Chapter 4

Decision-Making, Cybersecurity and Identification of Early Warning Signals

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4.1. Decision-Making, Cybersecurity and Identification of Early Warning Signal – Research Review

In a dynamic business environment, decision-making is becoming an increasingly complex process requiring the integration of modern technologies and tools to support the identification of Early Warning Signals (EWS). Today's organisations not only need to manage data effectively, but also use technologies such as predictive analytics, artificial intelligence and automation systems to increase decision relevance and minimise risk. A key aspect of this process is also to ensure an adequate level of cybersecurity, which plays a fundamental role in data protection and the stability of decision-making systems.

Table 4.1 presents an overview of the most important scientific publications on decision-making processes in the context of the use of EWS and modern technology. The compilation includes a variety of research approaches, such as empirical analyses,

experiments and case studies, which illustrate the practical applications of analytical tools and the challenges arising from their implementation. The research points to the key role of EWS in managing risk, identifying potential risks and supporting strategic and operational decision-making.

The publications presented in the table also consider the impact of technology on decision-making processes in the context of ethics and transparency. They point to the challenges of the dehumanisation of decision-making processes and the need to balance the autonomy of systems with human responsibility for decisions. The table also allows for the identification of key research trends, such as the use of artificial intelligence in identifying warning signals, the analysis of cybersecurity risks and the impact of automation on management processes in organisations.

The compilation of publications is a valuable resource for researchers and practitioners alike, providing a comprehensive view of issues related to decision-making and the identification of early warning signals in an era of digital transformation. Hence, the table not only summarises the current state of knowledge, but also inspires further research into the impact of modern technologies on risk management and decision-making processes.

Table 4.1. Summary of publications for the area "Decision-making/EWS"

Paper	Test sample	Methodology	Results	Citations by Scopus
Shahana et al., 2023	1749 articles	Systematic review of the literature	Key findings of the study include an analysis of publication trends in the detection of fraud in financial statements, identification of the most influential papers and authors in the field, and identification of limitations and directions for future research.	7
Mousavi et al., 2023	36,984 entities	Comparison of static and dynamic models for predicting financial distress	Dynamic models are more effective than static models. Using more information improves performance in predicting financial distress.	3
Janvrin & Wang, 2022	153 articles	Literature review	Setting research directions for cybersecurity and accounting.	7
Kipp et al., 2020	146 experienced managers	Experiment	The study's findings indicate that managers make less aggressive financial reporting decisions when supported by intelligent agents (IAs) than human agents, and when working with agents with less autonomy.	6
L. Gao et al., 2020	No data	Linguistic analysis	The paper's findings show an increase in the extent of cybersecurity risk disclosure by public companies between 2007 and 2018.	30
Roychowdhury et al., 2019	No data	Model analysis and experimental tests	A review of the literature on the impact of financial reporting and disclosure on corporate investment decisions indicates that there are different effects of these factors on investment performance.	236

Paper	Test sample	Methodology	Results	Citations by Scopus
Allee & Deangelis, 2015	Transcription of 73,201 conference speeches	Linguistic analysis	The study found that the structure of tone in voluntary information narratives plays an important role in the communication and shaping of information by managers and in user responses.	129
Y.-S. Choi & Young, 2015	Companies in the UK before the adoption of International Financial Reporting Standards (IFRS)	Statistical methods	Non-GAAP profit disclosures have a dual role in communicating company performance depending on managers' reporting incentives.	21
Mundy & Owen, 2013	10 managers	Semi-structured interviews, snowball sampling	The results of the study include the identification of areas of potential weakness in internal control over financial reporting.	11
S. Huang et al., 2012	2407 companies	Use of an unsupervised neural network tool called a growing hierarchical self-organising map (GHSOM)	The results of the analysis indicate that the GHSOM classification approach can help capital providers assess the reliability of financial statements and make decisions based on accounting data.	28
Liou, 2008	52 financial variables of Taiwanese companies	Logistic regression, neural networks and decision trees	The results show that many financial variables are effective in detecting fraud and predicting the failure of companies.	51
J. W. Lin et al., 2003	40 companies accused of falsifying financial statements	Fuzzy neural networks (FNN)	Modern technologies, such as a hybrid system integrating fuzzy logic with neural networks, can significantly improve the detection of fraud in financial statements. This approach gives better results compared to traditional statistical models.	130
Osei-Assibey Bonsu et al., 2023	220 accountants surveyed	Statistical analysis from survey data	Research indicates that the adoption of fintech tools such as artificial intelligence (AI) and big data analytics (BDA) positively impacts financial reporting, performance management, budgeting, auditing, risk management and fraud prevention.	6
C. Zhang et al.2023	41 interviews	Interviews	Artificial intelligence brings numerous benefits, but at the same time carries numerous ethical risks, such as data security, accountability, accessibility, transparency and trust.	11

Source: own elaboration on the basis of a review using the VOSviewer tool.

The very rapid development of information technology poses an unprecedented challenge to managers, including those in charge of corporate finance divisions (hereafter CFOs). The ability and propensity to adapt to the changing information technology environment is a differentiating factor between managers who are less inclined

to use new technologies and those who are constantly making efforts to implement new ways of solving old problems.

Modern CFOs are proactively using the latest technological solutions to increase the efficiency of their work, as well as to make greater use of available internal and external information, which ultimately supports the value creation of the managed organisation. The use of a variety of tools related to artificial intelligence in the broadest sense can be used to (i) support decision-making, (ii) manage cybersecurity and (iii) create internal early warning systems. This was a key finding of the literature review.

Cybersecurity is one of the three issues described in this section that is the least examined in the specialist literature Due to high-profile cybersecurity breaches resulting in increased attention from professionals and regulators, organisations are under increased pressure to conduct extended analyses of the potential consequences of security breaches also in the accounting area and, as a result of these analyses, to develop and implement adequate safeguards. Recent research identified increased stakeholder communication of the need to protect business entities from network threats. Janvrin and Wang (2022) highlighted the impact of cybersecurity on an organisation's core operations, financial and non-financial performance, and stakeholders, offering a structured approach to identifying threats, assessing impact and developing response strategies. The authors emphasised the need for interdisciplinary collaboration in addressing cybersecurity by considering financial accounting, management and auditing information systems together, and categorised cybersecurity incidents and breaches according to whether the incident falls within the scope of dedicated laws and regulations. This distinction is key to understanding reputation and compliance (compliance) and litigation issues related to cybersecurity incidents. Given the implications for stakeholders, regulators and investors alike, the distinction identified proves important for understanding, monitoring and responding to cybersecurity risks.

Gao, Calderon and Tang (2020) examined the disclosure of information related to cyber risk in reports of listed companies. They studied reports covering over a decade (from 2007 to 2018), focusing on their content, manner (location in the report) and language characteristics of the disclosures, and identified the trend of increasing disclosure of cyber risks, especially those related to operational disruptions and data breaches. While the findings indicated that cyber risks are significant and can materially affect operations and the integrity of financial reporting, yet empirical research on cyber risk disclosure is limited. The results of observing financial statements dating over a decade led the authors to some interesting conclusions, namely that the corporate environment has become much more complex, prompting companies to disclose more information with higher levels of complexity. They observed that over time, cybersecurity disclosures become more difficult to read. Using multiple regression methods, it was found that disclosures become harder to read as company size increases. The conclusion was to stress the importance of effective and clear cyber risk disclosures to stakeholders, which should enable them to adequately assess the scale of the risks generated for companies by cyberattacks and their subsequent impact.

The most widely presented topic in the literature is decision support using new technologies. Despite indicating the high usefulness of tools for these purposes, financial managers feel threatened by artificial intelligence. Kipp et al. (2020) suggested that despite having an agent that can delegate actions to support their financial reporting decision, managers are morally unable to disengage from selfish behaviour due to increased perceptions of AI control, less autonomous accounting robots, and the certainty of these robots' actions in generating results. Concerns about the use of AI are often expressed in the media and beyond. They concluded that the results of their study cannot allay fears of job loss, suggesting that AI must not push us into a world completely devoid of human control and responsibility.

A separate issue of the use of AI in decision support is the ethical dilemmas surrounding its use. C. Zhang et al. (2023) suggested that along with the benefits, there are also ethical concerns associated with the use of AI, such as deprofessionalisation, data breaches and isolation among accountants. The use of AI-based management accounting systems is a largely personalised process, i.e. based on the individual decisions of the accountant, not constrained by any accounting standard but should follow the specific decision-making behaviour of each organisation. Therefore, the behaviour of management accountants can significantly increase ethical risks when using AI and should be properly controlled to reduce bias, unfairness, the risk of harm to user autonomy and independence and poor decision-making. To achieve this, the authors argued for commencing collaboration between regulators and AI solution developers for the rapid collection of key indicators from companies and the notification of anomalies detected to regulators.

In the stream of research on the risks associated with the impact of AI on decision support is the study by Mundy (2013), showing how the use of AI for regulatory compliance can impact organisational roles. In particular, AI managers need to ensure that internal systems using AI take into account regulatory requirements for internal control over financial reporting. The findings allow for a better understanding of IT's role in managing compliance issues and provide insights into the role of AI-enabled ERP systems in addressing legislative requirements. Additionally, Mundy described how managers can use AI to develop effective internal controls.

Roychowdhury et al. (2019) conducted a literature review regarding the trend of using AI to support investment decisions made in stock markets by external stakeholders, and focused on information asymmetry as a fundamental obstacle to sound investment decisions. The authors identified methods of machine learning in a broad sense as a helpful tool in bridging this asymmetry, and also found research gaps that can be a signpost for future research. Moreover, the authors stressed the importance of understanding the sources of variation in the quality of financial reporting and the mechanisms through which reporting information influences stock investors' decisions.

Osei-Assibey Bonsu et al. (2023) chose a very optimistic approach to the use of new technologies in company operations. The authors conducted a study on the use of modern AI tools in optimising a company's internal decisions, particularly to improve

efficiency, and demonstrated that accountants using AI help companies obtain more detailed information, predict more reliable results and streamline non-standard processes. They showed that AI is an opportunity for the accounting profession to create entirely new value for businesses and help them transform their decision-making process in many ways.

Huang et al. (2012) pointed to the use of advanced tools in minimising the credit risk of trading partners, in particular by examining the quality of the reporting information they provide. The results showed that this approach can help a variety of stakeholders when assessing the reliability of reports. Appropriately selected indicators to identify risks in this area, extracted through the use of advanced tools, can be used to assess the reliability of financial reports that form the basis for analyses to assess the reliability of counterparties.

The analysis of the use in decision support of tools for automated analysis of presented reports by counterparties and other external stakeholders is also an important research strand in this field. Allee and Deangelis (2015) examined the narrative structures of voluntary information presented by managers and the role of tone dispersion in the communication and shaping of this information and in the responses of report users to this information. Tone dispersion, or the even distribution of tone words in a narrative, is associated with current and future performance, manager reporting decisions, incentives and actions, and analyst and investor responses to conference narratives. The authors demonstrated that analysts and investors react more adversely to negative news when the tone is less diffuse, and more positively when the positive tone prevails.

The issue of the use of external party reports for internal decision support is found in the study by Y.-S. Choi and Young (2015). The authors presented statistical and economic evidence of a significant asymmetry between the propensity to disclose information and the occurrence of transitional items in the performance reports of these companies. The external regulations under which these reports were prepared are also important. The authors also pointed out tools to help find manipulation in the profit and loss accounts of counterparties or other stakeholders.

The primary task facing financial reporting is to provide external stakeholders with information useful for making economic decisions. An important element of economic decisions is the identification of risk factors, including the risk of significant financial distress and, ultimately, bankruptcy. Research on models to assist in the identification of bankruptcy risk has been ongoing for almost six decades, starting with the pioneering work of Altman (1968) and Beaver (1966; 1968). Over that time, researchers have developed dozens of competing financial distress prediction models (hereafter MPTF), less commonly referred to as bankruptcy (insolvency) prediction models. These models were classified according to a variety of criteria: the time range of the data, the type of data considered, the way the data were processed. Over time, we have witnessed the use of increasingly sophisticated methods which evolved from those purely statistical, then probabilistic, to those based on neural networks, fuzzy logic and using machine learning and AI.

