

AI Governance in the Digital Age: Recognizing Challenges and Determining Future Directions

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Abstract

The surge of organizational documents presenting ethical principles regarding artificial intelligence (AI) usage leads to rising demand for applying these principles through AI governance (AIG). Research on AIG continues to grow fast while staying mostly fragmented. The main purpose of this review is to synthesize the AIG literature in organizational contexts by identifying its research themes and knowledge gaps as well as putting forward future agendas. The current conceptualization of AIG receives analysis through systematic literature review to establish new research paths for both academic and applied fields. The review adopts established systematic review guidelines through implementation of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework.

The review results were in line with the former assumption that AIG is an emerging research topic with a lack of explicit definitions. In addition, review pointed out four topics in the Literature of the AIG: Technology, stakeholders and context, regulation and processes. Unsolved central knowledge gaps that emerged were the lack of understanding how AIGs would be implemented, insufficient attention to AIG context, uncertainty how effective ethical principles and regulation would be, and how AIG process would be operated. The study then presents four future AIG agendas: technical, stakeholder and contextual, regulatory, and process. Professional practitioners need to understand that training combined with stakeholder management skills and senior management commitment within organizational culture remain vital according to this research. The study demonstrates how practitioners must deliver training while working with stakeholders to develop a proper AI governance framework which depends on their organization's culture.

Key words: Artificial intelligence, corporate governance, AI governance, AI and ethics.

Introduction

Artificial Intelligence (AI) has transformed both economy and industrial operations along with social structures following the development of AI technology across digital environments. AI systems keep becoming both more advanced and influential so AI governance needs to be implemented properly than ever before. A comprehensive structured governance structure becomes essential because the problems with transparency and accountability together with bias and ethical issues and regulatory oversight require careful management when deploying AI systems. The absence of strong regulatory measures allows unintended negative effects to conceal the beneficial transformations of AI systems. These negative outcomes include discriminatory algorithmic systems and privacy

breaches alongside societal breakdown. The study explores current changes in AI governance and covers essential problems and development paths for creating a balanced AI system which combines innovative breakthroughs with social security through ethical and lawful procedures.

Changes in AI governance result directly from accelerating advancements made in artificial intelligence technologies. The worldwide movement for establishing regulatory standards constitutes a primary emerging pattern to achieve ethical AI implementations. The European Union's AI Act serves alongside the OECD AI Principles and the U.S. Blueprint for an AI Bill of Rights together as international models which seek to protect both innovation and ethical standards (European Commission, 2021; OECD, 2019; White House, 2022). Businesses focus increasingly on transparent and explorable decision systems for AI because they understand the importance of making AI processes comprehensible to their stakeholders (Floridi & Cowls, 2019). Tech companies now actively establish their own AI ethics guidelines to minimize government intervention in the field of technology (Maas, M.M., 2019). AI governance has started adopting a multi-stakeholder model that brings together policymakers and industry leaders as well as ethicists alongside civil society organizations during decision-making operations (Mökander & Floridi, 2022).

The biggest issue facing AI governance consists of discriminatory and biased behaviors arising from algorithms. When AI systems receive training through biased datasets they maintain social inequalities that cause discriminatory results in hiring, lending and law enforcement processes (Buolamwini & Gebru, 2018). The current legal and ethical challenge of holding AI systems responsible for their harmful actions constitutes a major problem because we cannot determine who is accountable when AI systems cause harm (Kuner, 2021). AI-driven surveillance along with predictive analytics has become a primary challenge for data security because these technologies infringe human rights (Zuboff, 2019). AI governance creates geopolitical tension because major powers like the U.S. and China attempt to become leaders in this field through separate regulatory methods (Schmitt & Hadfield, 2022).

AI governance recognition exists as a necessity even though numerous essential challenges continue to unfold. Multinational AI firms face substantial regulatory issues because different jurisdictions lack uniform standards which produces jurisdictional disparities that complicate their international business operations (Cath, 2018). Lawmakers face a challenge because AI innovation progresses intensively which outpaces the ability of laws to adapt to new technology advancements (Brynjolfsson & McAfee, 2017). The resolution of moral issues in AI choice generation remains ongoing because organizations need advanced governance approaches to establish suitable equilibrium between AI system performance and human rights defense (Mittelstadt et al., 2016). The future adoption of AI systems faces risks because the lack of effective governance mechanisms leads people to develop growing mistrust toward AI technology (Hagendorff 2020).

The main purpose of this review is to synthesize the AIG literature in organizational contexts by identifying its research themes and knowledge gaps as well as putting forward future agendas.

2. Literature Review

2.1. AI Governance

The term AI governance can broadly be described as policies, regulations, and the moral framework in which to develop, deploy, and oversee artificial intelligence systems (Floridi, 2021). With AI technologies becoming more wide spread, the governance structures need to keep pace to deal with the risks and challenges that these systems present and make sure that they bring the maximum benefit for society (Rahwan et al., 2019). In the AI governance system, the digital age provides specific difficulties which include, determining how we can support innovation and encourage regulation, how we can manage ethical risks and how we address the geopolitical aspects (Binns, 2018).

2.2. Regulatory Frameworks and Legal Challenges

There is inconsistency in the global regulatory frameworks in developing ways in which different countries and regions have adopted different approaches towards AI governance. As a part of creating the AI Act, the European Union is working to create a risk based regulatory system for AI in which transparency and accountability are given priority (European Commission, 2021). On the contrary, the United States depends on sector specific

regulations or voluntary guidelines to allow creativity over strict regulatory oversight (Brundage et al., 2020). At the same time, China's AI governance policies stress the state's control and security, as well as data sovereignty (Creemers, 2022). If these variations bring such challenges for regulating healthcare in the absence of harmonisation, as outlined earlier, they also pose difficulties for global AI governance harmonisation as it impedes cross border cooperation and compliance (Yeung, 2019).

2.3. Ethical Considerations and Bias in AI Systems

So far, ethical concerns have remained a core concern when discussing AI governance, especially bias, fairness, and accountability. According to studies, AI models can enclose societal biases which can result in unfair or discriminatory effects (Mitchell et al. 2021). The deployment of unregulated AI systems like this have risk of being biased such as case of biased facial recognition technology that is misidentifying more people in marginalized communities (Buolamwini & Gebru, 2018). The principles of fairness, transparency and explainability at the heart of ethical AI governance frameworks are difficult to uphold since the processes of making decisions with AI are complex (Jobin, Ienca and Vayena, 2019).

2.4. AI Accountability and Transparency

In the OECD AI Principles, transparency, accountability and human oversight in AI systems were advocated for, but in practice, the adoption is varying from one industry to another (OECD, 2019). A group of scholars suggests that explainable AI (XAI) models would go a long way toward making AI decision making process interpretable and auditable (Doshi-Velez & Kim, 2017). However, trade-offs between explainability and performance present technical and ethical dilemmas for policymakers and developers (Lipton, 2018).

