

PROGRAMMING AND MATERIAL DEFECTS IN AI TECHNOLOGIES AS BASES FOR CIVIL LIABILITY: A STUDY WITHIN THE SCOPE OF JORDANIAN LAW AND EU LEGISLATION

Abeer Hassan Al-Qaisi ^{*}, Mohammad Ali Ahmad Alamawi ^{**},
Ma'en Abdel-rahim Abdel-aziz Juwaihian ^{*},
Shadi Meeush D'yab Altarawneh ^{***}, Sayel Mufleh Al-Momani ^{*},
Mohammad Rajai Jaber ^{****}, Ahmad Al-Btoush ^{*****}

^{*} Faculty of Law, Department of Public Law, University of Petra, Amman, Jordan

^{**} Department of Private Law, Al-Ahliyya Amman University, Amman, Jordan

^{***} Corresponding author, Department of Private Law, Al-Ahliyya Amman University, Amman, Jordan

Contact details: Department of Private Law, Al-Ahliyya Amman University, 19111 Amman, Jordan

^{****} Jordan Insurance Company, Amman, Jordan

^{*****} Faculty of Law, Ajloun National University, Ajloun, Jordan



Abstract

How to cite this paper: Al-Qaisi, A. H., Alamawi, M. A. A., Juwaihian, M. A. A., Altarawneh, S. M. D., Al-Momani, S. M., Jaber, M. R., & Al-Btoush, A. (2026). Programming and material defects in AI technologies as bases for civil liability: A study within the scope of Jordanian law and EU legislation. *Corporate Law & Governance Review*, 8(1), 155–161. <https://doi.org/10.22495/clgrv8i1p13>

Copyright © 2026 The Authors

This work is licensed under a Creative Commons Attribution 4.0 International License (CC BY 4.0). <https://creativecommons.org/licenses/by/4.0/>

ISSN Online: 2664-1542

ISSN Print: 2707-1111

Received: 15.09.2025

Revised: 17.12.2025; 07.01.2026

Accepted: 09.02.2026

JEL Classification: K13, K23, K24, L51, O33

DOI: 10.22495/clgrv8i1p13

This paper investigates the material characteristics of artificial intelligence (AI) technologies as a legal foundation for the imposition of civil liability for damages pursuant to Jordanian law and European Union (EU) regulations (Rahman et al., 2024; Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence, 2024). The study problem entails considering AI as an autonomous entity, despite its reliance on software operating within a physical medium, hence questioning the adequacy of existing legal systems. The study aims to assess the sufficiency of current laws in reflecting material reality and to ascertain whether legal accountability should be attributed to AI systems or to the humans responsible for their design, development, and operation. A descriptive, analytical, and comparative approach is employed to examine relevant legislative texts, ethical frameworks, and current European regulatory instruments. The results show that Jordanian law has a glaring vacuum in that it only has non-binding ethical principles. In contrast, the EU has standards that recognize AI technology as a complicated industrial product that can be held liable for defective products. The study indicates that acknowledging the material essence of AI establishes a more cohesive and legally robust framework for civil responsibility, advocating for legislative reform in Jordan in accordance with recent European advancements.

Keywords: Artificial Intelligence, Civil Liability, Material Nature, Jordanian Legislation, European Union Legislation

Authors' individual contribution: Conceptualization — A.H.A.-Q.; Methodology — A.H.A.-Q. and S.M.D.A.; Formal Analysis — A.H.A.-Q. and M.A.A.J.; Validation — M.A.A.A., S.M.D.A., and M.R.J.; Data Curation — M.A.A.J.; Investigation — M.A.A.J. and S.M.D.A.; Resources — S.M.A.-M. and A.A.-B.; Writing — Original Draft — A.H.A.-Q.; Writing — Review & Editing — M.A.A.A., M.R.J., and A.A.-B.; Supervision — M.A.A.A., S.M.D.A., and M.R.J.; Project Administration — S.M.A.-M. and M.R.J.

Declaration of conflicting interests: The Authors declare that there is no conflict of interest.