The emergence of so many different MPTF models has laid the groundwork for a research trend of testing their predictive performance and, subsequently, attempting to rank models. Mousavi et al. (2023) pointed out that model comparisons using single-criteria evaluations and with a static approach do not yield good results, preventing reliable model comparisons. Based on this, they proposed a dynamic, multi-criteria MPTF comparison approach, arguing that the dynamic element enables a more accurate assessment of MPTF performance at different points in business and macroeconomic cycles. Their research brings evidence of the following regularities:

- dynamic models have greater predictive power than static models,
- within the group of dynamic models, duration-dependent models have better predictive power than time-independent models,
- in each class of models and configurations, models fed with market data and macroeconomic data in addition to reporting data prove superior,
- models fed only with reporting data had less predictive power than models fed only with market and macroeconomic data (combined),
- in each class of models and configurations, too long a time series of data reduces the predictive efficiency of the model (models fed (learned) with three periods of data perform better than models fed with five periods of data).

Starting from the 1990s, research on the identification of warning signals has also directed the attention of researchers to the problem of constructing accounting fraud risk identification models (Fraudulent Reporting Detection Models – hereafter FRDM). Shahana et al. (2023) conducted a systematic survey of the literature describing approaches to the identification of accounting fraud, indicating that in recent years the identified irregularities have been further divided into:

- intentional, resulting from the misappropriation of the entity's assets by staff,
- unintentional, resulting from errors.

They cited research findings that, in a typical case, irregularities generate a cost to the affected entity of around 5% of annual revenue (ACFE, 2020). They pointed out that the development of effective FRDMs is hampered by the small number of fraud cases identified, yet the potential cost of not detecting fraud is many times higher than the cost of misidentifying fraud (unfounded accusations). An additional difficulty is that often the factors treated as fraud risks are relatively ambiguous.

Shahana et al. (2023) listed the most common methods used in FRDM:

- statistical methods, including frequent use of logistic regression and analysis using Benford's law,
- methods based on data mining and machine learning, especially in developed economies, where the trend towards *ensemble algorithms* and lesser research using deep learning methods is evident.

They noted that these studies often omit textual analysis, and that research based on textual information mostly originates from the US.

In this context, the study by J. W. Lin et al. (2003) focused on the problem of FRDMs assisting auditors is interesting. Estimating the probability of misstatement is the

starting point for the auditor to properly plan the audit of the financial statements and, as the authors demonstrated, determines the effectiveness of the audit work. The most important thing for the auditor is to avoid the risk of undetected fraud, which entails legal and reputational consequences for him/her. The authors confirmed that the most common fraud risk assessment methods used by auditors (interviews, checklists, statistical models) are not effective in detecting fraud. Logit models yield slightly better accuracy than these traditionally used methods in this field, whereas significantly higher predictive accuracy is provided by models based on fuzzy neural networks, yielding seven times higher fraud identification efficiency than logit models.

Another stream of research is directed towards the analysis of models linking MPTF and FRDM. Liou (2008) listed arguments supporting the intuitively perceptible regularity that accounting fraud is more likely to occur in entities experiencing significant financial difficulties. The author conducted a similarity analysis of the MPTF and FRDM models, and concluded that many of the variables used in both types of models are statistically significant for predicting the occurrence of both phenomena (financial difficulties and fraud). These results attribute a high predictive value to those models serving both purposes combined, which are based on logistic regression. In common with other researchers, he suggested that the main limitation to the effectiveness of model calibration is the small sample size of entities identified as having financial difficulties and those where fraud has occurred.

The literature analysis provides a starting point for considering the use of modern technology in decision-making, cybersecurity and early warning models, as well as for setting future research directions in this area.

4.2. Decision-Making, Cybersecurity and EWS Identification in the Context of the Application of Modern Technologies

The literature research points to an important link between modern intelligent IT tools and the development of the accounting/finance profession. The research conducted in section 4.1 indicated three key points of interface between artificial intelligence and accounting, namely cybersecurity, decision support and early warning systems. The following areas in the use of modern technology were identified:
- the role of the accountant and auditor in ensuring cybersecurity,
- cybersecurity risk assessment models,
- modern information technology in the service of economic decision-making,
- methods for predicting financial distress and bankruptcy based on non-financial data.

The Role of the Accountant and Auditor in Ensuring Cybersecurity

Recent research on the issue of cybersecurity stresses the undeniably important role of accounting as a key security link. Janvrin and Wang (2022) described the most glaring cybersecurity breaches, pointing to the need for increased attention to this

issue by professionals, threat-pressured entities and regulators alike to consider the accounting implications of threats and develop appropriate responses. They suggested that cybersecurity incidents can impact an organisation's operations, financial and non-financial performance and, consequently, its stakeholders. To discuss the impact of cybersecurity issues on accounting, the study presented a framework of events, impacts and responses to discuss current research and consider the implications for both practitioners and researchers. The authors indicated how practitioners can rely on the research findings to better assess cybersecurity threats, understand their impact and develop response strategies. The results encourage additional research to examine how organisations identify cybersecurity threats, incidents and breaches, moreover suggesting the need to expand cybersecurity research into the areas of financial accounting, management accounting and auditing.

A link between audit issues and cybersecurity can be found in the research of Kurniawan and Mulyawan (2023). Cybersecurity is seen as highly relevant to protecting and improving the security of corporate information, where auditors play an important role in developing internal controls in technology-based operations by analysing audit findings. However, research models integrating cybersecurity with auditing have not yet been widely developed. Their research results indicate that the development of innovative technologies affects the auditor's ability to support the review of audit findings and risk measurements, yet the auditor's ability to apply technology to review audit findings has little impact. This research contributes to the development of a model for understanding cybersecurity audit processes in industry and academia based on professional standards to improve audit performance through advanced technology.

Cybersecurity risk assessment models. An interesting study on the payment system in the aviation industry was conducted by Alghamdi et al. (2024). Due to its ubiquity, e-payments have caught the attention of many companies in the aviation industry and are fast becoming the dominant means of payment, however, as technology advances, the number of the associated fraud cases has been increasing at a comparative rate. Over the years the airline industry has seen a sharp increase in payment fraud, reducing the credibility of payment systems and confidence in the industry as a whole. Despite attempts to eradicate e-payment fraud, decision-makers lack the technical expertise required to apply best judgement in detecting and preventing fraud. The authors identified the lack of an established decision-making model for the detection and prevention of e-payment fraud as an obstacle to the successful elimination of fraud, therefore setting as their goal the development of such a model, and developed a hierarchical decision-making model based on expert input regarding validation, quantification and attractiveness. The results of the validation and quantification factors show that decision-making is mainly influenced by economic, financial, and safety perspectives. Airline companies can use the developed framework to test whether they are ready to adopt online fraud prevention technology to increase their success rate. To measure the readiness of payment organisations to adopt digital payment fraud protection technology, this study developed a scoring methodology.

Lattanzio and Ma (2023) went even further, proposing a textual ex-ante measure of company exposure to cybersecurity risk, and documented how the digitalisation of the US economy is changing innovation policies of companies. As cybersecurity risk increases, businesses are hedging against the risk of data breaches by protecting their intangible capital under national patent and intellectual property laws, yet this strategic response is not without its price as it reduces the cost of implementing the growth strategies adopted by industry for firms with low innovation leaders, resulting in a reduced return on R&D investment. Another conclusion was to highlight the crucial role of trade secrets, intellectual property and patent law in today's cyber age. The negative impact of cybersecurity risk on innovation has resulted in diminishing returns on R&D investment, not in a reduced R&D investment.

A different solution was proposed by Al-Hawamleh (2024) exploring a comprehensive cyber-resilience framework designed to strengthen the defence mechanisms of organisations of the changing cyber-threat landscape, while enhancing business continuity capabilities. The aim was to provide businesses with a robust system that transcends traditional cybersecurity paradigms. The author applied a methodology based on extensive research of the cybersecurity literature to develop a conceptual and iterative model of cyber resilience. From a behavioural perspective the research covered human factors, user awareness and decision-making processes. This resulted in an action plan including technological resilience, regular audits and assessments, emphasising evidence-based improvements. As businesses increasingly rely on interconnected technologies, this framework remains relevant as an essential tool for enhancing security, protecting critical assets and ensuring continuity in the face of an ever-changing cyber-threat.

A similar study was conducted by Alhanatleh et al. (2024), taking as its objective the diagnosis of the link between cybersecurity awareness and the public value theory of mobile financial services (fintech), and the results can be applied to the development of financial services. Moreover, the findings showed that the cybersecurity of fintech services and its predictors positively and significantly influence the use of fintech services among an increasing proportion of the population; the findings can also be used in work relating to the development of mobile devices.

The link between security issues and the public sector is emphasised by Hilario et al. (2023). The aim of the researchers was to assess the phenomenon of cyber sabotage in public entities based on the state policies in place in the cybersecurity infrastructure, through reviews of research and academic articles. The research was conducted to help technologists improve their knowledge of the tools, methods and effectiveness of using metrics to mitigate multiple anomalies in entities. A research method with a qualitative approach, based on scientific research methodology with case study methods, was used to achieve the objective of analysing the strategic situation, outlining the policies of public entities. The results highlighted the basic structure of these strategies, including the priorities and main problems identified for the countries studied, to establish an overall model of the strategy, taking into account the political

background of the countries. The authors concluded that if a cyberattack is successful, then security recommendations will be provided, thus laying the groundwork for protecting networks and telecommunications systems for the future, in order that more people become aware of lesser-known vulnerabilities and gaps in such systems.

Modern information technology in the service of economic decision-making. Just as important as ensuring cybersecurity is providing a high level of efficiency in the business conducted, which is not possible without the development of new decision support tools based on artificial intelligence. In this vein, an interesting analysis of the good practices of major Western European companies in automated decision-making was conducted by Bonsón et al. (2023), who pointed out that the automation of decision-making is still at an early stage and that the first beneficiaries are mainly companies operating in the financial sector. Only 22 Western European companies disclosed the use of such practices in their annual reports (or sustainability reports), and a total of 33 mentions were recorded. The main categories of decision automation disclosures identified in this study were automations in credit risk assessment, algorithms and medical diagnostics, and others. The latter was related to the electronics sector disclosing AI technology used in devices such as smartphones, smartwatches, and home robots. The most common company disclosures regarded to CRAs operating in the banking and financial services sector, which can be explained by both the signalling theory and the voluntary disclosure theory. According to the signalling theory, by being transparent about their use of AI technologies, companies try to reduce information asymmetry and attract the attention of their stakeholders. Nevertheless, they only disclose favourable or very general information. Different approaches to this type of disclosure have been observed as some companies simply expressed their general concerns about the unacceptable consequences of AI decisions or future scenarios in which decisions will be made solely on the basis of an algorithm.

Artificial intelligence algorithms can be used to assess aggressive investor behaviour, as presented in a study by Rizal et al. (2024), aimed to develop and validate a questionnaire to measure aggressive investor behaviour. The questionnaire design is important given the lack of validated questionnaires in the current literature since only limited research is currently available on aggressive investor behaviour. This survey involved three stages: first, the development of the questionnaire; second, checking its validity and reliability; third, conducting a statistical analysis. The results provide valuable information for researchers and financial institutions with a keen interest in financial decisions.

A continuation of research linking investor behaviour to accounting using artificial intelligence algorithms was presented by Hussain and Alaya (2024). Their aim was to examine investor reactions to bad financial news based on financial statement disclosures, as well as the impact of investor herd behaviour and the reactions of individual investors. This study identified key elements of investor behaviour that are reactions to adverse financial news, which can be effectively managed using algorithms.

The developed algorithms can also be used to study the propensity of managers to dispose of shares in the companies they manage, as was demonstrated by Firk et al. (2021a). The main focus of their research was to use management accounting in the broadest sense as a basis for building algorithms to support investor decision-making. This study examined under what circumstances an algorithm can play a facilitating role in divestment decisions. The significant information advantage of advanced algorithms over, for example, profitability measures such as ROI was demonstrated.

