

Audit Committee Diversity and Emerging-Risk Recognition

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Abstract

Audit committees increasingly operate in an environment in which material organizational threats extend beyond conventional financial-reporting and compliance risks. Cybersecurity incidents, digital-system dependence, supply-chain disruption, climate exposure, regulatory change, data-governance failures, third-party dependencies, and rapidly evolving business models can develop before they become visible through traditional accounting indicators. This study examines whether diversity within an audit committee can strengthen the recognition of such emerging risks. Diversity is conceptualized as a multidimensional governance resource encompassing gender representation, functional expertise, industry exposure, international experience, and digital or technological competence rather than as a single demographic attribute. Because verified company-level audit committee and risk-event data were not supplied, the empirical component is explicitly designed as a simulation-based methodological study. Sixty synthetic audit committee profiles are evaluated across five emerging-risk scenarios, generating 300 committee-risk assessments.

An Audit Committee Diversity Index and an Emerging-Risk Recognition Score are developed to evaluate the proposed relationship. Simulated findings indicate that committees with broader multidimensional diversity demonstrate stronger risk-recognition scores, more balanced risk classification, and greater capacity to identify cross-functional implications than relatively homogeneous committees. A representative synthetic scatter analysis also shows a strong positive association between the diversity index and recognition performance. The study does not suggest that demographic diversity alone guarantees effective oversight. Rather, its central proposition is that diversity produces governance value when differences in professional knowledge, experience, perspective, and cognitive framing are effectively integrated into committee deliberation. The study contributes an interpretable framework for audit committee composition, board evaluation, succession planning, enterprise-risk oversight, and future empirical validation.

Keywords: audit committee diversity, emerging risk, corporate governance, risk recognition, audit committee expertise, enterprise risk management, cognitive diversity

1. Introduction

Audit committees have traditionally been associated with financial-reporting integrity, external audit oversight, internal control, and the monitoring of accounting judgments. These responsibilities remain fundamental, but the risk environment surrounding financial reporting and organizational governance

has become substantially more interconnected. Operational disruption can generate liquidity consequences; cybersecurity weaknesses can create financial, legal, and reputational exposure; supply-chain failures can affect inventory, revenue recognition, impairment, and business continuity; and regulatory or technological changes can alter business models before their effects become evident in conventional financial indicators. Enterprise risk frameworks consequently emphasize the integration of risk with strategy, performance, governance, information, and reporting rather than treating risk as an isolated compliance exercise.

This expansion of the risk landscape increases the importance of how audit committees recognize risks that are still developing. An established risk can generally be evaluated through known metrics, historical experience, and documented controls. Emerging risks are more difficult because their probability, timing, interconnectedness, or financial consequences may initially be uncertain. Effective oversight therefore depends partly on the committee's capacity to recognize weak signals, challenge assumptions, interpret information from different professional perspectives, and ask whether a development outside traditional accounting boundaries could eventually influence control effectiveness, financial reporting, strategic resilience, or stakeholder confidence. Audit committee risk oversight consequently requires more than technical accounting literacy; it requires access to sufficiently broad knowledge to understand changing organizational exposures. Professional guidance has similarly emphasized the importance of continuously identifying and reassessing emerging and strategic risks rather than relying on static risk registers.

Audit committee composition is relevant to this challenge because the information-processing capacity of a group is partly determined by the knowledge and perspectives represented among its members. Research on audit committee expertise has repeatedly shown that composition matters to governance outcomes. Bédard, Chtourou, and Courteau found that financial and governance expertise, independence, and clear committee mandates were associated with lower aggressive earnings-management behavior. Sultana, Singh, and Van der Zahn subsequently demonstrated that financial expertise, prior audit committee experience, and independence were associated with more timely audit reporting. Ghafran and O'Sullivan also reported that different forms of financial expertise can influence audit-related outcomes, suggesting that the nature of expertise matters rather than the mere presence of a formally qualified member.

The diversity literature broadens this argument. Board diversity can involve visible characteristics such as gender and age, but it can also include differences in tenure, functional knowledge, professional background, international exposure, and specialized expertise. Harjoto, Laksmana, and Yang distinguished relation-oriented diversity from task-oriented diversity and found that expertise- and tenure-related diversity was associated with stronger corporate investment oversight. Bernile, Bhagwat, and Yonker similarly used a multidimensional view of board diversity and reported associations with corporate risk and policy choices. Audit committee research has also produced evidence that female representation, particularly when combined with relevant financial expertise, can contribute to monitoring and audit quality, although results are not universally consistent across contexts.

