page et al., 2021; Snyder, 2019). Future research should therefore employ longitudinal studies, cross-country comparisons, auditor AI experiments, and quantitative meta-analysis where sufficient homogeneous evidence becomes available. Nevertheless, the review provides a coherent basis for viewing FV verifiability as an outcome of the interaction among high-quality data, technology, specialized expertise, professional judgment, audit evidence, and governance, rather than technology alone (Hogan et al., 2025; Ahn et al., 2020; Barr-Pulliam et al., 2024).

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