Methods for predicting financial distress and bankruptcy based on data. Researchers are following new paths in the area of corporate insolvency risk diagnosis, going beyond the well-established standard models based on financial reporting data. Costa et al. (2022) attempted to link bankruptcy risk to the quality of published reports. They studied companies in the SME segment, highlighting that the quality of reports influences decision-making due to the impact on the information content of financial ratios based on reporting data. The authors analysed the data of 1560 Portuguese companies in the SME segment from the construction sector. Reports from the years from 2012 to 2018 were included in the analysis. The researchers adopted the following approach: first, they assessed the ex-ante bankruptcy risk based on simple quantitative criteria proposed in the literature for SME entities (Lisboa et al., 2021), dividing the research sample into groups bankrupt, and non-bankrupt. Then, using an iterative approach, they made a selection of other variables that improved the predictive accuracy of the model. The results obtained show that measures of the quality of financial statements, i.e. the quality of accruals and settlements and revenue recognition, significantly affect the insolvency of companies, confirming their importance in predicting financial distress. Hence, using logit methods for bankruptcy prediction, the accuracy of the model increased when quality variables were included. The results obtained were validated with 'new age' qualifiers, specifically the random forest methodology.

Blanco-Oliver et al. (2016) conducted a similar study focusing, however, on micro-segment firms, resulting in the development of a hybrid bankruptcy screening model through a combination of parametric and non-parametric approaches. As in previous research, variables with the highest predictive power for bankruptcy detection were first selected using logistic regression. Then, alternative non-parametric methods (Multilayer Perceptron, Approximation Sets and Classification-Regression Trees) were applied to the discrimination of firms obtained in the first step in order to improve the classification accuracy. The authors showed that hybrid models, especially those combining logit Perceptron multi-layer regression, provide better predictive accuracy, interpretability and are faster than each method applied separately. Furthermore, the authors showed that the introduction of non-financial and macroeconomic variables enhances the predictive value of the bankruptcy of pure financial indicators.

A similar study was conducted by Fathi et al. (2023), who attempted to develop a bankruptcy prediction model based on combining the worst-practice-frontier method with the data envelopment analysis method (WPF-DEA) and using an artificial

neural network. Using the prepared model from a sample of 106 companies listed on the Tehran Stock Exchange, for data from 2017-2019, 103 cases were accurately predicted, indicating that the obtained neural network had a 97% probability of accurately qualifying a company.

The rapid development of advanced cyber technologies increases both risks and opportunities in the accounting area related to decision-making, cybersecurity and the identification of early warning signals. The research stream in this area is evolving with changing technology, pointing to undoubted challenges for practitioners and academics alike, the most important of which is keeping pace with the changing reality.

4.3. Decision-Making, Cybersecurity and EWS Identification – Diagnosis and Directions for Further Research

To summarise the research carried out so far, it is necessary to highlight the key issues concerning the impact of robotic tools, in the broadest sense, on the processes of cybersecurity assurance, EWS support, characterised in Table 4.2.

Table 4.2. Areas of impact of modern technology on cybersecurity, decision support and bankruptcy prediction

Key research areas	Description	Exemplary publications
Role of the accountant and auditor in ensuring cybersecurity		
Compliance	The significant impact of cybersecurity on an organisation's core operations, financial and non-financial performance, and stakeholders. The need for interdisciplinary collaboration in addressing cybersecurity issues by considering the combined information systems for financial accounting, management accounting and auditing is highlighted.	Janvrin & Wang, 2022
Challenges for the auditor	Cybersecurity is seen as highly relevant to protecting and improving the security of corporate information, where auditors play an important role in developing internal controls in technology-based operations by analysing audit findings. However, research models that integrate cybersecurity with auditing have not yet been widely developed.	Kurniawan & Mulyawan, 2023
Cybersecurity risk assessment models		
Risk disclosure	The corporate environment has become much more complex, prompting companies to disclose more information with higher levels of complexity. Rapid diffusion of threat intelligence is necessary, as cybersecurity disclosures become increasingly difficult to read over time.	L. Gao et al., 2020
Security e-payments	A scoring methodology has been developed for selecting online fraud prevention technologies to protect against digital payment fraud, The need to provide businesses with a robust system that goes beyond traditional cybersecurity paradigms is emphasised.	Alghamdi et al., 2024; Al-Hawamleh, 2024; Lattanzio & Ma, 2023
Modern information technology in the service of economic decision-making		
Ethical risks of robotic decision support	Along with the benefits come ethical concerns related to the use of AI, such as deprofessionalisation, data breaches and isolation among accountants. The use of AI-based management accounting systems is a largely personalised process, i.e. based on the individual decisions of the accountant, which is not constrained by any accounting standard, but should follow the specific decision-making behaviour of each organisation.	C. Zhang et al., 2023

Key research areas	Description	Exemplary publications
New role for the accountant and controller	Accountants and controllers using AI help companies get more detailed information, predict more reliable results and streamline non-standard processes.	Firk et al., 2021b; Osei-Assibey Bonsu et al., 2023a
Methods for predicting financial distress and bankruptcy based on non-financial data		
Predictive models	Measures of the quality of financial statements significantly affect the insolvency of companies, confirming their importance in predicting financial distress. Hybrid models provide better predictive accuracy, interpretability and are faster than each method used separately. In addition, the introduction of non-financial and macroeconomic variables enhance the predictive value of a hybrid model.	Fathi et al., 2023; Lisboa et al., 2021
Identification of warning signals	Research on identifying warning signals has directed the attention of researchers to the problem of building models for identifying accounting fraud risk. Analysis using Benford's law and methods based on data mining and machine learning are often used.	Shahana et al., 2023

Source: own elaboration.

Table 4.2 presents the most important research areas linking new technologies to the daily work of financial and accounting services, in particular accounting controllers and internal risk analysts. The dynamic development of robotisation requires a new definition of these roles in developed companies and institutions. Each of the highlighted areas also demands the setting of an impassable limit to dehumanisation in the form of the revision of codes of ethics.

The role of the accountant and auditor in ensuring cybersecurity – threats to e-payments and data confidentiality are now the responsibility of everyone in the entity. However, accountants and auditors are a key element of internal control in the broadest sense, which often manifests itself in the form of active participation in the development of internal compliance policies. These risks are also becoming a new challenge for national regulators in defining a new role for the auditor as a link in mitigating such risks.

Cybersecurity risk assessment models are difficult to develop in individual institutions. Literature research points to the need for knowledge diffusion in the preparation of tools to protect against digital threats. Detailed information about new forms of attacks by criminals allows for the protection of other market participants, as well as the collective creation of new tools to counter threats also through new robotic tools.

Modern information technology in the service of economic decision-making is becoming an integral part of the work of the financial and accounting services of modern business. Accountants and controllers using artificial intelligence algorithms are more useful for effective management. However, there are new ethical risks associated with the loss of livelihood due to staff reductions resulting from the implementation of solutions that allow humans to be replaced by robots.

Methods of predicting financial distress and bankruptcy based on non-financial data will allow better identification of ongoing concern risks. The classic approach is based mainly on ratio analysis of presented financial statements supplemented by counterparty information. The use of effective analytical tools based on extensive and

publicly available non-financial information significantly enriches the process of estimating risks. Again, however, the risk of dehumanisation may prove to be more of a threat than a benefit.

On the basis of the conclusions drawn from the research to date and the areas characterised in Table 4.1 concerning the impact of modern technologies on selected aspects of the functioning of finance and accounting departments, the planned research directions in this area were determined. Table 4.3 presents three strategic directions for future research on the evolution of cyber-security management processes, business decision support and the prediction of financial distress and insolvency in the face of increasing digitalisation and the development of modern technologies. Each of the designated research directions was extended to include future research methods, geared towards identifying the new competencies needed to understand the impact of new technologies on the implementation of the designated roles of the cadres dealing with the aforementioned problems of the broader accounting.

Table 4.3. Planned research directions for cybersecurity, decision support and bankruptcy prediction

Direction of research	Research questions	Suggested testing methodology
The impact of automation in ensuring cyber security	How does the automation of financial processes support increased cybersecurity?	Survey of finance and accounting staff
	Doesn't the automation of security processes reduce staff vigilance levels?	In-depth interviews with managers of the finance and accounting divisions
Responsibilities associated with decision support automation	Will the analytical decision-making process require a human presence?	In-depth interviews with managers of the finance and accounting divisions
	How to design an automated decision support process so that it is free from external interference (e.g. cybersecurity aspects)?	In-depth interviews with IT managers
	How should the problem of liability for erroneous recommendations made by artificial algorithms be resolved?	In-depth interviews with managers of finance and accounting, risk divisions and auditors
Evaluation of new technologies in anticipation of financial distress and bankruptcy	What challenges do financial managers face in adapting procedures to anticipate financial difficulties?	In-depth interviews with managers of the finance and accounting divisions
	Are the algorithms created by new technologies able to identify new threats to business continuity?	In-depth interviews with risk managers and auditors
	What mandatory controls should be implemented in the regulations to mitigate the risk of a flawed ongoing concern analysis?	In-depth interviews with auditors

Source: own elaboration.

The first line of research, on the impact of automation on the provision of cyber-security, highlights the increasing reliance on technologies such as Robotic Process Automation (RPA) and Artificial Intelligence (AI) to accompany finance professionals in their day-to-day business processes. The research questions are directed towards the

possibility of reducing cybersecurity risks. It is also necessary to recognise whether such algorithms will not become the cause of the development of new threats which may be based on the dormant level of vigilance of employees.

The second line of research involves liability for the inadequate preparation of recommendations before business decisions are made. Risks to accountants and controllers due to the possibility of losing their livelihood are also an important issue that requires in-depth investigation. Moreover, the full transfer of decision support to virtual reality generates a new problem, i.e. liability for wrong decisions, hence it is necessary to direct future research towards the establishment of impassable regulatory boundaries for decision liability.

The third line of research recognises the role of the risks associated with the de-humanisation of the process of identifying business continuity risks and the over-reliance on algorithms. This section emphasises the responsible preparation of new legal regulations limiting the elimination of the human factor from this type of analysis. The proposed methodology is oriented towards in-depth interviews with an interdisciplinary panel of specialists in finance, risk and information technology in order to reduce the impact of undesirable factors on the proper identification of new types of risks and financial difficulties.

Concluding, Table 4.3 provides a basis for future research work that not only highlights new challenges for accounting controllers and financiers, but also points to the need to adapt research to the rapid development of artificial intelligence, the development of new legal regulations and new rules for adhering to ethical standards in accounting and finance for companies and institutions.

4.4. Ethical Dilemmas in Decision-Making, Cybersecurity and EWS Identification in the Context of the Use of Modern Technology

Technological advances, particularly in the field of artificial intelligence (AI), are opening up new opportunities in accounting, but at the same time pose a number of ethical challenges for professionals. Automated systems, decision-making algorithms and advanced analytical technologies are changing the way accountants, financial managers and auditors work. This chapter discusses the ethical dilemmas associated with the use of technology in accounting, focusing on three key sub-areas: information user decision-making, cybersecurity and identifying early warning signals (EWS). The literature review provides a better understanding of the challenges and identifies possible solutions to maintain ethical standards.

Technological advances, particularly in artificial intelligence (AI), are changing the way accounting works, opening up new opportunities but also posing a number of ethical challenges for professionals. Process automation, advanced decision-making algorithms and systems that support the analysis of financial data are bringing significant innovations to the work of accountants, financial managers and auditors. However, the rapid pace of implementation of new technologies raises significant

issues such as accountability for AI decisions, transparency of algorithm performance and data protection.

Table 4.4 presents key ethical dilemmas in three relevant areas: decision-making, early warning signal (EWS) identification and cybersecurity. The summary considers distinctive challenges, ethical questions and proposed solutions that can help maintain high ethical standards in AI applications in accounting. Problems such as the lack of transparency of data, the risk of algorithmic biases and the difficulty of assigning responsibility for errors of autonomous systems, are increasingly evident in financial management practice.