The present study extends these streams of research by examining emerging-risk recognition rather than restricting audit committee effectiveness to financial-reporting outcomes already visible in

accounting data. It proposes that the governance value of audit committee diversity may arise through a broader information-processing mechanism: heterogeneous committees may possess a wider collective repertoire for identifying unfamiliar risk signals, connecting risks across business functions, and challenging overly narrow managerial interpretations. Because no authenticated board-level dataset has been provided, this proposition is assessed through a transparent simulation rather than presented as completed corporate field research. The study therefore contributes a testable framework that can later be validated using real committee composition, risk-register, meeting, internal-audit, and incident data.

2. Objectives of the Study

2.1 Development of a Multidimensional Audit Committee Diversity Measure

The first objective is to conceptualize audit committee diversity more comprehensively than a single demographic measure. A committee may satisfy a visible diversity criterion while remaining highly homogeneous in professional experience, industry exposure, technological understanding, or geographic perspective. Conversely, a committee may contain extensive occupational variety while lacking meaningful demographic representation. Neither situation should be treated as a complete representation of diversity.

The study therefore develops an Audit Committee Diversity Index incorporating gender representation, functional expertise, industry-background variety, international experience, and digital or technological competence. The intention is not to imply that these are the only relevant attributes. Rather, the index provides a structured starting point for examining whether diversity across several governance-relevant dimensions is associated with stronger recognition of developing risks.

2.2 Assessment of Emerging-Risk Recognition Capability

The second objective is to operationalize emerging-risk recognition as an observable committee capability. Recognition is distinguished from complete risk management. An audit committee may correctly identify a developing threat without being responsible for managing the underlying operational response. The committee's oversight contribution is instead reflected in whether it detects the risk, interprets its significance, requests appropriate information, challenges management assumptions, and escalates concerns to the full board or relevant governance body when necessary.

Five synthetic scenarios are used to assess this capability: cybersecurity compromise, supply-chain concentration, rapid regulatory change, climate-related operational exposure, and automated-data integrity failure. These scenarios were selected because each requires knowledge extending beyond conventional accounting expertise while remaining capable of generating material reporting, internal-control, strategic, or reputational consequences.

2.3 Evaluation of the Diversity–Recognition Relationship

The third objective is to evaluate whether greater diversity is associated with stronger simulated risk-recognition performance. The analysis focuses particularly on whether committees with varied expertise are more capable of connecting weak signals across organizational domains.

The study does not assume that diversity inevitably produces superior outcomes. Diverse groups may experience coordination difficulty, disagreement, or slower consensus formation. The theoretical

benefit is expected only where different perspectives are expressed, considered, and incorporated into deliberation. The analysis therefore treats diversity as a potential governance capability rather than an automatic indicator of committee effectiveness.

3. Review of Literature

3.1 Audit Committee Composition and Monitoring Effectiveness

Research on audit committees has consistently examined whether specific compositional characteristics affect monitoring quality. Earlier governance reforms emphasized independence and financial expertise because audit committee members must evaluate complex accounting judgments and communicate effectively with internal and external auditors. Bédard, Chtourou, and Courteau found that financial and governance expertise and committee independence were associated with constraints on aggressive earnings management. Bédard and Gendron's broader review subsequently concluded that audit committee effectiveness depends on several interacting characteristics rather than a single structural attribute.

These studies are important for emerging-risk oversight because they show that committee capability depends on the knowledge members bring to deliberation. However, traditional expertise research tends to focus heavily on accounting and financial competencies. Contemporary risk recognition can require knowledge of technology, cybersecurity, operations, international regulation, supply networks, environmental exposure, and data systems. A committee designed solely around conventional financial qualifications may therefore be highly competent in financial reporting while remaining less prepared to recognize threats originating outside the accounting function.