2.5 Framework

However, in the context of a bibliometric review, many research gaps exist with regards to AI governance, despite the ever increasing body of literature on that subject. There have been numerous studies existing in the regulatory frameworks, ethical aspects, and governance mechanisms (Floridi, 2021; Jobin, Ienca, & Vayena, 2019). However, the lack of pertinent bibliometric studies to map the intellectual structure, thematic evolution, and emerging trends of AI governance research is significant. In most governance studies, the argument is based on conceptual, legal or ethical lenses without quantitative assessment on the evolution of the field over time (Bryson, 2021).

Furthermore, there is no scientifically established blend of computer science, law, ethics and public policy based on interdisciplinary synthesis within the AI governance research (Binns, 2018). Limited study is done to explore how diverse governance models interact across the geopolitical spaces, and how the harmonization of the AI regulation between geospatial areas like the European Union, the United States and China (Brundage et al., 2020). Moreover, the evolution of ethical AI principles is well discussed in the previous studies, however, the empirical studies conducted to ascertain the actual impact of AI regulations and the governance structures to a field application scale are quite few (Whittlestone et al., 2019).

These gaps can be addressed by a bibliometric review of AI governance research that helps identify key research clusters, prominent publications, citation networks, and emerging themes. This will give us an understanding of how the field has evolved, with a focus on those areas given the least attention so far and the next direction for research in the field. This study uses scientometric methods, mainly co-citation analysis, thematic mapping, and keywords co-occurrence analysis to fill the gaps of the existing research literature and provides an overall perspective towards AI governance in the digital era.

This study investigates the following questions to determine its outcomes.

RQ1. What are the current publication and collaboration trends in AI governance field?

RQ2. Who are the leading contributors and contributions in this domain?

RQ3. Which themes emerge as the most influential?

RQ4. What are the Challenges in AI governance field?

3. Methodology

Research groups are able to analyze related findings and have the possibility to systemize the previous research results of existing projects employing different literature investigation methods. Bibliometrics is probably the most advanced methodology to structure scientific inquiry using statistical principles and research regulations (Diodato, 1994; Pritchard 1969; Broadus, 1987) New evaluation techniques can be introduced by using R-based tools for bibliometric analysis, which can contribute to improve the objectivity on the assessment of research data beyond classical methods (Aria & Cuccurullo, 2017). It offers a full study of the research trends in a related field so that the scholars can recognize the major authors, the leading institutions and the most active nations involved in this area (Farrukh et al., 2020; Zupic & Cater, 2015).

To investigate the growth pattern and intellectual structure of research on the AI governance in the digital era, this study is conducted based on data gathered by using bibliometrics analysis. This study attempts to understand emerging trends, research gap, and key contributions in the domain of AI governance through application of bibliometric techniques like co-citation analysis, keyword mapping, and thematic evolution. Based on the findings, findings will offer a structured reference for future administrative systems, ethical debates, and strategy suggestions in that critical field.

3.1 Data Selection Approach

To maintain a rigorous and structured way to select data, this study adhered to the PRISMA model (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) which is expressed in Figure 1. PRISMA is an evidence-based reporting guideline with which it systematically describes the stages that the researcher needs to follow in the execution of a systematic review or meta-analysis. PRISMA has been endorsed by a number of organizations as a standardized framework to realize transparency, replicability and completeness of systematic reviews of literature.

The flow chart in accordance with the PRISMA serves to guide the systematic review process followed in the study. Moreover, it depicts the stepwise refinement of the dataset starting from the identification phase where 3,741 records were retrieved from the Scopus database. 690 records were excluded before screening which included 7 duplicates and 683 records published before 2017. As a result, 3,051 records entered the screening phase.

Of these reports, 1,038 records were discarded out of screening relevance (including the TSC database), leaving 2013 records to be retrieved. At this stage 975 records were removed as it was restricted to journal articles only. Next, the eligibility assessment evaluated 1,033 studies, which were excluded due to three of the following criteria: 1) 123 in press articles, 2) 892 studies without suitable keywords, and 3) 16 non-English reports. Finally, 206 studies were included in the final review, and high relevance and methodological rigor was ensured. In this process, a thorough screening strategy is indicated which shows it screened the high quality literature of the study.

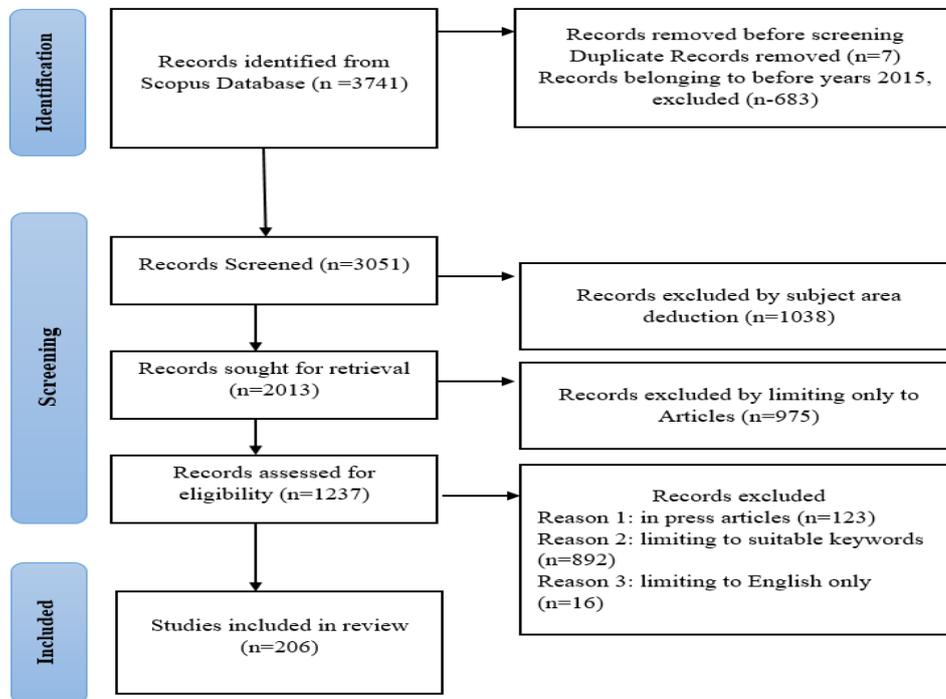
3.2 Data Analysis Tools

Bibliometric mapping and network visualization was performed by employing the VOSviewer software (Van Eck and Waltman, 2010, 2011). Using VOSviewer, co citation and bibliographic coupling networks can be constructed that show the relation between publications in a visual form. The tool is widely known for its capability to analyze large bibliometric datasets and to detect essential research patterns; it was created in Leiden University.

Furthermore, Bibliometrix R package (Aria & Cuccurullo, 2017) was employed to help in bibliometric data analysis and visualization. Bibliometrix provides a solid framework for analyzing co-citation network, citation based analysis, theme evolution study. It provides out of the box extraction and processing of data from major academic databases like Web of Science and Scopus, guarantees workflow reproducibility, and helps a user to manage large scale bibliographic datasets. The integration with Bibliometrix also adds bibliometric capabilities to further extend its capabilities to create dynamic visual displays, which are able to create real-time research environment assessment (Zupic & Čater, 2015). Considering the increasing significance of bibliometric studies,

Bibliometrix offers researchers a complete and methodical tool to conduct data driven literature analysis in different fields of the academic research.