The literature analysis points to the need to implement explainable AI systems, regulatory frameworks and data protection procedures such as anonymisation and advanced machine learning methods (e.g. Federated Learning). In addition, special attention should be paid to eliminating algorithmic biases through simulation testing and optimisation of results. The table below provides a valuable tool for understanding the main issues and developments in the ethical framework for the application of modern technologies in accounting and finance.

Table 4.4. Key ethical dilemmas in the areas of decision-making, EWS and cybersecurity

The ethical dilemma	Description	Ethical question	Proposed solutions
Transparency data	Risk of manipulation of results and ambiguities in decision-making algorithms	How to ensure transparency in AI decisions?	Ethical guidelines, explainable AI, algorithm audits
Accountability for AI decisions	Lack of clarity on who is responsible for errors generated by autonomous systems	Who is responsible for the decisions made by AI?	Regulatory framework, training, 'human-in-the-loop'
Data privacy and security	Risk of financial data leakage and unauthorised use	How to protect customer and organisational data?	Data anonymisation, Federated Learning
Algorithmic bias	AI systems can perpetuate discrimination and injustice	How to eliminate bias in AI algorithms?	Simulation tests, optimisation of results

Source: own elaboration based on the literature.

Decision-Making by Information Users

Automation in accounting is changing the decision-making process, which raises challenges of accountability and transparency. Wang et al. (2024) analysed the performance of decision-making algorithms in the context of historical data, using predictive modelling methods on a sample of 150 companies. They identified the problem of unrepresentative data, which is that historical data used to train algorithms often reflect past errors, biases or limitations. Such data can lead to distorted analysis results and inappropriate decisions, especially in a changing business environment. The authors recommend creating more balanced and representative data sets that better reflect current and future market conditions.

Identified ethical issues include questions of responsibility (difficulty in clearly assigning accountability), bias (partiality and reinforcement of prejudices), lack of transparency (black box effect), and potential violations of privacy and individual autonomy. The authors concluded that EBA can enhance procedural transparency and stakeholder trust while acknowledging limitations such as conceptual and technical barriers. They recommended integrating EBA with organisational governance mechanisms, promoting interdisciplinary collaboration, ensuring system transparency, clearly assigning roles and responsibilities, and establishing independent oversight mechanisms for systems.

Lehner et al. (2022) addressed the ethical challenges associated with the use of artificial intelligence (AI) in decision-making processes in accounting and auditing. Their analysis was based on Rest's four-component model of ethical decision-making, aimed to understand how AI affects ethical processes and to identify implications for practitioners and researchers.

The study relied on a hermeneutic analysis of literature from 2015-2020, focusing on the identification of five main ethical challenges: objectivity, privacy (lack of control over how AI processes sensitive information), transparency, responsibility, and trust. The methodology involved a semi-systematic literature review and narrative analysis.

The authors noted that, despite AI's ability to process data and make decisions, it cannot independently meet ethical requirements due to its lack of autonomous morality. They suggested the need for shared responsibility between humans and AI, with adaptations in governance and audit processes to ensure ethical compliance, and recommended establishing AI governance committees within organizations, promoting algorithmic transparency, and enhancing users' knowledge and skills regarding AI applications in accounting.

C. Zhang et al. (2023) analysed the risks of introducing AI into management accounting. The study included an analysis of surveys of 500 accounting managers and simulations in AI systems, which showed the risks of dehumanising decision-making processes and technological misuse. The authors stressed that educating accountants on the ethical applications of AI and strengthening data security are key to minimising risks. The findings also suggested increasing individual and professional accountability in the use of these technologies.

Ahmad (2024) conducted a survey-based study among 312 respondents working in international organizations operating in Jordan, identifying ethical challenges related to the use of AI in accounting. Similarly to other authors, the study highlighted key ethical concerns such as data security, algorithmic bias, and accountability, while also incorporated respondents' expressed concerns about job losses and the need for retraining due to the automation of certain tasks by AI-driven systems.

Cybersecurity plays a key role in protecting financial data. Perols and Murthy (2021) analysed the impact of cybersecurity incidents on investors' decisions, using data from 200 listed companies. The study found that incidents reduce investor confidence, especially when auditors offer risk management services, and recommended reducing conflicts of interest.

Janvrin and Wang (2019) conducted a literature review and case study analysis of cybersecurity breaches in major organisations, including Equifax, Sony, and Target. The authors examined how cyber incidents impact the credibility of accounting information, regulatory compliance, and ethical practices within organisations.

The study identified key ethical issues, including a lack of transparency in disclosing cybersecurity incidents and a minimalist approach by companies to cybersecurity measures – often limited to merely meeting minimum regulatory requirements.

The authors emphasised that cybersecurity in accounting is not just a technological or regulatory issue but, above all, an ethical one. Companies and auditors have a professional ethical obligation to protect data, ensure honest reporting, and manage risk in a way that safeguards the interests of clients, investors, and society as a whole. An ethical approach to cybersecurity management is essential for maintaining trust and the reliability of financial data.

Their recommendations included strengthening internal ethical codes that highlight data management responsibilities, educating stakeholders involved in these processes, and introducing mandatory reporting requirements for cybersecurity incidents.

Munoko et al. (2020) pointed out the risks to data privacy arising from the use of advanced AI technologies in auditing. Their research was based on case study analysis and interviews with key stakeholders in the audit sector. The authors attempted to envisage and analyse potential future scenarios related to AI adoption, focusing on possible ethical conflicts that may arise when AI replaces traditional audit methods and the broader implications for stakeholders.

One of the key concerns identified was the excessive collection of data, which may be misused or stored in non-compliant ways, posing a direct threat to privacy. The authors proposed developing detailed data protection policies, including restrictions on data storage and processing, as well as the use of anonymisation tools to enhance trust in AI-driven accounting processes.

They stressed that while AI technology offers significant benefits, it also requires robust ethical risk management, including greater transparency, accountability, and consideration of social factors.

Identification of Early Warning Signals (EWS)

Predictive systems, such as Early Warning Systems (EWS), support risk identification but can also lead to manipulation of results. The literature highlights cases of manipulation, including deliberate algorithm tuning to achieve favourable outcomes for specific stakeholders, falsification of risk indicators to conceal financial issues, and the improper use of training data, resulting in inaccurate forecasts.

Jiang et al. (2024) focused on the challenges associated with using modern technologies to predict corporate bankruptcies. They examined how manipulation of input data in bankruptcy prediction models can generate false early warning signals and lead to flawed financial decisions. One of the main issues with these models is the limited number of bankrupt firms available for calibration. To address this, the authors

analysed the potential of Generative Adversarial Networks (GANs) to improve input data quality by supplementing datasets.

However, several key risks were identified, including:

- data manipulation by report creators – dishonest firms, aware of how the algorithms work, may deliberately distort financial reports to avoid detection;
- inaccurate AI model predictions – underestimation of financial risk by predictive systems can shorten the early warning horizon, leading to misguided financial decisions;
- use of generative models (GANs) for data supplementation – while improving forecast accuracy, this approach also carries the risk of introducing false trends if applied unethically.

From an ethical standpoint these challenges raise concerns about AI algorithm transparency and the difficulty of implementing effective auditing mechanisms.

A recurring theme in researchers' conclusions is the risk of early warning model distortions due to fraudulent corporate reporting practices. Liu et al. (2024) proposed a solution combining Benford's Law, which detects data irregularities caused by manipulation, with early warning models. This integration enhances the predictive value of the models, providing a more reliable approach to financial risk assessment.

References

Abbott, L. J., Daugherty, B., Parker, S., & Peters, G. F. (2016). Internal Audit Quality and Financial Reporting Quality: The Joint Importance of Independence and Competence. *Journal of Accounting Research*, *54*(1), 3-40. https://doi.org/10.1111/1475-679X.12099

Abhishek N., Suraj, N., Rahiman H. U., Nawaz, N., Kodikal, R., Kulal, A., & Raj, K. (2024). Digital Transformation in Accounting: Elevating Effectiveness Across Accounting, Auditing, Reporting and Regulatory Compliance. *Journal of Accounting and Organizational Change* [in print]. https://doi.org/10.1108/JAOC-01-2024-0039

Aboud, A., & Robinson, B. (2022). Fraudulent Financial Reporting and Data Analytics: An Explanatory Study from Ireland. *Accounting Research Journal*, *35*(1), 21-36. https://doi.org/10.1108/ARJ-04-2020-0079

ACFE. (2020). *Report to the Nations. 2020 Global Study on Occupational Fraud and Abuse*. https://Legacy.Acfe.Com/Report-to-the-Nations/2020/

Adelakun, B. O., Antwi, B. O., Ntiakoh, A., & Eziefule, A. O. (2024). Leveraging AI for Sustainable Accounting: Developing Models for Environmental Impact Assessment and Reporting. *Finance & Accounting Research Journal*, *6*(6), 1017-1048. https://doi.org/10.51594/farj.v6i6.1234

Adeyelu, O. O., Ugochukwu, C. E., & Shonibare, M. A. (2024). The Impact of Artificial Intelligence on Accounting Practices: Advancements, Challenges, And Opportunities. *International Journal of Management & Entrepreneurship Research*, *6*(4), 1200-1210. https://doi.org/10.51594/ijmer.v6i4.1031

Afzali, M. (2023). Corporate Culture and Financial Statement Comparability. *Advances in Accounting*, *60*, 100640. https://doi.org/10.1016/j.adiac.2022.100640

Ahmad, A. Y. A. B. (2024). Ethical Implications of Artificial Intelligence in Accounting: A Framework For Responsible AI Adoption In Multinational Corporations in Jordan. *International Journal of Data and Network Science*, *8*(1), 401-414. https://doi.org/10.5267/j.ijdns.2023.9.014

Ahmed, A. E., Ucbasaran, D., Cacciotti, G., & Williams, T. A. (2022). Integrating Psychological Resilience, Stress, and Coping in Entrepreneurship: A Critical Review and Research Agenda. *Entrepreneurship: Theory and Practice*, *46*(3), 497-538. https://doi.org/10.1177/10422587211046542

Ajayi-Nifise, A. O., Falaiye, T., Olubusola, O., Daraojimba, A. I., & Mhlongo, N. Z. (2024). Blockchain in U.S. Accounting: A Review: Assessing Its Transformative Potential for Enhancing Transparency And Integrity. *Finance & Accounting Research Journal*, *6*(2), 159-182. https://doi.org/10.51594/farj.v6i2.786

Aksoy, T., & Gurol, B. (2021). Artificial Intelligence in Computer-Aided Auditing Techniques and Technologies (CAATTs) and an Application Proposal for Auditors. In T. Aksoy, U. Acioglu (Eds.), *Auditing Ecosystem and Strategic Accounting in the Digital Era: Global Approaches and New Opportunities* (pp. 361-384). Springer. https://doi.org/10.1007/978-3-030-72628-7_17

Albrecht, A., Mauldin, E. G., & Newton, N. J. (2018). Do Auditors Recognize the Potential Dark Side of Executives' Accounting Competence? *Accounting Review*, *93*(6), 1-28. https://doi.org/10.2308/accr-52028

Alghamdi, S., Daim, T., & Alzahrani, S. (2024). Technology Assessment for Cybersecurity Organizational Readiness: Case of Airlines Sector and Electronic Payment. *IEEE Transactions on Engineering Management*, *71*, 7701-7718. https://doi.org/10.1109/TEM.2024.3376314

Alhanatleh, H., Khaddam, A., Abudabaseh, F., Alghizzawi, M., & Alzghoul, A. (2024). Enhancing the Public Value of Mobile Fintech Services Through Cybersecurity Awareness Antecedents: A Novel Framework in Jordan. *Investment Management and Financial Innovations*, *21*(1), 417-430. https://doi.org/10.21511/imfi.21(1).2024.32

Al-Hawamleh, A. (2024). Cyber Resilience Framework: Strengthening Defenses and Enhancing Continuity in Business Security. *International Journal of Computing and Digital Systems*, *15*(1), 1315-1331. https://doi.org/10.12785/ijcds/150193