3.2 Diversity as an Information and Governance Resource

The broader board-diversity literature suggests that heterogeneous groups may possess a larger pool of information, experience, and interpretive frames. Harjoto, Laksmana, and Yang distinguished between relation-oriented diversity, including characteristics such as gender, race, and age, and task-oriented diversity, including tenure and expertise. Their findings indicate that task-oriented diversity can strengthen oversight of complex corporate investment decisions.

The audit committee literature provides additional evidence but also warns against overly simplistic conclusions. Sun, Liu, and Lan did not identify a significant association between the proportion of female directors on independent audit committees and earnings management in their study, demonstrating that demographic representation by itself should not automatically be interpreted as stronger monitoring. Other studies have reported more favorable relationships between female audit committee participation and financial-reporting or audit outcomes. Izadi and Oradi found female audit committee representation associated with lower restatement likelihood, while Abbasi, Alam, and Bhuiyan reported evidence linking female directors and female accounting experts with audit quality.

3.3 Emerging Risks and the Need for Cognitive Breadth

Enterprise risk management increasingly requires organizations to consider risks in relation to strategy, performance, governance, and information flows. The COSO enterprise risk framework specifically positions governance, culture, strategy, performance, review, and communication as interconnected

components of risk management. This perspective is particularly relevant where risks are developing rapidly and cannot be evaluated only through historical loss information.

Audit committees occupy an important position within this governance architecture because their responsibilities commonly intersect with internal audit, controls, financial reporting, compliance, and selected enterprise risks. When a new technology, regulatory development, supply disruption, or cyber threat emerges, the committee may need to determine whether the issue creates implications for financial reporting, control design, business continuity, legal obligations, or assurance scope.

4. Research Methodology

4.1 Research Design and Synthetic Committee Profiles

The study uses a quantitative simulation-based design. No confidential board minutes, director biographies, committee evaluations, risk registers, internal-audit reports, cyber incidents, regulatory events, or financial records from a real organization were supplied. Accordingly, the study does not claim to measure the behavior of actual directors.

Sixty synthetic audit committee profiles are constructed. Each profile represents a three- to five-member committee with varying levels of demographic and task-related diversity. Every committee is evaluated against five emerging-risk scenarios, resulting in 300 synthetic committee-risk assessments.

The scenarios cover cybersecurity compromise, concentrated supply dependence, unexpected regulatory change, climate-related operational disruption, and automated financial-data integrity failure. Each scenario contains several weak signals that the committee must theoretically identify, connect, classify, and escalate.

Table 1: Operational Variables in the Simulation Model

Construct	Measurement Dimension	Illustrative Indicator	Analytical Purpose
Gender representation	Representation balance	Distribution across committee membership	Captures demographic heterogeneity
Functional expertise	Accounting, legal, operations, technology, strategy	Number of distinct professional domains	Captures task-related knowledge breadth
Industry exposure	Variety of sector backgrounds	Cross-sector experience score	Measures alternative industry perspectives
International experience	Geographic/regulatory exposure	Number of materially different market environments	Captures cross-border risk awareness
Digital competence	Technology, cyber, data, automation experience	Committee-level digital knowledge score	Assesses capacity to interpret technology-driven risk

Construct	Measurement Dimension	Illustrative Indicator	Analytical Purpose
Risk detection	Initial identification	Number of material weak signals correctly recognized	Measures recognition sensitivity
Risk integration	Cross-functional interpretation	Ability to connect operational and financial implications	Measures cognitive integration
Escalation quality	Governance response	Appropriateness of requested information and escalation	Measures oversight relevance

4.2 Construction of the Audit Committee Diversity Index

The Audit Committee Diversity Index (ACDI) combines five normalized components:

$$[ACDI_i = w_g G_i + w_f F_i + w_s S_i + w_n N_i + w_d D_i]$$

where:

(G_i) = gender-representation diversity; (F_i) = functional-expertise diversity; (S_i) = sector and industry-background diversity; (N_i) = international experience diversity; (D_i) = digital and technological competence diversity.

For the baseline simulation, equal weights are assigned:

$$[w_g = w_f = w_s = w_n = w_d = 0.20]$$

and:

$$[\sum_{j=1}^5 w_j = 1]$$

The resulting index ranges from 0 to 1. A higher value indicates broader committee diversity across the included dimensions.

The use of equal weights is deliberately conservative because no validated organizational evidence was available to justify assigning superior importance to one form of diversity. Subsequent empirical research could estimate weights statistically or modify them according to the organization's risk environment.