1. INTRODUCTION

There is still a very clear line between real people and AI systems, even though some people have tried to blur it. Tech gadgets that use artificial intelligence (AI) are not smart enough to have real human personalities. It is a type of intelligence that thinks like people but not exactly like people (European Parliament resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics, 2017; Lu & Tie, 2025). This distinction is important not only from a technological perspective but also from a legal standpoint, as attributing human-like qualities to AI could create significant challenges in civil liability frameworks (Alhrerat & Altarawneh, 2024). An explicit analytical framework is applied to assess the effectiveness of Jordanian and European Union (EU) legislation in addressing AI-related harms, using criteria such as enforceability, coverage of AI defects, and clarity of operator liability (Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence, 2024; Jordanian Ministry of Digital Economy, 2020).

At the moment, AI systems can only do certain things on their own, even if they can learn on their own by remembering what they did in the past and changing how they act in similar situations in the future. Having legal personality or the legal rights that come with it, like being able to make choices or being financially independent, is not the same thing. Legal independence is also not a reason to give someone legal personality (Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence, 2024; Akpan, 2025). The distinction between autonomy in operation and legal autonomy is crucial, as it directly affects the allocation of responsibility in cases of damage or malfunction. In other words, AI devices still need software that works with a real medium. AI systems are more like complicated industrial goods than they are like different legal entities because they depend on physical things (Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence, 2024). Seeing these technologies as separate from their physical base creates big law problems when it comes to figuring out who is responsible for damages caused by their use (Wang, 2019; Al-Hawamdeh & Alhasan, 2024). Contemporary scholarship emphasizes the need to evaluate AI liability through agency models and algorithmic accountability frameworks (Pagallo, 2022; Wendehorst, 2022; Awaisheh, 2023). This approach clarifies the distinction between AI as a product and as a service, reinforcing human responsibility. This underlines the necessity of analyzing AI within the framework of existing civil liability principles, where the focus is on human actors who design, operate, or maintain these systems.

Legal research has always looked at AI systems as a single, physical thing. Some researchers think that AI systems should be given their own legal identity and rights. This would be the first step toward holding the systems themselves civilly

responsible instead of the people who planned, built, or ran them (European Parliament resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics, 2017). However, this approach is debated extensively in scholarly literature, with contrasting views on whether AI can truly assume legal obligations independent of human oversight.

This study looks at how true these principles are by breaking down AI systems into their basic parts and how they work. To achieve this, we need to find the best legal system for handling the civil responsibility that comes from using AI technologies. The research emphasizes not only the material constitution of AI systems but also the interaction between technology, ethics, and civil law, particularly in the Jordanian and European contexts.

Limited studies evaluate both Jordanian and EU frameworks in a comparative manner, leaving a gap in understanding enforceable civil liability standards for AI. The aim of this study is to evaluate whether Jordanian and EU legislation adequately address AI-related harms and propose recommendations for enforceable liability standards in Jordan.

The study aims to answer the following research questions:

RQ1: To what extent do Jordanian and EU legislations reflect the material reality of AI technologies?

RQ2: How are civil liability mechanisms applied to damages arising from AI defects?

RQ3: What legal frameworks or reforms can improve accountability for AI technologies in Jordan based on the EU experience?

This paper is important for lawyers because it looks at different regulatory frameworks for AI systems. It uses the EU as an example to show how future legislative changes could be made in Jordan. This is especially important because Jordan is still in the early stages of making a full set of laws for AI (Al-Dabbas, 2024). Instead of making rules that everyone must follow, the country has mostly focused on giving moral advice. Understanding the gap between non-binding ethical principles and enforceable legal standards is crucial for crafting effective regulatory mechanisms. The study recommends establishing enforceable liability standards in Jordan, drawing on EU best practices to ensure accountability and legal certainty for AI developers and operators (Lu & Tie, 2025; Al-Hmesat et al., 2025).

The rest of the paper is structured as follows. Section 2 reviews the literature. Section 3 presents the methodology used. Section 4 provides and discusses the main results. Section 5 concludes the paper.