Allee, K. D., & Deangelis, M. D. (2015). The Structure of Voluntary Disclosure Narratives: Evidence From Tone Dispersion. *Journal of Accounting Research*, *53*(2), 241-274. https://doi.org/10.1111/1475-679X.12072

Alles, M. (2020). AIS-Ethics as an Ethical Domain: A Response to Guragai, Hunt, Neri and Taylor (2017) and Dillard and Yuthas (2002). *International Journal of Digital Accounting Research*, *20*. https://doi.org/10.4192/1577-8517-v20_1

Almulla, D., Abbas, M., Al-Alawi, A., & Alkooheji, L. (2024). Process and Impact Evaluation of Artificial Intelligence in Managerial Accounting: A Systematic Literature Review. *International Journal of Computing and Digital Systems*, *15*(1), 1467-1482. https://doi.org/10.12785/ijcds/1501104

Altman, E. I. (1968). Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy. *The Journal of Finance*, *23*(4), 589-609. https://doi.org/10.1111/j.1540-6261.1968.tb00843.x

Amiram, D., Bozanic, Z., Cox, J. D., Dupont, Q., Karpoff, J. M., & Sloan, R. (2018). Financial Reporting Fraud and Other Forms of Misconduct: A Multidisciplinary Review of the Literature. *Review of Accounting Studies*, *23*(2), 732-783. https://doi.org/10.1007/s11142-017-9435-x

Appelbaum, D., Kogan, A., Vasarhelyi, M., & Yan, Z. (2017). Impact of Business Analytics and Enterprise Systems on Managerial Accounting. *International Journal of Accounting Information Systems*, *25*, 29-44. https://doi.org/10.1016/j.accinf.2017.03.003

Arkhipova, D., Montemari, M., Mio, C., & Marasca, S. (2024). Digital Technologies and the Evolution of the Management Accounting Profession: A Grounded Theory Literature Review. *Meditari Accountancy Research*, *32*(7), 35-64. https://doi.org/10.1108/MEDAR-07-2023-2097

Arnold, V. (2018). The Changing Technological Environment and the Future of Behavioural Research in Accounting. *Accounting and Finance*, *58*(2), 315-339. https://doi.org/10.1111/acfi.12218

Arnold, V., Benford, T., Canada, J., & Sutton, S. G. (2015). Leveraging Integrated Information Systems to Enhance Strategic Flexibility and Performance: The Enabling Role of Enterprise Risk Management. *International Journal of Accounting Information Systems*, *19*, 1-16. https://doi.org/10.1016/j.accinf.2015.10.001

Austin, A. A., Carpenter, T. D., Christ, M. H., & Nielson, C. S. (2021). The Data Analytics Journey: Interactions Among Auditors, Managers, Regulation, and Technology. *Contemporary Accounting Research*, *38*(3), 1888-1924. https://doi.org/10.1111/1911-3846.12680

Autore, D., Chen, H., Clarke, N., Lin, J. (2024). Blockchain and Earnings Management: Evidence from the Supply Chain. *The British Accounting Review, 56*(4), 101357. https://doi.org/10.1016/j.bar.2024.101357

Ayinla, B. S., Atadoga, A., Ike, C. U., Ndubuisi, N. L., Asuzu, O. F., & Adeleye, R. A. (2024). The Role of Robotic Process Automation (RPA) in Modern Accounting: A Review – Investigating How Automation Tools Are Transforming Traditional Accounting Practices. *Engineering Science & Technology Journal*, *5*(2), 427-447. https://doi.org/10.51594/estj.v5i2.804

Azaan, S., & Elsa, J. (2024). *The Rise of Automated Accounting: Navigating the Digital Landscape The Rise of Automated Accounting: Navigating the Digital Landscape*. EasyChair Preprint 12113. https://easychair.org/publications/preprint/G7b5

Baldwin, A. A., & Williams, S. L. M. (1999). The Future of Intelligent Internet Agents in European Financial Reporting. *European Accounting Review*, *8*(2), 303-319. https://doi.org/10.1080/096381899336050

Balkaran, L. (2017). Understanding and Applying Data Mining and Data Analysis Techniques. *EDPACS*, *56*(1), 1-6. https://doi.org/10.1080/07366981.2017.1343550

Bani Ahmad, A. Y. A. (2024). Ethical Implications of Artificial Intelligence in Accounting: A Framework for Responsible AI Adoption in Multinational Corporations in Jordan. *International Journal of Data and Network Science*, *8*(1), 401-414. https://doi.org/10.5267/j.ijdns.2023.9.014

Barker, R., Barone, E., Birt, J., Gaeremynck, A., Mcgeachin, A., Marton, J., & Moldovan, R. (2013). Response of the EAA FRSC to the EFRAG/ANC/FRC Discussion Paper: Towards a Disclosure Framework for the Notes. *Accounting in Europe*, *10*(1), 1-26. https://doi.org/10.1080/17449480.2013.772715

Bassyouny, H., Abdelfattah, T., & Tao, L. (2020). Beyond Narrative Disclosure Tone: The Upper Echelons Theory Perspective. *International Review of Financial Analysis*, *70*, 101499. https://doi.org/10.1016/j.irfa.2020.101499

Beaver, W. H. (1966). Financial Ratios As Predictors of Failure. *Journal of Accounting Research*, *4*, 71-111. https://doi.org/10.2307/2490171

Beaver, W. H. (1968). Alternative Accounting Measures as Predictors of Failure. *The Accounting Review*, *43*(1), 113-122. http://www.jstor.org/stable/244122

Bedard, J. C., Hoitash, R., & Hoitash, U. (2014). Chief Financial Officers as Inside Directors. *Contemporary Accounting Research*, *31*(3), 787-817. https://doi.org/10.1111/1911-3846.12045

Bini, L., Schaper, S., Simoni, L., Giunta, F., & Nielsen, C. (2023). Mandatory Non-Financial Disclosure: Is Everybody on the Same Page About Business Model Reporting? *Accounting Forum*, *47*(2), 198-222. https://doi.org/10.1080/01559982.2023.2170036

Bisht, D., Singh, R., Gehlot, A., Akram, S. V., Singh, A., Montero, E. C., Priyadarshi, N., & Twala, B. (2022). Imperative Role of Integrating Digitalization in the Firms Finance: A Technological Perspective. *Electronics* , *11* 19, 3252. https://doi.org/10.3390/electronics11193252

Black, E. L., Christensen, T. E., Kiosse, P. V., & Steffen, T. D. (2017). Has the Regulation of Non-GAAP Disclosures Influenced Managers' Use of Aggressive Earnings Exclusions? *Journal of Accounting, Auditing and Finance*, *32*(2), 209-240. https://doi.org/10.1177/0148558X15599131

Blanco-Oliver, A., Irimia-Dieguez, A., Oliver-Alfonso, M. D., & Vázquez-Cueto, M. J. (2016). Hybrid Model Using Logit and Nonparametric Methods for Predicting Micro-Entity Failure. *Investment Management and Financial Innovations*, *13*(3), 35-46. https://doi.org/10.21511/imfi.13(3).2016.03

Blessing, M. (2024). *The Role of AI in Real-Time Financial Reporting and Continuous Auditing*. https://www.researchgate.net/publication/384971921

Bonsón, E., Bednárová, M., & Perea, D. (2023). Disclosures About Algorithmic Decision Making in the Corporate Reports of Western European Companies. *International*

Journal of Accounting Information Systems, *48*, 100596. https://doi.org/10.1016/j.accinf.2022.100596

Bonsón, E., Lavorato, D., Lamboglia, R., & Mancini, D. (2021). Artificial Intelligence Activities and Ethical Approaches in Leading Listed Companies in the European Union. *International Journal of Accounting Information Systems*, *43*, 100535. https://doi.org/10.1016/j.accinf.2021.100535

Briere, M., & Ramelli, S. (2022). *Green Sentiment, Stock Returns, and Corporate Behavior*. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3850923

Cameran, M., Campa, D., & Pettinicchio, A. (2014). IFRS Adoption Among Private Companies: Impact on Earnings Quality. *Journal of Accounting, Auditing and Finance*, *29*(3), 278-305. https://doi.org/10.1177/0148558X14534260

Chang, Y. J., & Lee, B. H. (2022). The Impact of ESG Activities on Firm Value: Multi-Level Analysis of Industrial Characteristics. *Sustainability*, *14*(21), 14444. https://doi.org/10.3390/su142114444

Chen, J. J., Cheng, X., Gong, S. X., & Tan, Y. (2014). Do Higher Value Firms Voluntarily Disclose More Information? Evidence from China. *British Accounting Review*, *46*(1), 18-32. https://doi.org/10.1016/j.bar.2013.06.003

Chen, M., Mussalli, G., Amel-Zadeh, A., & Weinberg, M. O. (2022). NLP for SDGs: Measuring Corporate Alignment with the Sustainable Development Goals. *The Journal of Impact and ESG Investing*, *2*(3), 61-81. https://doi.org 10.3905/jesg.2021.1.035

Chen, M., von Behren, R., & Mussalli, G. (2021). The Unreasonable Attractiveness of More ESG Data. *The Journal of Portfolio Management*, *48*(1), 147-162. https://doi.org 10.3905/jpm.2021.1.281

Chiu, P. C., Teoh, S. H., Zhang, Y., & Huang, X. (2023). Using Google Searches of Firm Products to Detect Revenue Management. *Accounting, Organizations and Society*, *109*, 101457. https://doi.org/10.1016/j.aos.2023.101457

Choi, J. H., Gipper, B., & Malik, S. (2023). Financial Reporting Quality and Wage Differentials: Evidence from Worker-Level Data. *Journal of Accounting Research*, *61*(4), 1109–1158. https://doi.org/10.1111/1475-679X.12477

Choi, Y.-S., & Young, S. (2015). Transitory Earnings Components and the Two Faces of Non-Generally Accepted Accounting Principles Earnings. *Accounting and Finance*, *55*(1), 75-103. https://doi.org/10.1111/acfi.12040

Christ, M. H., Emett, S. A., Summers, S. L., & Wood, D. A. (2021). Prepare for Takeoff: Improving Asset Measurement and Audit Quality with Drone-Enabled Inventory Audit Procedures. *Review of Accounting Studies*, *26*(4), 1323-1343. https://doi.org/10.1007/S11142-020-09574-5

Christensen, D. M., Jones, K. L., & Kenchington, D. G. (2018). Gambling Attitudes and Financial Misreporting. *Contemporary Accounting Research*, *35*(3), 1229-1261. https://doi.org/10.1111/1911-3846.12322

Cieślak M. (2011). *Podejście etyczne w rachunkowości a jakość sprawozdań finansowych*. Wydawnictwo Uniwersytetu Ekonomicznego w Poznaniu.