Figure-1: PRISMA Framework



Source: Authors own

4. Results and Discussion

4.1 Current Publication and Collaboration Trends

This section has made an effort to answer the following predetermined research question

RQ1. What are the current publication and collaboration trends in AI governance field?

4.1.1 Analysis of Publication Trend

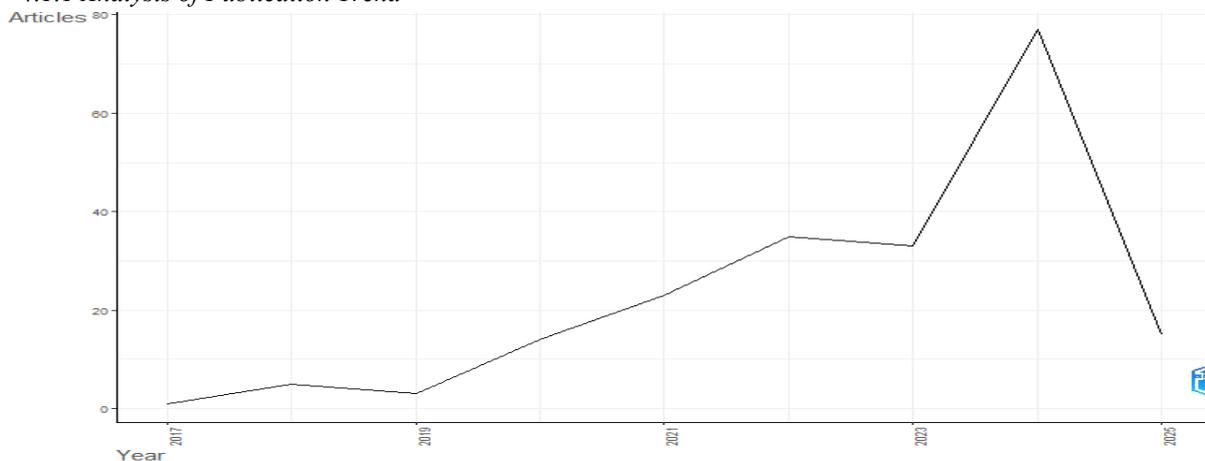


Figure 2: Publication trend

Source: Authors own using Bibliometrix R

Figure-2, shows the academic interest increase and decrease patterns in the AI Governance in the Digital Age. Scholarly studies about AI governance challenges were recorded consistently from 2017 all the way to 2021. The number of published articles on AI regulation, ethics and policies peaked at 77 in 2024, spanning the years 2022 and 2024, thus bringing them into the spotlight of the worldwide attention. In 2025, the decrease means there has been no additional research interest, or research has been prioritized, or data have not yet been collected.

Emerging regulatory approaches and ethical problems, along with rapidly developing AI, make the pattern that AI governance has become more important. Perhaps this surge came with global policy changes that had combined with legal arbitration to manage such guidelines worldwide in AI governance in 2024. After the fad of the 2025 research decline subsides, researchers may have to figure out what implementation methods and practical applications may be necessary for the foundational research that has reached its limit. Identifying research gaps in resolving such challenges requires understanding the changes of the importance of AI across time, while indicating future research demands in regards to open, unanswered AI governance challenges.

4.1.2 Analysis of global scientific production

REGION	FREQ.
USA	77
UK	54
GERMANY	44
NETHERLANDS	36
AUSTRALIA	32
ITALY	24
CHINA	22
SWITZERLAND	22
FINLAND	21
IRELAND	15

Table I: Top ten countries of scientific production in AI governance research

Source: Authors own using Bibliometrix R

Geographically speaking, there is a strong concentration of scholarly knowledge on AI governance produced by developed economies; USA (77), UK (54), Germany (44); if these are ranked by publication output. Some of these nations have good policies for AI (policy), regulations (regulation), and academic institutions discussing AI governance (discourse). While also making evident EU's stance on AI ethics and governance, other European nations like the Netherlands (36), Italy (24), Switzerland (22) and Finland (21) similarly make noteworthy contributions.

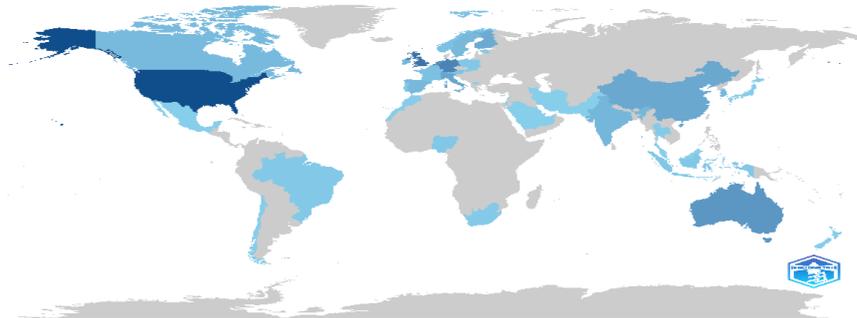


Figure 3: Countries scientific production in AI governance research

Source: Authors own using Bibliometrix R

Research engagement also emerges from China (22), India (14) and South Korea (13) with probable reason that they have now entered fast track technology and look to become AI driven economy. While the African, Latin American, Middle Eastern countries have some contributions, their contributions are comparatively low, hence a research gap exists on AI governance in developing regions. One of the areas where the current representation is limited is the number of nations represented at the table: There are five Nigerian, four Brazilian, and three South African representations in the current discussions. It could provide future research with a means to expand the regional contributions of their studies to include the perspective of underrepresented economies, in order to create more global AI governance frameworks.

4.1.3 Analysis of Most Relevant sources of AI governance research

Figure 4, presents the most frequently cited academic sources relevant to the research. *AI & Society* (14 citations) – This journal, which is leading in citations, focuses on the societal and ethical dimensions of artificial intelligence, aligning well with discussions on AI governance. *Internet Policy Review* (11 citations) – This journal, a key source in internet governance, digital regulation, and policy, which directly relates to AI governance frameworks. *Technology in Society* (9 citations) – This journal focuses on how technology affects social structures, making it a vital source for AI governance and its societal implications. *Computer Law and Security Review* (7 citations) – This source emphasizes AI legal frameworks, cybersecurity, and regulatory concerns, which are core elements of governance. *Minds and Machines* (6 citations) – A journal that discusses the philosophy and ethics of AI, providing theoretical perspectives on governance. Other relevant sources include *Communication Research and Practice*, *Ethics and Information Technology*, and *Government Information Quarterly*, which suggest an interdisciplinary approach to AI governance, combining policy, ethics, security, and societal impact.