4.3 Emerging-Risk Recognition Score and Analytical Procedure

The Emerging-Risk Recognition Score (ERRS) measures five components: initial risk detection, signal interpretation, cross-functional linkage, materiality assessment, and governance escalation. Each component is scored from 0 to 20, creating a maximum recognition score of 100.

The aggregate score is represented as:

$$[ERRS_i = DR_i + SI_i + CL_i + MA_i + GE_i]$$

where:

(DR_i) = detection of relevant risk signals; (SI_i) = interpretation of the signals; (CL_i) = cross-functional linkage; (MA_i) = materiality assessment; (GE_i) = governance escalation quality.

The simulated committees are classified into three diversity bands: relatively low diversity, moderate diversity, and high diversity. Descriptive comparisons are then conducted across the categories. A representative subset of twenty synthetic committee profiles is also used for scatter analysis to illustrate the relationship between ACDI and ERRS.

Because all observations are generated for methodological demonstration, inferential statistics are not presented as evidence of real causal relationships. The simulation is intended to establish analytical plausibility and produce hypotheses suitable for subsequent empirical testing.

5. Analysis

5.1 Emerging-Risk Recognition Across Diversity Levels

The simulated results indicate a systematic improvement in risk-recognition performance as multidimensional committee diversity increases. Relatively homogeneous committees demonstrate satisfactory performance when the risk scenario falls within their dominant field of expertise but perform less consistently when threats cross several professional domains.

For example, committees dominated by conventional accounting and finance backgrounds identify the financial implications of a cyber incident but are slower to recognize the underlying data-integrity, third-party, and operational-continuity dimensions. Conversely, committees containing financial, technology, operational, legal, and international experience identify a broader set of signals before assessing their financial-reporting significance.

The strongest differences therefore occur not simply in whether a risk is noticed but in whether its interdependencies are understood.

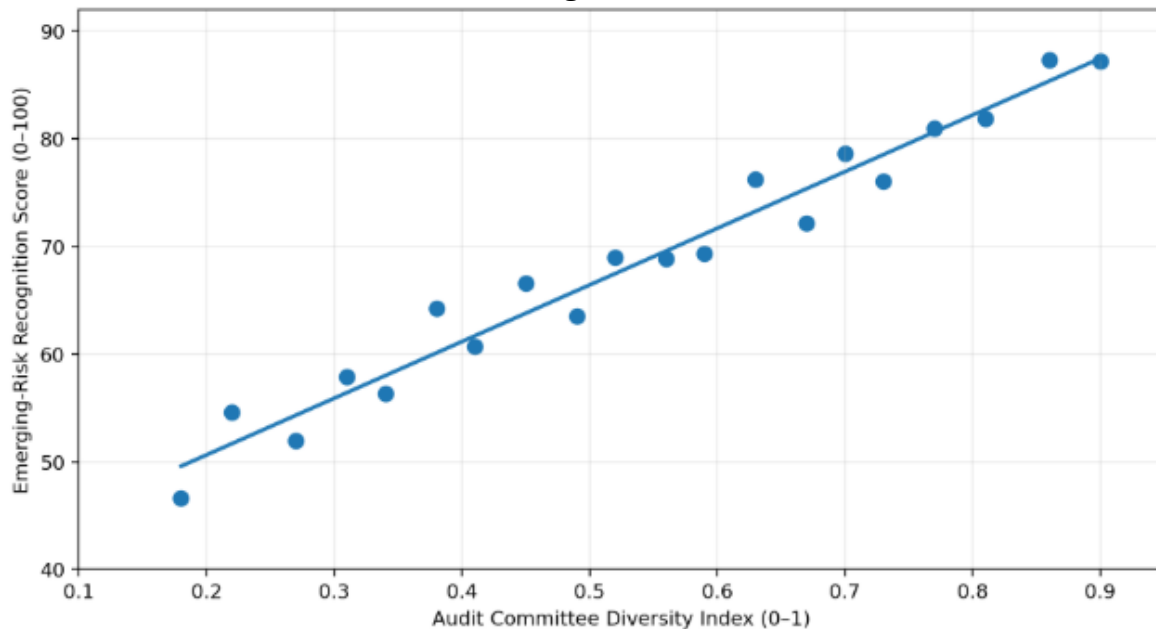
Table 2: Simulated Audit Committee Diversity and Emerging-Risk Recognition