Costa, M., Lisboa, I., & Gameiro, A. (2022). Is the Financial Report Quality Important in the Default Prediction? SME Portuguese Construction Sector Evidence. *Risks*, *10*(5), 98. https://doi.org/10.3390/risks10050098

Crawley, M., & Wahlen, J. (2014). Analytics in Empirical/Archival Financial Accounting Research. *Business Horizons*, *57*(5), 583-593. https://doi.org/10.1016/j.bushor.2014.05.002

Dauth, T., Pronobis, P., & Schmid, S. (2017). Exploring the Link Between Internationalization of Top Management and Accounting Quality: The CFO's International Experience

Matters. *International Business Review*, *26*(1), 71-88. https://doi.org/10.1016/j.ibusrev.2016.05.007

Davidson, R., Dey, A., & Smith, A. J. (2012). *Executives' "Off-The-Job" Behavior, Corporate Culture, and Financial Reporting Risk*. NBER Working Paper No. 18001. http://www.nber.org/papers/w18001

De Franco, G., Fogel-Yaari, H., & Li, H. (2020). Md&A Textual Similarity and Auditors. *Auditing*, *39*(3), 105-131. https://doi.org/10.2308/ajpt-18-016

De Villiers, C., Dimes, R., & Molinari, M. (2024). How Will AI Text Generation and Processing Impact Sustainability Reporting? Critical Analysis, a Conceptual Framework and Avenues for Future Research. *Sustainability Accounting, Management and Policy Journal*, *15*(1), 96-118. https://doi.org/10.1108/SAMPJ-02-2023-0097

Debreceny, R., & Gray, G. L. (2001). The Production and Use of Semantically Rich Accounting Reports on the Internet: XML and XBRL. *International Journal of Accounting Information Systems*, *2*(1), 47-74. https://doi.org/10.1016/S1467-0895(00)00012-9

Dharmani, P., Das, S., & Prashar, S. (2021). A bibliometric analysis of creative industries: Current trends and future directions. *Journal of Business Research*, *135*, 252–267. https://doi.org/10.1016/J.JBUSRES.2021.06.037

Elad, C., Shah, N., & Agyeman, C. (2023). Accounting Classification in the Era of International Financial Reporting Standards: The Case of Africa. *Journal of International Accounting, Auditing and Taxation*, *51*. https://doi.org/10.1016/j.intaccaudtax.2023.100546

Elbashir, M. Z., Collier, P. A., & Sutton, S. G. (2011). The Role of Organizational Absorptive Capacity in Strategic Use of business Intelligence to Support Integrated Management Control Systems. *Accounting Review*, *86*(1), 155-184. https://doi.org/10.2308/accr.00000010

Estep, C., Griffith, E. E., & MacKenzie, N. L. (2023). How Do Financial Executives Respond to the Use of Artificial Intelligence in Financial Reporting and Auditing? *Review of Accounting Studies*, *29*, 2798-2831. https://doi.org/10.1007/s11142-023-09771-y

Eulerich, M., Masli, A., Pickerd, J., & Wood, D. A. (2023). The Impact of Audit Technology on Audit Task Outcomes: Evidence for Technology-Based Audit Techniques. *Contemporary Accounting Research*, *40*(2), 981-1012. https://doi.org/10.1111/1911-3846.12847

Faccia, A., & Petratos, P. (2024). Big Data Applications in Accounting Information Systems. *ICBDC '24: Proceedings of the 2024 9th International Conference on Big Data and Computing* (pp. 1-7). Association for Computing Machinery. https://doi.org/10.1145/3695220.3695223

Fan, G., & Wu, X. (2022). *Going Green: The Effect of Environmental Regulations on Firms*. Singapore Management University School of Accountancy Research Paper No. 2023-163. https://ssrn.com/abstract=4098403

Fathi, M. R., Rahimi, H., & Minouei, M. (2023). Predicting Financial Distress Using the Worst-Practice-Frontier Data Envelopment Analysis Model and Artificial Neural Network. *Nankai Business Review International*, *14*(2), 295-315. https://doi.org/10.1108/NBRI-01-2022-0005

Firk, S., Richter, S., & Wolff, M. (2021). Does Value-Based Management Facilitate Managerial Decision-Making? An Analysis of Divestiture Decisions. *Management Accounting Research*, *51*, 100736. https://doi.org/10.1016/j.mar.2021.100736

Fisher, I. E. (2007). A Prototype System for Temporal Reconstruction of Financial Accounting Standards. *International Journal of Accounting Information Systems*, *8*(3), 139-164. https://doi.org/10.1016/j.accinf.2007.07.001

Hilario, F., Liendo, M., Chipana, L., & Rivera. R. (2023). Evaluation of Cyber Sabotage in Public Entities. *Journal of System and Management Sciences*, *14*(4), 574-582. https://doi.org/10.33168/JSMS.2023.0434

Gao, L., Calderon, T. G., & Tang, F. (2020). Public Companies' Cybersecurity Risk Disclosures. *International Journal of Accounting Information Systems*, *38*, 100468. https://doi.org/10.1016/j.accinf.2020.100468

Gao, R., & Sidhu, B. K. (2018). Convergence of Accounting Standards and Financial Reporting Externality: Evidence From Mandatory IFRS Adoption. *Accounting and Finance*, *58*(3), 817-848. https://doi.org/10.1111/acfi.12236

Glancy, F. H., & Yadav, S. B. (2011). A Computational Model for Financial Reporting Fraud Detection. *Decision Support Systems*, *50*(3), 595-601. https://doi.org/10.1016/j.dss.2010.08.010

Gonzalez, P. A., & Ashworth, L. (2021). Not Your Typical Leader? How Perceptions of CIOs Compare to Other Members of the Top Management Team. *Communications of the Association for Information Systems*, *49*, 515-534. https://doi.org/10.17705/1CAIS.04925

Groșanu, A., Fülöp, M.-T., & Măgdaș, N. (2024). Ethical Dilemmas in Digital Accounting: A Comprehensive Literature Review. *CECCAR Business Review*, *5*(4), 56-67. https://doi.org/10.37945/cbr.2024.04.06

Gupta, A., Sharma, U., & Gupta, S. K. (2021). The Role of ESG in Sustainable Development: An Analysis Through the Lens of Machine Learning. In *2021 IEEE International Humanitarian Technology Conference, IHTC 2021*. IEEE. https://doi.org/10.1109/IHTC53077.2021.9698939

Hamidah, D. H. A. (2024). Exploring Publication Trends in Accounting Information Systems and Identifying Research Positions in Indonesia: A Bibliometric Analysis. *International Journal of Economics and Business Research*, *27*(5). https://doi.org/10.1504/ijebr.2024.10064584

Harrison, J. S., & Malhotra, S. (2024). Complementarity in the CEO-CFO Interface: The Joint Influence of CEO and CFO Personality and Structural Power on Firm Financial Leverage. *Leadership Quarterly*, *35*(2), 101711. https://doi.org/10.1016/j.leaqua.2023.101711

Hasan, A. R. (2022). Artificial Intelligence (AI) in Accounting & Auditing: A Literature Review. *Open Journal of Business and Management*, *10*(1), 440-465. https://doi.org/10.4236/ojbm.2022.101026

Hennes, K. M., Leone, A. J., & Miller, B. P. (2008). The Importance of Distinguishing Errors from Irregularities in Restatement Research: The Case of Restatements and CEO/CFO Turnover. *Accounting Review*, *83*(6), 1487-1519. https://doi.org/10.2308/accr.2008.83.6.1487

Hennes, K. M., Leone, A. J., & Miller, B. P. (2014). Determinants and Market Consequences of Auditor Dismissals After Accounting Restatements. *Accounting Review*, *89*(3), 1051-1082. https://doi.org/10.2308/accr-50680

Herath, S. K., Herath, L. M., & Yoo, J. K. (2024). Opportunities and Challenges of Digital Audits and Compliance: Adoption of International Financial Reporting Standards (IFRS) in the Digital Age. In A. J. Alqatan, K. Hussainey, M. Hamed, K. Benameur (Eds.), *Impact of Digitalization on Reporting, Tax Avoidance, Accounting, and Green Finance* (pp. 1-35). IGI Global. https://doi.org/10.4018/979-8-3693-1678-8.ch001

Hope, O.-K., & Vyas, D. (2017). Private Company Finance and Financial Reporting. *Accounting and Business Research*, *47*(5), 506-537. https://doi.org/10.1080/00014788.2017.1303963

Hrazdil, K., Simunic, D. A., Spector, S., & Suwanyangyuan, N. (2023). Top Executive Gender Diversity and Financial Reporting Quality. *Journal of Contemporary Accounting and Economics*, *19*(2), 100363. https://doi.org/10.1016/j.jcae.2023.100363

Huang, A. H., Wang, H., & Yang, Y. (2023). FinBERT: A Large Language Model for Extracting Information from Financial Text. *Contemporary Accounting Research*, *40*(2), 806-841. https://doi.org/10.1111/1911-3846.12832

Huang, S., Tsaih, R., & Lin, W. (2012). Unsupervised Neural Networks Approach for Understanding Fraudulent Financial Reporting. *Industrial Management & Data Systems*, *112*(2), 224-244. https://doi.org/10.1108/02635571211204272

Hussain, S. M., & Alaya, A. (2024). Investor Response To Financial News in the Digital Transformation Era: The Impact of Accounting Disclosures and Herding Behavior as Indirect Effect. *Journal of Financial Reporting and Accounting*, *22*(2), 254-273. https://doi.org/10.1108/JFRA-05-2023-0287

Hussein, T. M., Michael, A. A., & Goparaju, A. (2025). Reviewing the Impact of Technological Innovation on Accounting Practices. *Studies in Systems, Decision and Control*, *566*, 69-82. https://doi.org/10.1007/978-3-031-71318-7_7

Ibrahim, A. E. A., Elamer, A. A., & Ezat, A. N. (2021). The Convergence of Big Data and Accounting: Innovative Research Opportunities. *Technological Forecasting and Social Change*, *173*, 121171. https://doi.org/10.1016/j.techfore.2021.121171

Indrayani, Sukoharsono, E. G., Djamhuri, A., & Roekhudin. (2024). Mapping Research Landscape of Emerging Technology in the Accounting Field: A Bibliometric Analysis. *Cogent Business and Management*, *11*(1), 2407044. https://doi.org/10.1080/23311975.2024.2407044

Islam Priom, M. A., Lopa Mudra, S., Ghose, P., Islam, K. R., & Hasan, M. N. (2024). Blockchain Applications in Accounting and Auditing: Research Trends and Future Research Implications. *International Journal of Economics, Business and Management Research*, *8*(7), 225-247. https://doi.org/10.51505/ijebmr.2024.8715

Janvrin, D. J., & Wang, T. (2019). Implications of Cybersecurity on Accounting Information. *Journal of Information Systems*, *33*(3), A1-A2. https://doi.org/10.2308/isys-10715

Janvrin, D. J., & Wang, T. (2022). Linking Cybersecurity and Accounting: An Event, Impact, Response Framework. *Accounting Horizons*, *36*(4), 67-112. https://doi.org/10.2308/HORIZONS-2020-101

Jayesh, G. S., Novaliendry, D., Gupta, S. K., Sharma, A. K., & Hazela, B. (2022). A Comprehensive Analysis of Technologies for Accounting and Finance in Manufacturing Firms. *ECS Transactions*, *107*(1), 2715-2733. https://doi.org/10.1149/10701.2715ECST

Jejeniwa, T. O., Mhlongo, N. Z., & Jejeniwa.T. O. (2024). A Comprehensive Review of the Impact of Artificial Intelligence on Modern Accounting Practices and Financial Reporting. *Computer Science & IT Research Journal*, *5*(4), 1031-1047. https://doi.org/10.51594/csitrj.v5i4.1086

Jiang, M., Liang, Y., Han, S., Ma, K., Chen, Y., & Xu, Z. (2024). Leveraging Generative Adversarial Networks for Addressing Data Imbalance in Financial Market Supervision. *ArXiv*, *abs/2412.15222*. https://api.semanticscholar.org/CorpusID:274965774

Jiang, S. (2020). Research on the Influence of Big Data to Audit. *Proceedings. 2020 International Conference on Big Data Economy and Information Management, BDEIM 2020* (pp. 1-4). https://doi.org/10.1109/BDEIM52318.2020.00008

Jiang, Z., Zhao, X., Wang, Z., & Herbert, K. (2024). Safety Leadership: A Bibliometric Literature Review and Future Research Directions. *Journal of Business Research*, *172*, 114437. https://doi.org/10.1016/J.JBUSRES.2023.114437

Kadyshevitch, D. (2024). Traditional Fraud Engines Need to Widen Their View. *Computer Fraud and Security*, *2024*(6). https://doi.org/10.12968/S1361-3723(24)70024-4

Khomiak, N., Petchenko, M., Yarmoliuk, O., Viter, S., & Dmytrenko, O. (2022). Problems of Organization and Maintenance of Financial Accounting in the Conditions of Implementation of the Latest Methods and Tools. *Financial and Credit Activity: Problems of Theory and Practice*, *6*(47), 88-98. https://doi.org/10.55643/fcaptp.6.47.2022.3914