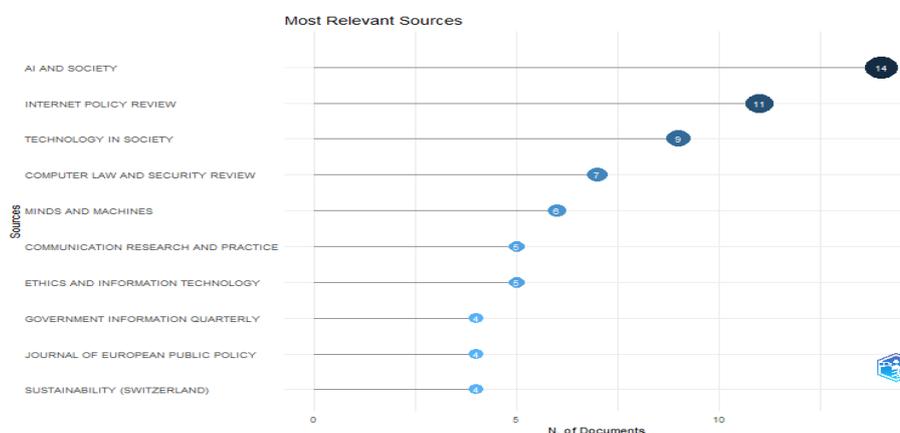


Figure 4: Most Relevant sources

Source: Authors own using Bibliometrix R

4.1.4. Analysis of Global Collaboration

Figure 5, depicts the global distribution of AI governance research and collaboration primarily on the USA, UK and European nations. In this regard, the USA has the highest research activity, with Germany, Netherlands, and Switzerland standing out as other leading nations involved in efforts of shaping AI governance, ethics, and regulation. There is evidence of strong collaboration links between North America and Europe in the matter of AI policy frameworks. There are emerging contributors from China, India, South Korea, and Australia, which signals Asia-Pacific emerging as an important site for the governance of AI. As China's research corresponds to its development in AI regulation, Australia and India may be more inclined to research on ethical issues, legal frameworks and digital transformation policies.

Despite worldwide cooperation, there is little Africa, Latin America, and parts of Middle East are represented, pointing out a research area of AI governance at developing economies. While Brazil, Nigeria and Qatar do contribute, AI policy research primarily is done in the West and some other parts of Asia. The uneven distribution across regions makes it necessary that the AI governance frameworks be inherently inclusive and take account of those from underrepresented regions. With the evolution of AI, it is critical to receive global collaborative efforts apart from the Western nations to have ethical, fair, and effective global AI policies.

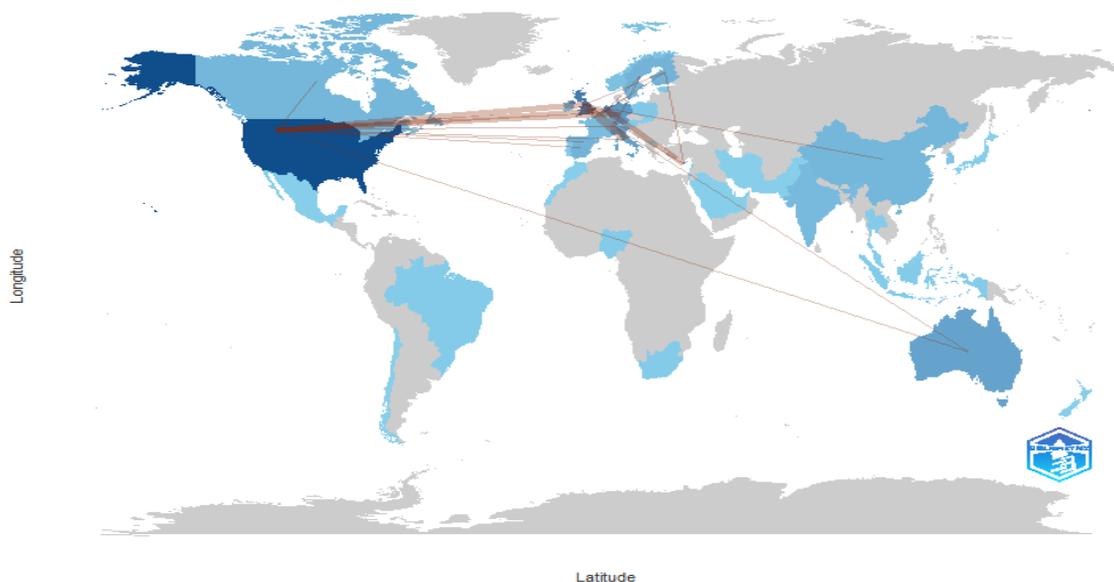


Figure 5: Global Collaboration

Source: Authors own using Bibliometrix R

4.2 Leading contributors and contributions

This section has made an effort to answer the following predetermined research question

RQ2. Who are the leading contributors and contributions in this domain?

4.2.1 Relevant Contributors

The visualization points out, within the authors that are most relevant in the research on AI governance, the most productive authors which by specialization on the most papers produced in the field are: Luciano Floridi with six documents; and also Keith Miller and Igor Nikolic with three and two documents respectively. A well known scholar of AI ethics and governance and SBP, Floridi's research (with a broad range of outlook) is important to understand the problems of AI governance. Other significant contributors are Stahl BC and Taddeo M, both of whom have four documents, that may explore ethical, legal and policy implications of AI. For instance, Fontes C,

Hine E, and Lutge C each had three contributions to various other documents on the issue of AI governance, e.g. trust, accountability or regulatory frameworks.

The strong presence of few key scholars puts forward that a concentrated work has been done to put the regional voice on vested AI governance discourse, by philosophers, lawyers, policy experts and others. More than one contributor and two or three publications suggest that the field is growing, with different perspectives of contributors being included. While Floridi has an outsized lead, it is striking that the broadband of AI governance commentary is defined not only by the usual suspects but by only a few authors, undeniably indicating that much more of the scholarly community, particularly from under resourced regions and inter disciplinary fields, needs to get in on the conversation. With the advancements in the industry, inclusivity and universality of the frameworks entirely depend on broadening the coverage of the research sample, while addressing the challenges.

Table-II: Relevant Contributors

Authors	Articles	Articles Fractionalized
FLORIDI L	6	1.642857143
STAHL BC	4	1.383333333
TADDEO M	4	0.892857143
FONTES C	3	0.833333333
HINE E	3	0.892857143
LÜTGE C	3	0.833333333
ROBERTS H	3	0.55952381
ANTONIOU J	2	0.333333333
BUHMANN A	2	1
CARTER D	2	2

Source: Authors own using Bibliometrix R

4.2.2 Corresponding Authors' Countries

It shows an analysis of the countries where corresponding authors of AI governance research are from, with the USA, the United Kingdom, and the Netherlands having a large share. It is clear that the highest number of publications is owned by the USA, while UK trails closely thereafter, implying that people in the Western world are the ones to lead in the debate on AI governance. Moreover, strong research activity is also observed in Australia, Italy, and Germany, indicating that AI governance is becoming a topic of interest worldwide. In almost all cases, the Single Country Publications (SCP) are higher, which implies that a large proportion of research is being carried out on individual country levels (rural or urban) as opposed to international collaboration. Nevertheless, the Multiple Country Publications (MCP) contributions highlight some cross-border collaborations, especially in European countries, which implies the attempt of international AI governance frameworks.