Diversity Category	Mean ACDI	Initial Risk Detection	Cross-Functional Interpretation	Escalation Quality	Mean ERRS
Relatively low diversity	0.29	61.2	52.8	56.4	56.8
Moderate diversity	0.55	73.6	66.7	68.2	69.4
High diversity	0.79	86.1	81.9	83.5	82.7

Note: These values are simulated and do not represent observations from actual audit committees. The difference between the low- and high-diversity categories is especially pronounced for cross-functional interpretation. This result is consistent with the conceptual premise that the principal value of multidimensional diversity lies not merely in generating more risk labels but in connecting the consequences of a developing issue across organizational functions.

5.2 Diversity Breadth and Recognition Performance

Graph 1: Simulated Relationship Between Audit Committee Diversity and Emerging-Risk Recognition



The scatter plot presents a positive simulated association between the Audit Committee Diversity Index and the Emerging-Risk Recognition Score. The illustrative correlation within this synthetic subset is approximately $r = 0.98$. This value must not be interpreted as a real-world effect size because the observations were constructed specifically for methodological evaluation.

The analytical significance of the graph lies in the direction rather than the magnitude of the relationship. As committees incorporate broader functional, sectoral, international, demographic, and technological perspectives, the simulated capacity to recognize weak risk signals improves.

Key Finding: The model suggests that multidimensional diversity can strengthen risk recognition when diverse knowledge domains are actively integrated during committee deliberation.

5.3 Which Forms of Diversity Matter Most?

The simulation also indicates that different dimensions contribute differently depending on the type of risk. Digital competence produces the largest incremental benefit under the cybersecurity and automated-data-integrity scenarios. International experience becomes more influential under the regulatory-change scenario, while sector and operational experience contribute strongly to supply-chain and climate-related risks.

This pattern reinforces the importance of avoiding a narrow interpretation of audit committee diversity. No single demographic or professional attribute can provide complete coverage of an organization's emerging-risk environment.

Gender diversity remains an important component of a balanced governance structure, but the literature itself suggests that its governance effect may depend on independence, expertise, professional

experience, institutional context, and the extent to which members participate substantively in committee work. Evidence that female accounting experts can be associated with stronger audit outcomes supports this interaction-based interpretation.

The simulation therefore supports a portfolio view of committee capability. Effective composition should seek complementary knowledge rather than maximizing one diversity dimension in isolation.

6. Discussion

6.1 Diversity as an Early-Warning Governance Capability

The most important implication of the study is that audit committee diversity may create value before a risk becomes fully measurable. Traditional committee effectiveness research generally evaluates observable outcomes such as earnings management, restatements, audit effort, reporting timeliness, or financial risk. These remain essential measures, but they occur relatively late in the risk-development sequence.

Emerging-risk recognition moves the analytical focus earlier. A committee that identifies a developing data-security weakness before it creates financial-reporting consequences may contribute substantial governance value even though no misstatement or financial loss subsequently occurs. This creates a measurement challenge because successful preventive governance may eliminate the adverse outcome researchers would ordinarily observe.

A multidimensional committee may improve this early-warning function because its members interpret information through different professional frames. A technology-oriented member may notice vulnerability in a digital architecture; an operations specialist may identify business-continuity consequences; a financial expert may interpret impairment, disclosure, or control implications; and an internationally experienced member may recognize regulatory exposure. Diversity becomes valuable when these perspectives are integrated into a shared risk assessment.

6.2 Expertise Diversity Beyond Formal Financial Literacy

Audit committee regulation and governance practice have traditionally placed strong emphasis on financial literacy. The literature provides sound reasons for this emphasis. Financial expertise is associated with several dimensions of audit committee effectiveness, including reporting quality, audit effort, and reporting timeliness.

However, expanding risk responsibilities create a distinction between financial expertise and risk-recognition breadth. A highly experienced accountant may identify complex financial-reporting issues while possessing limited specialist knowledge concerning cloud computing, artificial intelligence, cybersecurity architecture, environmental risk, supply-network dependency, or geopolitical disruption.