Kipp, P. C., Curtis, M. B., & Li, Z. (2020). The Attenuating Effect of Intelligent Agents and Agent Autonomy on Managers' Ability to Diffuse Responsibility for and Engage in Earnings Management. *Accounting Horizons*, *34*(4), 143-164. https://doi.org/10.2308/HORIZONS-19-133

Kovach, J. J., Swink, M., & Rodriguez, M. (2023). A Novel Measure of Firm-Level Production Outsourcing. *International Journal of Production Economics*, *263*, 108940. https://doi.org/10.1016/j.ijpe.2023.108940

Kurniawan, Y., & Mulyawan, A. (2023). The Role of External Auditors in Improving Cybersecurity of the Companies Through Internal Control in Financial Reporting. *Journal of System and Management Sciences*, *13*(1), 485-510. https://doi.org/10.33168/JSMS.2023.0126

Lantto, A.-M. (2014). Business Involvement in Accounting: A Case Study of International Financial Reporting Standards Adoption and the Work of Accountants. *European Accounting Review*, *23*(2), 335–356. https://doi.org/10.1080/09638180.2013.833411

Lantto, A.-M. (2022). Obtaining Entity-Specific Information and Dealing With Uncertainty: Financial Accountants' Response to Their Changing Work of Financial Reporting and the Role of Boundary Objects. *Critical Perspectives on Accounting*, *85*, 102277. https://doi.org/10.1016/j.cpa.2020.102277

Lattanzio, G., & Ma, Y. (2023). Cybersecurity Risk and Corporate Innovation. *Journal of Corporate Finance*, *82*, 102445. https://doi.org/10.1016/j.jcorpfin.2023.102445

Lehner, O. M., Ittonen, K., Silvola, H., Ström, E., & Wührleitner, A. (2022). Artificial Intelligence Based Decision-Making in Accounting and Auditing: Ethical Challenges and Normative Thinking. *Accounting, Auditing & Accountability Journal*, *35*(9), 109-135. https://doi.org/10.1108/AAAJ-09-2020-4934

Leocádio, D., Malheiro, L., & Reis, J. (2024). Artificial Intelligence in Auditing: A Conceptual Framework for Auditing Practices. *Administrative Sciences*, *14*(10), 238. https://doi.org/10.3390/admsci14100238

Leuz, C., & Wysocki, P. D. (2016). The Economics of Disclosure and Financial Reporting Regulation: Evidence and Suggestions for Future Research. *Journal of Accounting Research*, *54*(2), 525-622. https://doi.org/10.1111/1475-679X.12115

Li, J., Li, N., Xia, T., & Guo, J. (2023). Textual Analysis and Detection of Financial Fraud: Evidence from Chinese Manufacturing Firms. *Economic Modelling*, *126*, 106428. https://doi.org/10.1016/j.econmod.2023.106428

Lim, T. (2024). Environmental, Social, and Governance (ESG) and Artificial Intelligence in Finance: State-of-the-art and Research Takeaways. *Artificial Intelligence Review*, *57*(4), 76 (2024). https://doi.org/10.1007/s10462-024-10708-3

Lin, F., Wu, C.-M., Fang, T.-Y., & Wun, J.-C. (2014). The Relations Among Accounting Conservatism, Institutional Investors and Earnings Manipulation. *Economic Modelling*, *37*, 164-174. https://doi.org/10.1016/j.econmod.2013.10.020

Lin, J. W., Hwang, M. I., & Becker, J. D. (2003). A Fuzzy Neural Network for Assessing the Risk of Fraudulent Financial Reporting. *Managerial Auditing Journal*, *18*(8), 657-665. https://doi.org/10.1108/02686900310495151

Liou, F.-M. (2008). Fraudulent Financial Reporting Detection and Business Failure Prediction Models: A Comparison. *Managerial Auditing Journal*, *23*(7), 650-662. https://doi.org/10.1108/02686900810890625

Lisboa, I. M. C., Costa, M., & Santos, F. (2021). Analysis of Family SMEs Default Risk: The Portuguese Case. *Australasian Business, Accounting and Finance Journal*, *15*(4), 76-92. https://doi.org/10.14453/aabfj.v15i4.5

Liu, Z., & Li, D. (2025). Research of Dempster-Shafer's Theory and Ensemble Classifier Financial Risk Early Warning Model Based on Benford's Law. *Computational Economics*, *65*, 3361-3389. https://doi.org/10.1007/s10614-024-10679-1

Lopez, C., Contreras, O., & Bendix, J. (2020). *ESG Ratings: The Road Ahead*. https://ssrn.com/abstract=3706440

Loureiro, G., & Taboada, A. G. (2015). Do Improvements in the Information Environment Enhance Insiders' Ability to Learn from Outsiders? *Journal of Accounting Research*, *53*(4), 863-905. https://doi.org/10.1111/1475-679X.12082

Maksymov, E., Peecher, M., Sutherland, A., & Weber, J. (2024). Audit Partners' Role in Material Misstatement Resolution: Survey and Interview Evidence. *Journal of Accounting Research*, *62*(1), 275-333. https://doi.org/10.1111/1475-679X.12506

Maksymov, E., Pickerd, J., Wilks, T. J., & Williams, D. (2023). The ICFR Process: Perspectives of Accounting Executives at Large Public Companies. *Contemporary Accounting Research*, *40*(3), 1671-1703. https://doi.org/10.1111/1911-3846.12859

Mališ, S. S., Žager, L., & Brozović, M. (2020). The Future of Audit in Light of Technological Changes: Opportunities and Threats. In A. Boitan, K. Marchewka-Bartkowiak (Eds.), *Fostering Innovation and Competitiveness With FinTech, RegTech, and SupTech* (pp. 228-249). IGI Global. https://doi.org/10.4018/978-1-7998-4390-0.CH012

Mariani, M., & Dwivedi, Y. K. (2024). Generative Artificial Intelligence in Innovation Management: A Preview of Future Research Developments. *Journal of Business Research*, *175*, 114542. https://doi.org/10.1016/j.jbusres.2024.114542

Mariano, S., & Laker, B. (2024). On-the-fly Decision Making Within Organizations: A Systematic Literature Review and Future Research Directions. *Journal of Business Research*, *174*, 114484. https://doi.org/10.1016/j.jbusres.2023.114484

Marques, D., & Morais, G. (2022). Internal Audit and the Use of New Technologies in Higher Education. In *Iberian Conference on Information Systems and Technologies, CISTI*, *2022-June*. https://doi.org/10.23919/CISTI54924.2022.9820269

Martins, A., Bianchi de Aguiar, M. T., Sambento, M., & Branco, M. C. (2024). Business Intelligence System Adoption and the Leveraging of Reporting Process Capabilities. *Journal of Accounting and Organizational Change*, *21*(3), 506-534. https://doi.org/10.1108/JAOC-11-2023-0204

Martinsons, M., Davison, R., & Tse, D. (1999). The Balanced Scorecard: A Foundation for the Strategic Management of Information Systems. *Decision Support Systems*, *25*(1), 71-88. https://doi.org/10.1016/S0167-9236(98)00086-4

McCallig, J., Robb, A., & Rohde, F. (2019). Establishing the Representational Faithfulness of Financial Accounting Information Using Multiparty Security, Network Analysis and a Blockchain. *International Journal of Accounting Information Systems*, *33*, 47-58. https://doi.org/10.1016/j.accinf.2019.03.004

Melloni, G., Caglio, A., & Perego, P. (2017). Saying More With Less? Disclosure Conciseness, Completeness and Balance in Integrated Reports. *Journal of Accounting and Public Policy*, *36*(3), 220-238. https://doi.org/10.1016/j.jaccpubpol.2017.03.001

Mi, H. (2024). Digital Transformation Strategy of Enterprise Financial Accounting Management Based on Blockchain Technology. *Applied Mathematics and Nonlinear Sciences*, *9*(1). https://doi.org/10.2478/amns-2024-0448

Mian, S. (2001). On the Choice and Replacement of Chief Financial Officers. *Journal of Financial Economics*, *60*, 143-175. https://doi.org/10.1016/S0304-405X(01)00042-3

Moodaley, W., & Telukdarie, A. (2023). Greenwashing, Sustainability Reporting, and Artificial Intelligence: A Systematic Literature Review. *Sustainability*, *15*(2), 1481. https://doi.org/10.3390/su15021481

Moral-Muñoz, J. A., Herrera-Viedma, E., Santisteban-Espejo, A., & Cobo, M. J. (2020). Software Tools for Conducting Bibliometric Analysis in Science: An Up-to-date Review. *Profesional de La Informacion*, *29*(1). https://doi.org/10.3145/epi.2020.ene.03

Mousavi, M. M., Ouenniche, J., & Tone, K. (2023). A Dynamic Performance Evaluation of Distress Prediction Models. *Journal of Forecasting*, *42*(4), 756-784. https://doi.org/10.1002/for.2915

Mundy, J., & Owen, C. A. (2013). The Use of an ERP System to Facilitate Regulatory Compliance. *Information Systems Management*, *30*(3), 182-197. https://doi.org/10.1080/10580530.2013.794601

Munoko, I., Brown-Liburd, H. L., & Vasarhelyi, M. (2020). The Ethical Implications of Using Artificial Intelligence in Auditing. *Journal of Business Ethics*, *167*(2), 209-234. https://doi.org/10.1007/s10551-019-04407-1

Murphy, P. R., Purda, L., & Skillicorn, D. (2018). Can Fraudulent Cues Be Transmitted by Innocent Participants? *Journal of Behavioral Finance*, *19*(1), 1-15. https://doi.org/10.1080/15427560.2017.1365367

Nguyen, T., Chen, J. V., & Nguyen, T. P. H. (2021). Appropriation of Accounting Information System Use Under the New IFRS: Impacts on Accounting Process Performance. *Information and Management*, *58*(8), 103534. https://doi.org/10.1016/j.im.2021.103534

Nofel, M., Marzouk, M., Elbardan, H., Saleh, R., & Mogahed, A. (2024). *From Sensors to Standardized Financial Reports: A Proposed Automated Accounting System Integrating IoT, Blockchain, and XBRL*. Preprints.org. https://doi.org/10.20944/preprints202408.2274.v1

Omer, T. C., Shelley, M. K., & Tice, F. M. (2020). Do Director Networks Matter for Financial Reporting Quality? Evidence From Audit Committee Connectedness and Restatements. *Management Science*, *66*(8), 3361-3388. https://doi.org/10.1287/mnsc.2019.3331

Osei-Assibey Bonsu, M., Wang, Y., & Guo, Y. (2023). Does Fintech Lead to Better Accounting Practices? Empirical Evidence. *Accounting Research Journal*, *36*(2-3), 129-147. https://doi.org/10.1108/ARJ-07-2022-0178

Pargmann, J., Riebenbauer, E., Flick-Holtsch, D., & Berding, F. (2023). Digitalisation in Accounting: A Systematic Literature Review of Activities and Implications for Competences. *Empirical Research in Vocational Education and Training*, *15*(1), 1 (2023). https://doi.org/10.1186/s40461-023-00141-1

Park, K., & Jang, S. C. (2014). Hospitality Finance and Managerial Accounting Research: Suggesting an Interdisciplinary Research Agenda. *International Journal of Contemporary Hospitality Management*, *26*(5), 751-777. https://doi.org/10.1108/IJCHM-12-2013-0554

Pei, D., & Vasarhelyi, M. A. (2020). Big Data and Algorithmic Trading Against Periodic and Tangible Asset Reporting: The Need for U-XBRL. *International Journal of Accounting Information Systems*, *37*, 100453. https://doi.org/10.1016/j.accinf.2020.100453

Perols, R. R., & Murthy, U. S. (2021). The Impact of Cybersecurity Risk Management Examinations and Cybersecurity Incidents on Investor Perceptions and Decisions. *Auditing: A Journal of Practice & Theory*, *40*(1), 73-89. https://doi.org/10.2308/AJPT-18-010

Piotrowska, K., Szymura, A., & Wanicki, P. (2024). Effect of R&D Activity on Level of Innovation of EU Countries in 2014 and 2020. *PLoS ONE*, *19*(2 February). https://doi.org/10.1371/journal.pone.0299697