2. LITERATURE REVIEW

The theoretical background of this study is grounded in product liability theory, risk allocation theory, and the material conception of technology in civil law. These approaches treat artificial intelligence technologies as material products rather than autonomous legal subjects, emphasizing the attribution of liability to natural or legal persons involved in design, programming, manufacturing, and operation. Recent legal scholarship stresses that

AI systems should be analyzed within existing liability frameworks governing defective products and technological risks, rather than through the creation of artificial legal personality (Wendehorst, 2022; Hacker & Passoth, 2022; Pagallo, 2022). The material nature of AI is therefore central to understanding how civil liability can be effectively imposed, as legal systems traditionally allocate responsibility based on the tangible objects and the actors controlling them, rather than on the intelligence embedded within software (Al-Maayta & Al-Afif, 2024).

Recent studies underscore that comprehending AI in the context of civil responsibility necessitates the amalgamation of ethical guidance with enforceable legal requirements, especially in nascent jurisdictions such as Jordan (Jordanian Ministry of Digital Economy, 2020).

By recognizing AI as a complex material product, this approach enables the legal system to address real-world harm without overextending legal personhood. Scholars argue that such a perspective helps maintain accountability while avoiding speculative legal constructs that could complicate enforcement (Farajpour & Gunkel, 2025). This focus also aligns with risk management practices, where human actors remain responsible for foreseeable risks associated with product use, including AI technologies.

2.1. The extent of consistency between Jordanian legislation, EU legislation, and the material nature of AI technologies

AI technologies rely on intelligent software built upon advanced algorithms, which endow AI with the ability to process data, learn from experiences, and interact within its operational environment. Operating this software requires a physical medium—such as servers, computers, or other devices—that constitutes the material substrate necessary for AI functionality (Custers et al., 2025; Farajpour & Gunkel, 2025). Without this material base, AI systems cannot function independently, which reinforces the argument that legal responsibility should rest with human actors rather than the systems themselves.

This confirms the significance of the study's research enquiries into the alignment of existing legal frameworks with the tangible realities of AI technologies and the corresponding distribution of civil liability (Awaishah et al., 2024).

Accordingly, AI technologies exist within their material environment much like the human mind exists within the body; while a computer does not inherently possess the ability to think, it can perform thinking tasks when programmed accordingly (Rahman et al., 2024). This analogy underlines the material dependency of AI and highlights the importance of examining legislative frameworks in light of this reality.

This section examines the extent to which Jordanian legislation and EU law have succeeded in accommodating the material nature of artificial intelligence technologies. The analysis addresses, first, the legal nature of AI technologies in each jurisdiction, and second, the legislative treatment of these technologies under the respective legal frameworks. This dual perspective enables

a comparative evaluation, identifying strengths, weaknesses, and gaps in civil liability approaches (Al-Qaisi et al., 2026).

2.2. The extent to which Jordanian legislation accommodates the material nature of AI technologies

2.2.1. Legal nature of AI technologies in Jordanian legislation

In Jordan, no distinction has been made between AI itself and its underlying technologies. AI is defined as: "The use of digital technology to create systems capable of performing tasks that mimic human mental capacities and operational patterns, analyzing the surrounding environment, learning from mistakes to make forecasts or predictions, provide recommendations, make decisions, or undertake actions that affect real or virtual environments with a degree of autonomy" (Jordanian Ministry of Digital Economy, 2020, p. 12).

However, the Jordanian Civil Code and other laws do not recognize intelligence as an element of legal personality. AI alone is insufficient to confer independent legal personality upon AI technologies, whether in relation to the legal personality enjoyed by a natural person and the attendant rights intrinsically linked to human nature, such as capacity. This includes both the capacity to hold independent financial assets and legal capacity, which is based on elements that cannot be attributed to AI technologies, such as the age of majority and maturity, as well as incapacity conditions like insanity, mental infirmity, folly, and negligence (Civil Code No. 43 of 1976, 1976, Articles 43–46). The absence of legal recognition for AI highlights a legislative gap that leaves responsibility primarily with humans who operate, develop, or maintain these technologies (Jordanian Ministry of Digital Economy, 2020).