This does not imply that every audit committee must contain a specialist in every emerging field. Such a requirement would be unrealistic. Instead, committees can combine appropriate member diversity with access to internal audit, chief risk officers, technology leaders, external specialists, and subject-matter advisers. The governance objective is to ensure that the committee possesses enough collective knowledge to recognize when additional expertise is required.

The findings of Harjoto, Laksmana, and Yang concerning task-oriented diversity are relevant here because expertise and tenure diversity were associated with stronger oversight of complex corporate investment decisions. Bernile, Bhagwat, and Yonker's multidimensional approach similarly demonstrates why governance research should move beyond single-attribute representations of diversity.

6.3 Diversity Without Inclusion Is Insufficient

The proposed framework also has an important limitation: composition does not guarantee deliberative quality. A committee can be statistically diverse yet behave as a cognitively homogeneous group if some members do not participate fully, if the chair discourages challenge, if information is filtered before reaching the committee, or if consensus pressure suppresses alternative interpretations.

This distinction helps explain why earlier empirical findings on demographic diversity are not uniformly positive. Sun, Liu, and Lan did not identify a significant association between female participation on independent audit committees and earnings-management constraints in their sample, whereas later studies identified more favorable relationships involving female directors, financial expertise, restatements, audit quality, or audit effort.

The governance mechanism therefore appears more complex than the proposition that “more diversity automatically produces better oversight.” Diversity creates access to alternative information and perspectives; inclusive committee processes determine whether those resources influence decisions.

An effective audit committee chair should consequently encourage constructive challenge, seek views from members whose expertise differs from the dominant interpretation, avoid prematurely closing discussion, and request information from outside the finance function when necessary. Committee evaluation should similarly examine whether diverse expertise is actually used rather than merely counting demographic or professional characteristics.

These considerations position emerging-risk recognition as an interaction between composition, information access, committee culture, and deliberative process. Diversity should therefore be viewed as one component of effective risk governance rather than a substitute for independence, competence, diligence, management transparency, or strong internal audit.

7. Conclusion

This study develops a simulation-based framework for examining the relationship between audit committee diversity and emerging-risk recognition. It responds to a governance environment in which audit committees increasingly encounter risks originating outside traditional financial reporting while still carrying potentially significant accounting, control, strategic, and reputational consequences. Cyber threats, automated information systems, changing regulations, supply-chain dependencies, and climate-related disruptions illustrate why effective oversight requires the capacity to recognize weak and interdisciplinary risk signals.

The proposed Audit Committee Diversity Index broadens diversity beyond a single demographic characteristic by combining gender representation, functional expertise, industry exposure, international experience, and digital competence. The Emerging-Risk Recognition Score evaluates whether committees can identify relevant signals, interpret their meaning, connect consequences across organizational functions, assess potential materiality, and determine appropriate governance escalation.

Within the synthetic environment, committees with greater multidimensional diversity achieve stronger recognition performance. These findings support the theoretical proposition that diverse knowledge resources can strengthen collective risk sensing, although the numerical outcomes cannot be treated as real organizational evidence.

The study also emphasizes that diversity should not be reduced to a compliance statistic. Effective risk oversight depends on whether different perspectives are substantively incorporated into committee deliberations. Demographic representation remains an important governance consideration, but emerging-risk recognition also requires task-related diversity and access to specialized knowledge. A committee composed entirely of conventional financial experts may be technically strong yet encounter limitations when evaluating threats rooted in technology, operations, international regulation, data governance, or rapidly changing business models. Conversely, broad expertise without financial-reporting competence would also be insufficient. The appropriate objective is complementary capability.

The principal limitation is the use of simulated committee profiles and scenarios. Future studies should validate the framework using authenticated director biographies, committee meeting records, enterprise-risk registers, internal-audit reports, board evaluations, incident databases, and longitudinal governance outcomes. Researchers could examine whether multidimensional audit committee diversity predicts earlier identification of cyber threats, control weaknesses, regulatory exposures, operational disruptions, or other novel risks. Future empirical models should also test whether the relationship is moderated by committee chair leadership, meeting frequency, information quality, management openness, internal-audit access, organizational complexity, and board culture. The present study therefore provides a methodological foundation for evaluating audit committee diversity not merely as a representation characteristic, but as a potential organizational risk-recognition capability.

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