Contributors such as China, India, and Brazil indicate the participation of emerging economies in the AI governance research, though their contribution is relatively low than the Western countries. Single country studies for AI governance create issues in establishing globally inclusive AI policies as AI governance involves having cross national regulatory alignment, ethical considerations and standardization. With a relatively low number of MCPs, therefore, there is a need to enhance conversations on AI governance across national boundaries, by not only including more countries in discussions, but also enabling participation from all regions and groups who will be impacted by the moral, legal, and technological frameworks AI will set for the digital age. In order to tackle AI's hard governance questions well, we will need to strengthen global research collaborations.

Table-III: Corresponding Authors' Countries

Country	Articles	Articles %	SCP	MCP	MCP %
USA	22	10.6796117	20	2	9.09090909
UNITED KINGDOM	21	10.1941748	14	7	33.3333333
NETHERLANDS	13	6.31067961	10	3	23.0769231
AUSTRALIA	12	5.82524272	10	2	16.6666667
ITALY	12	5.82524272	6	6	50
GERMANY	9	4.36893204	6	3	33.3333333
SPAIN	8	3.88349515	6	2	25
SWEDEN	8	3.88349515	6	2	25
SWITZERLAND	8	3.88349515	7	1	12.5
CHINA	6	2.91262136	6	0	0

Source: Authors own using Bibliometrix R

4.3 Themes that emerge as the most influential

This section tries answer the following predetermined research question

RQ3. Which themes emerge as the most influential?

4.3.1 Co-Occurrence Analysis

Figure 6, is the visualization co-occurrence network (visualization produced using VOSviewer) of most frequently observed keywords in AI governance research. The central terms are "Artificial Intelligence", "Artificial Intelligence (AI)" which highlights their prominence in discussions related to governance, ethics and technology. As its closely linked terms like 'ethical technology' 'algorithmic governance' 'data privacy' 'accountability' suggest, AI governance is largely focused on ethical frameworks, transparency and ways related to regulating AI. If 'fundamental rights,' 'social justice,' and 'philosophical aspects' are present then it means governance debates are equally intertwined with legal and human rights considerations, reinforcing the overarching societal ramifications of AI.

The resulting clusters of network allow us to see that AI governance cuts into distinct thematic areas. It seems that blue cluster cares about ethical AI and basic human rights, research ethics, political economy, and co-regulation. The green cluster highlights accountability, algorithmic governance and democracy, illuminating how accountability and democracy are possible through 'transparent' (or accountable) AI decision making. There is a red cluster which is highly technology oriented and incorporates machine learning, deep learning and digital public administration, in which it seeks to illustrate AI's place in public administration. These keywords are closely interconnected signifying that AI governance in the digital revolution is a transdisciplinary challenge since policymaking, technological practices, and ethical responsibilities need to be addressed by policymakers, technologists and ethicists jointly in the presence of the emerging regulatory gaps, ethical dilemmas, and societal impacts of AI driven technologies.

Source: Authors own using Bibliometrix R

4.3.4 Trend Topics

This visualization of trend topics (Figure 8), shows the evolution of related key terms of AI governance from 2021 to 2023 and thereby represents a certain focus area of this research domain. The most often repeated and lasting are "artificial intelligence", "ethics", "AI governance", "ethical technology", and "decision making", which corresponds to growing interest in the ethical repercussions, regulatory realm, and decision mechanisms of AI. In addition, artificial intelligence had the highest term frequency, implying that the discourse around governance has been closely linked to that of synthetic intelligence in general.

The emergence of "Ethical technology" and "AI governance" as dominant topics in 2023 is a reflection of central governance framework that is policy driven and driven by ethical considerations related to deployment of AI. Moreover, "governance approach" and "philosophical aspects" turn out as less commonly appearing but constantly occurring themes, suggesting that the academic community starts paying more attention to various philosophical and strategic aspects of AI regulation. Given terms such as humans, decision-making, these terms indicate that research into governance of AI is advancing direction towards human centered AI policies, concerning accountability, fairness and social impact. When it comes to this trend on the whole, it indicates that AI has begun to stir more and more in certain ethical technology, decision making frameworks and regulatory approaches, and this calls for addressing AI governance challenges increasingly urgently.

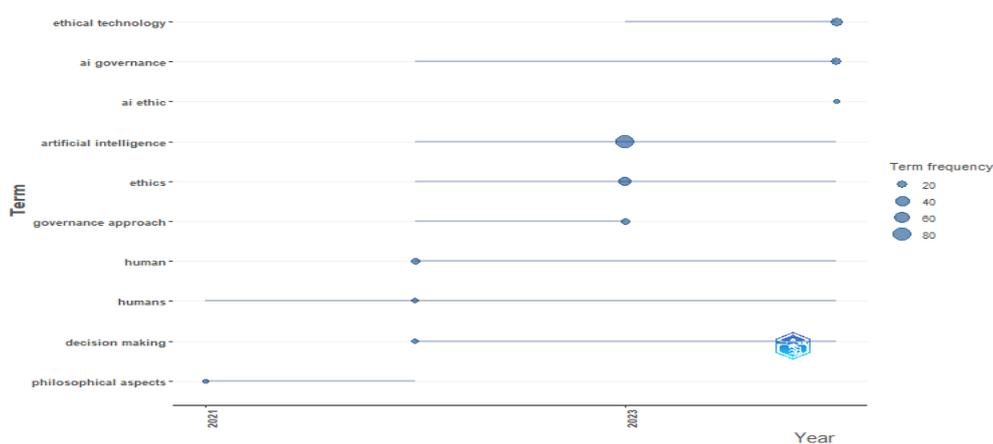


Figure 8: Thematic Analysis

Source: Authors own using Bibliometrix R

4.4 Challenges in AI Governance

This section attempts to answer the following predetermined research question

RQ4. What are the challenges in AI governance field?

It shows that there are many challenges in the field of AI governance through keyword co-occurrence, thematic mapping, author contribution, country collaboration and trending topics. These are grouped as ethical concerns, regulatory gaps, complex decision making and governance approaches.

1. Ethical and Transparency Issues

The deployment of AI is one of the dominant areas of worry in AI governance because of the ethical consequences. The keyword co-occurrence network (Figure 3) highlights "ethical technology," "AI ethics," "accountability," and "transparency" as central themes. To ensure ethical AI, one must deal with the problem of bias and fairness and privacy (Floridi, 2019). Ethics, decision making and governance approaches are placed as fundamental themes in

thematic maps (Figure 4), indicating that although these topics have been frequently discussed, their implementation into practical decision making is a challenge (Stahl et al., 2022).

2. Regulatory and Policy Gaps

Governance challenge: There are no standardized regulations for the countries. Moreover, the authors of Brundage et al., (2020) discuss strong AI governance research output from the US, the UK and the Netherlands, but no global regulatory consensus (as depicted in the corresponding author's countries chart in Figure 2). Moving on to the trend analysis (Figure 5), their discussions on AI governance and ethics in AI have been noticed to increase lately, indicating awareness is gradually growing while policy frameworks are yet to be fully developed (Taddeo & Floridi, 2018).

3. Decision-Making Complexity and Accountability

Problems related to responsibility and explain ability are involved in all these, given decision making is done by AI. This challenge is manifested in the growing attention of both communities as explored in the trend topics visualization (Figure 5) of growing interest for "decision-making" and "governance approaches", for the reasons that it is important to AI systems to stay interpretable and accountable (Mittelstadt et al., 2016). Figure 4 shows the thematic map algorithmic transparency and human oversight in the emerging themes quadrant suggesting that the governance framework of these topics are relatively new (Zeng et al. 2021).