Rabbani, M. R. (2024). Impact of Digital Advancements on Accounting, Auditing and Reporting Literature: Insights, Practice Implications and Future Research Directions. *Journal of Accounting and Organizational Change* [in print]. https://doi.org/10.1108/JAOC-01-2024-0028

Rana, P. H. (2024). Ethical Considerations in the Integration of Artificial Intelligence in Accounting: A Comprehensive Review and Framework. *MSNIM Management Review*, *2*(1), 16-23. https://msnim.edu.in/documents/1027/3.Ethical_Considerations_in_the_Integration_of_Artificial_Intelligence_in_Accounting.pdf

Rana, T., Svanberg, J., Öhman, P., & Lowe, A. (2023). Introduction: Analytics in Accounting and Auditing. In T. Rana, J. Svanberg, P. Öhman, A. Lowe (Eds.), *Handbook of Big Data and Analytics in Accounting and Auditing* (pp. 1-13). Springer. https://doi.org/10.1007/978-981-19-4460-4_1

Reig-Mullor, J., Garcia-Bernabeu, A., Pla-Santamaria, D., & Vercher-Ferrandiz, M. (2022). Evaluating ESG Corporate Performance Using a New Neutrosophic AHP-TOPSIS Based Approach. *Technological and Economic Development of Economy*, *28*(5), 1242-1266. https://doi.org/10.3846/tede.2022.17004

Rizal, M., Majid, M. S. A., Musnadi, S., & Sakir, A. (2024). Measuring Aggressive Decision-Making Behavior: A Confirmatory Factor Analysis. *International Journal of Applied Economics, Finance and Accounting*, *18*(1), 53-64. https://doi.org/10.33094/ijaefa.v18i1.1319

Rizzato, M., Wallart, J., Geissler, C., Morizet, N., & Boumlaik, N. (2022). Generative Adversarial Networks Applied to Synthetic Financial Scenarios Generation. *Physica A: Statistical Mechanics and Its Applications*, *623*, 128899. https://doi.org/10.1016/j.physa.2023.128899

Rowbottom, N., Locke, J., & Troshani, I. (2021). When the Tail Wags the Dog? Digitalisation and Corporate Reporting. *Accounting, Organizations and Society*, *92*, 101226. https://doi.org/10.1016/j.aos.2021.101226

Roychowdhury, S., Shroff, N., & Verdi, R. S. (2019). The Effects of Financial Reporting and Disclosure on Corporate Investment: A Review. *Journal of Accounting and Economics*, *68*(2-3), 101246. https://doi.org/10.1016/j.jacceco.2019.101246

Rubin, A., & Segal, D. (2019). Directors Skill and Financial Reporting Quality. *Journal of Business Finance and Accounting*, *46*(3-4), 457-493. https://doi.org/10.1111/jbfa.12359

Saluja, S., Nayyar, V., Dawra, S., Jain, M., & Shukla, R. P. (2024). Artificial Intelligence in Forensic Accounting. In S. Saluja, V. Nayyar, K. Rojhe, S. Sharma (Eds.), *Ethical Marketing Through Data Governance Standards and Effective Technology* (pp. 10-28). IGI Global. https://doi.org/10.4018/979-8-3693-2215-4.CH002

Sandner, P., Lange, A., & Schulden, P. (2020). The Role of the CFO of an Industrial Company: An Analysis of the Impact of Blockchain Technology. *Future Internet*, *12*(8), 128. https://doi.org/10.3390/FI12080128

Sanjiwani, P. D. A., Wulandari, A. A. I., Dewi, G.A, & Renta, M. P. P. (2024). The Impact of Artificial Intelligence on Accounting Information Systems. *Jurnal Ekonomi*, *13*(02), 1220-1234. https://ejournal.seaninstitute.or.id/index.php/Ekonomi/article/view/4570

Sauer, P. C., & Seuring, S. (2023). How to Conduct Systematic Literature Reviews in Management Research: A Guide in 6 Steps and 14 Decisions. *Review of Managerial Science*, *17*(5), 1899-1933. https://doi.org/10.1007/s11846-023-00668-3

Shahana, T., Lavanya, V., & Bhat, A. R. (2023). State of the Art in Financial Statement Fraud Detection: A Systematic Review. *Technological Forecasting and Social Change*, *192*, 122527. https://doi.org/10.1016/j.techfore.2023.122527

Shaikh, I. A., Wang, Z. H., & Drira, M. (2023). How Retaining Different Inside Directors on the Board Influences R&D-intensity: An Extension of Agency-theory Applied to the High-tech Sectors. *Journal of High Technology Management Research*, *34*(2), 100479. https://doi.org/10.1016/j.hitech.2023.100479

Shan, Y. G., & Troshani, I. (2021). Digital Corporate Reporting and Value Relevance: Evidence From the US and Japan. *International Journal of Managerial Finance*, *17*(2), 256-281. https://doi.org/10.1108/IJMF-01-2020-0018

Shapovalova, A., Kuzmenko, O., Polishchuk, O., Larikova, T., & Myronchuk, Z. (2023). Modernization of the National Accounting and Auditing System Using Digital Transformation Tools. *Financial and Credit Activity: Problems of Theory and Practice*, *4*(51), 33-52. https://doi.org/10.55643/fcaptp.4.51.2023.4102

Sharpe, W. H., Carey, P., & Zhang, H. F. (2023). Being Private, Big 4 Auditors, and Debt Raising. *Accounting and Finance*, *63*(2), 2295-2345. https://doi.org/10.1111/acfi.12969

Sisodia, J. (2022, December 6). *AI Ethics and the Role of IT Auditors*. https://www.isaca.org/Resources/News-and-Trends/Industry-News/2022/Ai-Ethics-and-the-Role-of-It-Auditors?Utm_source=isaca_internal&utm_medium=share_link

Sokolov, A., Mostovoy, J., Ding, J., & Seco, L. (2020). *Building Machine Learning Systems for Automated ESG Scoring. The Journal of Impact and ESG Investing*, *1*(3), 39-50. https://doi.org/10.3905/jesg.2021.1.010

Souza, P. V. S. de, Ribeiro, J. P. M., & Paulo, E. (2024). Organizational Complexity and Value Relevance Under the Regulatory and Financial Standards of Brazilian Electric Power Companies. *Energy Policy*, *186*, 114000. https://doi.org/10.1016/j.enpol.2024.114000

Sun, M. (2024). The Application of Embedded Hardware System and Blockchain in Rural Financial Management Cloud Platform. *Decision Making: Applications in Management and Engineering*, *7*(2), 81-100. https://doi.org/10.31181/dmame7220241040

Sunder, S. (2005). Minding Our Manners: Accounting as Social Norms. *British Accounting Review*, *37*(4), 367-387. https://doi.org/10.1016/j.bar.2005.08.007

Tang, F., Hess, T. J., Valacich, J. S., & Sweeney, J. T. (2014). The Effects of Visualization and Interactivity on Calibration in Financial Decision-Making. *Behavioral Research in Accounting*, *26*(1), 25-58. https://doi.org/10.2308/bria-50589

Teeter, R. A., Alles, M. G., & Vasarhelyi, M. A. (2010). The Remote Audit. *Journal of Emerging Technologies in Accounting*, *7*(1), 73-88. https://doi.org/10.2308/JETA.2010.7.1.73

The State of AI in Accounting 2024. Emerging Trends, Challenges & Opportunities 2. (2024). Karbon. https://karbonhq.com/resources/state-of-ai-accounting-report-2024/

Trinkle, B. S., Crossler, R. E., & Bélanger, F. (2015). Voluntary Disclosures via Social Media and the Role of Comments. *Journal of Information Systems*, *29*(3), 101-121. https://doi.org/10.2308/isys-51133

Troshani, I., Parker, L. D., & Lymer, A. (2015). Institutionalising XBRL for Financial Reporting: Resorting to Regulation. *Accounting and Business Research*, *45*(2), 196-228. https://doi.org/10.1080/00014788.2014.980772

Uwizeyemungu, S., Bertrand, J., & Poba-Nzaou, P. (2020). Patterns Underlying Required Competencies for CPA Professionals: a Content and Cluster Analysis of Job Ads. *Accounting Education*, *29*(2), 109-136. https://doi.org/10.1080/09639284.2020.1737157

Wang, A., Kapoor, S., Barocas, S., & Narayanan, A. (2024). Against Predictive Optimization: On the Legitimacy of Decision-making Algorithms That Optimize Predictive Accuracy. *ACM Journal on Responsible Computing*, *1*(1), Article 9. https://doi.org/10.1145/3636509

Wang, F., Zhang, Z., Ho, L. C. J., & Usman, M. (2023). CFO Gender and Financial Statement Comparability. *Pacific Basin Finance Journal*, *80*, 102100. https://doi.org/10.1016/j.pacfin.2023.102100

Wang, L., Zhou, Y., Sanders, K., Marler, J. H., & Zou, Y. (2024). Determinants of Effective HR Analytics Implementation: An In-depth Review and a Dynamic Framework for Future Research. *Journal of Business Research*, *170*, 14312. https://doi.org/10.1016/j.jbusres.2023.114312

Wen, H., Fang, J., & Gao, H. (2023). How FinTech Improves Financial Reporting Quality? Evidence From Earnings Management. *Economic Modelling*, *126*, 106435. https://doi.org/10.1016/j.econmod.2023.106435

Wu, J. S., & Zhang, I. X. (2019). Mandatory IFRS Adoption and the Role of Accounting Earnings in CEO Turnover. *Contemporary Accounting Research*, *36*(1), 168-197. https://doi.org/10.1111/1911-3846.12428

Yadav, S., Samadhiya, A., Kumar, A., Luthra, S., & Pandey, K. K. (2024). Environmental, Social, and Governance (ESG) Reporting and Missing (M) Scores in the Industry 5.0 Era: Broadening Firms' and Investors' Decisions to Achieve Sustainable Development Goals. *Sustainable Development*, *33*(3) 3455-3477. https://doi.org/10.1002/sd.3306

Yarmoliuk, O., Abramov, A., Mulyk, T., Smirnova, N., & Ponomarova, N. (2024). Digital Technologies in Accounting and Reporting: Benefits, Limitations, and Possible Risks. *Revista Amazonia Investiga*, *13*(74), 323-333. https://doi.org/10.34069/ai/2024.74.02.27

Zhang, C., Zhu, W., Dai, J., Wu, Y., & Chen, X. (2023). Ethical Impact of Artificial Intelligence in Managerial Accounting. *International Journal of Accounting Information Systems*, *49*, 100619. https://doi.org/10.1016/j.accinf.2023.100619

Zhang, F., Liu, Z., Feng, F., & Li, J. (2024). Can FinTech Promote Enterprises' Ambidextrous Innovation Capability? Organizational Resilience Perspective. *Finance Research Letters*, *68*. https://doi.org/10.1016/j.frl.2024.105994

Zhang, W. (2024). Ethical Dilemmas in Accounting: A Comprehensive Analysis of Professional Ethics. *Academic Journal of Business & Management*, *6*(2). https://doi.org/10.25236/ajbm.2024.060220

Zhang, Z., & Wang, F. (2023). Managerial Short-Termism and Financial Statement Comparability. *Accounting and Finance*, *63*(5), 5027-5067. https://doi.org/10.1111/acfi.13138

Zhou, G. (2021). Research on the Problems of Enterprise Internal Audit Under the Background of Artificial Intelligence. *Journal of Physics: Conference Series*, *1861*(1). https://doi.org/10.1088/1742-6596/1861/1/012051

Zhu, H., & Wu, H. (2014). Assessing the Quality of Large-Scale Data Standards: A Case of XBRL GAAP Taxonomy. *Decision Support Systems*, *59*(1), 351-360. https://doi.org/10.1016/j.dss.2014.01.006

Zhu, S. (2021). Audit and Technology. In *Proceedings. 2021 3rd International Conference on Machine Learning, Big Data and Business Intelligence, MLBDBI 2021* (pp. 745-749). IEEE. https://doi.org/10.1109/MLBDBI54094.2021.00145

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