4. Global Collaboration and Power Dynamics

The representation from developing countries is minimal in the collaboration map (Figure 2) which shows that the research on AI governance is mostly from Western countries. This indicates power asymmetries with shaping AI policies and points out that AI governance should be inclusive and equitable (Whittlestone et al., 2019). In other parts of the world, the lack of distribution of multiple-country publications (MCP) implies the fragmentation of the global AI policy discourse (Jobin et al., 2019).

5. Conclusion and Future Research Directions

However, governing Artificial Intelligence (AI) in our modern era digital has multifarious challenges that range from ethical to regulatory gaps, decision making complex to the varying degrees of global collaboration (Brundage et al., 2020; Floridi & Cowls, 2021). Both co-occurrence and thematic mapping analyses on the keyword of AI governance show that this area is developing, yet is standardizing and globally aligned to a degree (Jobin et al., 2019). Mittelstadt (2019) describes ethical concerns of transparency, accountability and fairness as central in the governance discourse. However, currently, the regulation of AI has been fragmented in various countries (Fjeld et al., 2020) in that they differ in their regulatory policies. Moreover, there are challenges in decision making in AI systems, which include algorithmic explainability and human oversight (Zerilli et al., 2019). In addition, it has been demonstrated that there is an unequal representation of developing nations in influencing AI policy dynamics and therefore biased governance frameworks are produced (Cath, 2018).

Solving these challenges is a multidisciplinary undertaking, involving technological innovation, legal frameworks, and ethical considerations (Moses, 2021). Binns (2018) noted that existing AI governance initiatives have yet to find an effective way to achieve the founding principles while existing AI governance initiatives offer the first principle (Binns, 2018). Given the importance of transparency, inclusiveness, and adaptability for governance mechanisms — insurance in balancing technology and societal well being (Bryson, 2019).

Future Research Directions

Future research on AI governance should prioritize the development of globally coordinated governance frameworks capable of responding to the transnational nature of artificial intelligence. Existing regulatory efforts remain fragmented across jurisdictions, which limits their capacity to address cross-border challenges associated with data flows, platform power, algorithmic deployment, and accountability. Accordingly, scholarship should examine the feasibility of harmonized regulatory architectures that extend beyond national boundaries and support greater interoperability among legal and institutional systems. Further attention is also required for multi-

stakeholder governance arrangements that integrate governments, private sector actors, technical communities, and civil society into more inclusive policy processes. In parallel, future studies should address persistent geopolitical and institutional asymmetries by exploring mechanisms through which underrepresented regions, particularly those in the Global South, can participate more substantively in shaping international AI governance agendas.

A second major direction concerns the strengthening of ethical governance mechanisms within AI systems and the institutions that oversee them. Although ethical principles such as fairness, accountability, transparency, and non-discrimination are widely recognized, their operationalization remains uneven and underdeveloped. Future research should therefore focus on advancing robust methods for bias detection and mitigation, as well as on designing governance instruments that ensure meaningful accountability across the AI lifecycle. Greater scholarly attention is also needed on algorithmic transparency and explainability, particularly in relation to whether users, regulators, and affected communities can adequately interpret the logic and consequences of automated decisions. Beyond technical concerns, research should engage more deeply with the broader societal, moral, and philosophical implications of AI governance, including how governance structures shape notions of autonomy, justice, trust, and human agency in digitally mediated societies.

Another critical avenue for future inquiry lies in narrowing the gap between AI policy formulation and the pace of technological advancement. One of the persistent weaknesses in the current literature is the limited availability of empirically grounded evidence regarding how governance principles are implemented in real-world organizational contexts. Future studies should therefore expand the use of case-based and comparative analyses of AI governance practices across industries, sectors, and regulatory environments. Such work would provide a stronger basis for evaluating the effectiveness of existing policy proposals and identifying which regulatory instruments produce measurable improvements in transparency, safety, compliance, and public trust. At the same time, research should examine dynamic and adaptive regulatory models capable of responding to the rapid evolution of AI technologies, since static governance approaches are unlikely to remain effective in environments characterized by continuous technical change.

Future scholarship should also address the emerging governance challenges generated by recent advances in AI, particularly those associated with generative AI, deepfakes, large-scale foundation models, and autonomous systems. These developments introduce new ethical, legal, and societal risks that extend beyond the scope of earlier governance frameworks, including risks related to misinformation, manipulation, authorship, responsibility, and the erosion of epistemic trust. Research is therefore needed to clarify how governance systems can respond to such novel dilemmas while preserving innovation and public value. In addition, more work should investigate the implications of AI for democracy, privacy, and human rights, especially in contexts involving surveillance, political communication, and automated decision-making in public institutions. Finally, future studies should examine the relationship between AI governance and sustainability by assessing how AI intersects with climate change policies, environmental justice, and sustainable development objectives. This line of inquiry is necessary for ensuring that AI governance evolves not only as a mechanism of control and compliance, but also as a framework for socially responsible and ecologically aware technological development.

Practical Implications

The discovery recognizes the pressing need for proactive AI governance frameworks that incorporate ethical, legal, and technical factors to guard against irresponsible AI rollout. Therefore, policymakers need to create standardized global regulation to solve different individual regulations and organizations need to employ transparent AI oversight mechanisms to improve accountability and fairness (Floridi & Cowls, 2021; Jobin et al., 2019). For businesses deploying AI, bias mitigation, algorithmic transparency and explainability should be at the top of the list to encourage public trust and compliance with everchanging regulations (Mittelstadt, 2019). In addition, AI governance should be inclusive (Bryson, 2019; Cath, 2018), and pertain to a plurality of stakeholders coming from government, private sector, academia and civil society, in order to establish multi stakeholder governance models. Continuously conduct research, collaborate and adapt policy to address AI governance challenges in order to achieve AI technologies that align with human values, the law and well being of society.

Given the dynamic, adaptive & globally coordinated governance that AI calls for; as it develops, risks must be mitigated whilst its benefits are maximized for the benefit of society. (A) Thus, a balanced approach that combines the technology with ethical responsibility shall be crucial to assure that AI becomes a force for good in the Digital Age (Brundage et al., 2020).

References

1. Ain, N.U., Vaia, G., DeLone, W.H. and Waheed, M. (2019), “Two decades of research on business intelligence system adoption, utilization and success – a systematic literature review”, *Decision Support Systems*, Vol. 125, doi: 10.1016/j.dss.2019.113113.
2. Al Zadjali, H. (2020), “Building the right AI governance model in Oman”, *Proceedings of the 13th International Conference on Theory and Practice of Electronic Governance*, pp. 116-119, doi: 10.1145/3428502.3428516.
3. Aliman, N.-M. and Kester, L. (2019), “Extending socio-technological reality for ethics in artificial intelligent systems”, *Proceedings of the 2019 IEEE International Conference on Artificial Intelligence and Virtual Reality*, IEEE, pp. 275-282, doi: 10.1109/AIVR46125.2019.00064.
4. Aliman, N.-M., Kester, L. and Werkhoven, P. (2019), “XR for augmented utilitarianism”, *Proceedings of the 2019 IEEE International Conference on Artificial Intelligence and Virtual Reality*, IEEE, pp. 283-285, doi: 10.1109/AIVR46125.2019.00065.
5. Bu, Q. (2021), “The global governance on automated facial recognition (AFR): ethical and legal opportunities and privacy challenges”, *International Cybersecurity Law Review*, Vol. 2 No. 1, pp. 113-145, doi: 10.1365/s43439-021-00022-x.
6. Buenfil, J., Arnold, R., Abruzzo, B. and Korpela, C. (2019), “Artificial intelligence ethics: governance through social media”, *Proceedings of the 2019 IEEE International Symposium on Technologies for Homeland Security*. doi: 10.1109/HST47167.2019.9032907.
7. Buhmann, A. and Fieseler, C. (2021), “Towards a deliberative framework for responsible innovation in artificial intelligence”, *Technology in Society*, Vol. 64, doi: 10.1016/j.techsoc.2020.101475.
8. Cihon, P., Maas, M.M. and Kemp, L. (2020), “Should artificial intelligence governance be centralised? Design lessons from history”, *Proceedings of the 2020 AAAI/ACM Conference on AI, Ethics, and Society*, pp. 228-234, doi: 10.1145/3375627.3375857.
9. Cihon, P., Schuett, J. and Baum, S.D. (2021), “Corporate governance of artificial intelligence in the public interest”, *Information (Switzerland)*, Vol. 12, p. 7, doi: 10.3390/info12070275.
10. Corbin, J. and Strauss, A. (2014), *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*, 4th ed., Sage Publications, Los Angeles, CA.
11. de Almeida, P.G.R., dos Santos, C.D. and Farias, J.S. (2021), “Artificial intelligence regulation: a framework for governance”, *Ethics and Information Technology*, Vol. 23 No. 3, pp. 505-525, doi: 10.1007/s10676-021-09593-z.
12. Dignum, V. (2020), “Responsibility and artificial intelligence”, in Dubber, M.D., Pasquale, F. and Das, S. (Eds), *The Oxford Handbook of Ethics of AI*, Oxford University Press, pp. 213-231. doi: 10.1093/oxfordhb/9780190067397.013.12.
13. Domanski, R.J. (2019), “The A.I. pandorica: linking ethically-challenged technical outputs to prospective policy approaches”, *Proceedings of the 20th Annual International Conference on Digital Government Research*, pp. 409-416, doi: 10.1145/3325112.3325267.
14. Erdélyi, O.J. and Goldsmith, J. (2018), “Regulating artificial intelligence: proposal for a global solution”, *Proceedings of the 2018 AAAI/ACM Conference on AI, Ethics, and Society*, pp. 95-101, doi: 10.1145/3278721.3278731.
15. Fjeld, J., Achten, N., Hilligoss, H., Nagy, A. and Srikumar, M. (2020), “Principled artificial intelligence: mapping consensus in ethical and rights-based approaches to principles for AI”, available at: <https://ssrn.com/abstract=3518482> (accessed 3 June 2022).
16. Floridi, L., Cowls, J., Beltrametti, M., Chatila, R., Chazerand, P., Dignum, V., Luetge, C., Madelin, R., Pagallo, U., Rossi, F., Schafer, B., Valcke, P. and Vayena, E. (2018), “AI4People—an ethical framework for a

- good AI society: opportunities, risks, principles, and recommendations*”, Minds and Machines, Vol. 28 No. 4, pp. 689-707, doi: 10.1007/s11023-018-9482-5.
17. Gasser, U. and Almeida, V.A.F. (2017), “*A layered model for AI governance*”, IEEE Internet Computing, Vol. 21 No. 6, pp. 58-62, doi: 10.1109/MIC.2017.4180835.
 18. Hickok, M. (2021), “*Lessons learned from AI ethics principles for future actions*”, AI and Ethics, Vol. 1 No. 1, pp. 41-47, doi: 10.1007/s43681-020-00008-1.
 19. Kaminski, M.E. (2019), “*Binary governance: lessons from the GDPR's approach to algorithmic accountability*”, Southern California Law Review, Vol. 92 No. 6, pp. 1529-1616.
 20. Kaplan, A. and Haenlein, M. (2019), “*Siri, Siri, in my hand: who's the fairest in the land? On the interpretations, illustrations, and implications of artificial intelligence*”, Business Horizons, Vol. 62 No. 1, pp. 15-25, doi: 10.1016/j.bushor.2018.08.004.
 21. Kitchenham, B., Pearl Brereton, O., Budgen, D., Turner, M., Bailey, J. and Linkman, S. (2009), “*Systematic literature reviews in software engineering – a systematic literature review*”, Information and Software Technology, Vol. 51 No. 1, pp. 7-15, doi: 10.1016/j.infsof.2008.09.009.
 22. Koniakou, V. (2023), “*From the 'rush to ethics' to the 'race for governance' in Artificial Intelligence*”, Information Systems Frontiers, Vol. 25 No. 1, pp. 71-102, doi: 10.1007/s10796-022-10300-6.
 23. Koulu, R. (2020), “*Human control over automation: EU policy and AI ethics*”, European Journal of Legal Studies, Vol. 12 No. 1, pp. 9-46, doi: 10.2924/EJLS.20i9.oi9.
 24. KPMG (2021), “*The shape of AI governance to come*”, available at: <https://home.kpmg/xx/en/home/insights/2020/12/the-shape-of-ai-governance-to-come.html> (accessed 20 May 2022).
 25. Krijger, J. (2022), “*Enter the metrics: critical theory and organizational operationalization of AI ethics*”, AI and Society, Vol. 37 No. 4, pp. 1427-1437, doi: 10.1007/s00146-021-01256-3.
 26. Laato, S., Mäntymäki, M., Birkstedt, T., Islam, A.K.M.N. and Hyrynsalmi, S. (2021), “*Digital transformation of software development: implications for the future of work*”, in Dennehy, D., Griva, A., Pouloudi, N., Dwivedi, Y.K., Pappas, I. and Mäntymäki, M. (Eds), Responsible AI and Analytics for an Ethical and Inclusive Digitized Society, Springer International Publishing, pp. 609-621, doi: 10.1007/978-3-030-85447-8_50.
 27. Laato, S., Birkstedt, T., Mäntymäki, M., Minkkinen, M. and Mikkonen, T. (2022a), “*AI governance in the system development life cycle: insights on responsible machine learning engineering*”, Proceedings of the 1st Conference on AI Engineering – Software Engineering for AI, ACM, New York.
 28. Laato, S., Tiainen, M., Islam, A.K.M.N. and Mäntymäki, M. (2022b), “*How to explain AI systems to end users: a systematic literature review and research agenda*”, Internet Research, Vol. 32 No. 7, doi: 10.1108/INTR-08-2021-0600.
 29. Landis, J.R. and Koch, G.G. (1977), “*The measurement of observer agreement for categorical data*”, Biometrics, Vol. 33 No. 1, pp. 159-174, doi: 10.2307/2529310.
 30. Larsson, S. (2020), “*On the governance of artificial intelligence through ethics guidelines*”, Asian Journal of Law and Society, Vol. 7 No. 3, pp. 437-451, doi: 10.1017/als.2020.19.
 31. Larsson, S. and Heintz, F. (2020), “*Transparency in artificial intelligence*”, Internet Policy Review, Vol. 9 No. 2, doi: 10.14763/2020.2.1469.
 32. Lee, J. (2020), “*Access to finance for artificial intelligence regulation in the financial services industry*”, European Business Organization Law Review, Vol. 21 No. 4, pp. 731-757, doi: 10.1007/s40804-020-00200-0.
 33. Lysaght, T., Lim, H.Y., Xafis, V. and Ngiam, K.Y. (2019), “*AI-assisted decision-making in healthcare*”, Asian Bioethics Review, Vol. 11 No. 3, pp. 299-314, doi: 10.1007/s41649-019-00096-0.
 34. Mäntymäki, M., Minkkinen, M., Birkstedt, T. and Viljanen, M. (2022a), “*Defining organizational AI governance*”, AI and Ethics, Vol. 2 No. 4, pp. 603-609, doi: 10.1007/s43681-022-00143-x.
 35. Maas, M.M. (2019), “*Innovation-proof global governance for military artificial intelligence? How I learned to stop worrying, and love the bot*”, Journal of International Humanitarian Legal Studies, Vol. 10 No. 1, pp. 129-157, doi: 10.1163/18781527-01001006.

36. Metcalf, J., Moss, E., Watkins, E.A., Singh, R. and Elish, M.C. (2021), “*Algorithmic impact assessments and accountability: the co-construction of impacts*”, Proceedings of the 2021 ACM Conference on Fairness, Accountability, and Transparency, pp. 735-746, doi: 10.1145/3442188.3445935.
37. ÓhÉigeartaigh, S.S., Whittlestone, J., Liu, Y., Zeng, Y. and Liu, Z. (2020), “*Overcoming barriers to cross-cultural cooperation in AI ethics and governance*”, Philosophy and Technology, Vol. 33, pp. 571-593, doi: 10.1007/s13347-020-00402-x.
38. Robles Carrillo, M. (2020), “*Artificial intelligence: from ethics to law*”, Telecommunications Policy, Vol. 44, p. 6, doi: 10.1016/j.telpol.2020.101937.
39. Roski, J., Maier, E.J., Vigilante, K., Kane, E.A. and Matheny, M.E. (2021), “*Enhancing trust in AI through industry self-governance*”, Journal of the American Medical Informatics Association, Vol. 28 No. 7, pp. 1582-1590, doi: 10.1093/jamia/ocab065.
40. Schiff, D., Biddle, J., Borenstein, J. and Laas, K. (2020), “*What's next for AI ethics, policy, and governance? A global overview*”, Proceedings of the 2020 AAAI/ACM Conference on AI, Ethics, and Society, pp. 153-158, doi: 10.1145/3375627.3375804.
41. Sharma, G.D., Yadav, A. and Chopra, R. (2020), “*Artificial intelligence and effective governance: a review, critique and research agenda*”, Sustainable Futures, Vol. 2, doi: 10.1016/j.sfr.2019.100004.
42. Shneiderman, B. (2020), “*Bridging the gap between ethics and practice: guidelines for reliable, safe, and trustworthy human-centered AI systems*”, ACM Transactions on Interactive Intelligent Systems, Vol. 10 No. 4, p. 31, doi: 10.1145/3419764.
43. Sigfrids, A., Nieminen, M., Leikas, J. and Pikkuaaho, P. (2022), “*How should public administrations foster the ethical development and use of artificial intelligence? A review of proposals for developing governance of AI*”, Frontiers in Human Dynamics, Vol. 4, doi: 10.3389/fhumd.2022.858108.
44. Sigov, A., Ratkin, L., Ivanov, L. and Xu, L. (2022), “*Emerging enabling technologies for Industry 4.0 and beyond*”, Information Systems Frontiers. doi: 10.1007/s10796-021-10213-w.
45. Stilgoe, J. (2018), “*Machine learning, social learning and the governance of self-driving cars*”, Social Studies of Science, Vol. 48 No. 1, pp. 25-56, doi: 10.1177/0306312717741687.
46. Stix, C. (2021), “*Actionable principles for artificial intelligence policy: three pathways*”, Science and Engineering Ethics, Vol. 27 No. 1, doi: 10.1007/s11948-020-00277-3.
47. Tandon, A., Dhir, A., Islam, N. and Mäntymäki, M. (2020), “*Blockchain in healthcare: a systematic literature review, synthesizing framework and future research agenda*”, Computers in Industry, Vol. 122, doi: 10.1016/j.compind.2020.103290.
48. Tandon, A., Dhir, A. and Mäntymäki, M. (2021), “*Jealousy due to social media? A systematic literature review and framework of social media-induced jealousy*”, Internet Research, Vol. 31 No. 5, pp. 1541-1582, doi: 10.1108/INTR-02-2020-0103.
49. Tranfield, D., Denyer, D. and Smart, P. (2003), “*Towards a methodology for developing evidence-informed management knowledge by means of systematic review*”, British Journal of Management, Vol. 14, pp. 207-222.
50. Truby, J. (2020), “*Governing artificial intelligence to benefit the UN sustainable development goals*”, Sustainable Development, Vol. 28 No. 4, pp. 946-959, doi: 10.1002/sd.2048.
51. Tsamados, A., Aggarwal, N., Cowls, J., Morley, J., Roberts, H., Taddeo, M. and Floridi, L. (2022), “*The ethics of algorithms: key problems and solutions*”, AI and Society, Vol. 37 No. 1, pp. 215-230, doi: 10.1007/s00146-021-01154-8.
52. Ulnicane, I., Eke, D.O., Knight, W., Ogoh, G. and Stahl, B.C. (2021a), “*Good governance as a response to discontents? Déjà vu, or lessons for AI from other emerging technologies*”, Interdisciplinary Science Reviews, Vol. 46 Nos 1-2, pp. 71-93, doi: 10.1080/03080188.2020.1840220.
53. Webster, J. and Watson, R.T. (2002), “*Analyzing the past to prepare for the future: writing a literature review*”, MIS Quarterly, Vol. 26 No. 2, pp. xiii-xxiii, doi: 10.1.1.104.6570.
54. Wu, W., Huang, T. and Gong, K. (2020), “*Ethical principles and governance technology development of AI in China*”, Engineering, Vol. 6 No. 3, pp. 302-309, doi: 10.1016/j.eng.2019.12.015.

55. Yeung, K. (2018), "*Algorithmic regulation: a critical interrogation*", Regulation and Governance, Vol. 12 No. 4, pp. 505-523, doi: 10.1111/rego.12158.
56. Zhang, B. and Dafoe, A. (2020), "*U.S. public opinion on the governance of artificial intelligence*", Proceedings of the 2020 AAAI/ACM Conference on AI, Ethics, and Society, pp. 187-193, doi: 10.1145/3375627.3375827.