Furthermore, AI alone is insufficient to confer upon AI technologies the legal personality—whether judicial, legal, or moral—that the law grants to certain groups of persons or entities, along with the rights attendant to such personality, including the capacity necessary to perform legal functions, the possession of independent financial assets, and the entitlement to litigation capacity (Al-Maayta & Al-Afif, 2024).

Indeed, the Jordanian civil legislator has not granted judicial persons the rights inherent to natural human attributes; therefore, it is even less appropriate for AI technologies, which fundamentally lack both natural and judicial legal personality, to enjoy such rights (Civil Code No. 43 of 1976, 1976, Article 50). This conceptual clarification is critical for assessing the scope and limits of civil liability in the Jordanian context.

2.2.2. Legislative treatment of AI technologies in Jordanian law

Jordan suffers from a clear legislative gap regarding the regulation of AI and its technologies. The country remains at the stage of non-binding guidelines; the Jordanian government issued the National Charter for AI Ethics in 2022. This

charter includes a number of ethical principles and guidelines for the responsible use of AI technologies, such as fairness, non-discrimination by avoiding bias towards certain data sets over others, inclusiveness, respect for data privacy, transparency in decision-making, reliability, accountability, integrity, and green intelligence (environmental protection). It also contains principles related to the virtual environment, scientific research ethics in AI, risks arising from non-compliance with these ethics, and other principles that promote the rule of law, human rights, democratic values, and diversity (Jordanian Ministry of Digital Economy, 2020).

In the absence of specific regulatory laws for AI technologies, the Civil Code remains the most relevant legal framework for governing relationships related to AI technologies. This approach aligns with the European Parliament resolution of 12 February 2019 on a comprehensive European industrial policy on artificial intelligence and robotics (2019). Earlier, the European Parliament issued a resolution on 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics, which similarly emphasized human accountability in AI use.

AI programs, as products of the human mind, are classified under intellectual property rights within Jordanian civil law. They are subject to the provisions of relevant laws, such as the Patents Law of 1999, the Trademark Protection Law of 1952, the Copyright and Related Rights Protection Law of 1992, and the Industrial Drawings and Designs Law of 2000 (Civil Code No. 43 of 1976, 1976, Article 71). Jordanian electronic legislation addresses the concept of software and its operators. Article 2 of the Jordanian Cybercrime Law of 2023 defines software as: "A set of technical commands and instructions designed to perform a task executable by information systems or any means of information technology". Similarly, the Personal Data Protection Law No. 24 of 2023 (2023) defines the data controller or processor as: "A natural or legal person authorized to process data", while the Electronic Transactions Law No. 15 of 2015 (2015) defines the originator as: "The person who creates or sends the information message".

By distinguishing AI programs as intangible things separate from the physical medium required for their operation, AI technologies remain tangible things confined to their material substrate (Wang et al., 2021). Legally, what matters is the safety and operational reliability of these products, not their degree of intelligence, which places AI squarely within the framework of civil liability for physical objects (Government of Jordan, 1976, Article 291).

The operation and application of AI programs to a given technology transform such technologies into industrial products characterized by highly advanced and complex capabilities, including autonomous learning and self-functioning. Consequently, these technologies are subject to the Jordanian Law No. 7 of 2017 on Consumer Protection if marketed directly to consumers. Additionally, developers, programmers, and manufacturers can be classified as "producers" under Jordanian law (Law No. 7 of 2017 on Consumer Protection, 2017, Article 2).

2.2.3. Civil liability for AI technologies in Jordanian legislation

The Jordanian National Charter for AI Ethics of 2022 emphasizes that non-compliance with AI ethics can result in various risks and harms — health-related, psychological, social, legal, human rights, environmental, and economic. Such harms include violations of human dignity or rights, defamation, spreading false information, or contributing to societal instability. The charter explicitly assigns responsibility and accountability to natural persons involved in AI technologies (The Ministry of Digital Economy and Entrepreneurship [MODEE], n.d.).

The Jordanian civil legislator differentiates between physical objects requiring special care and those that do not. AI technologies, due to their autonomous capabilities, qualify as self-moving machines requiring strict care. Consequently, liability arises automatically upon the occurrence of harm (strict liability). Responsibility extends to defects in programming, design, marketing, or operational environment, except in cases of force majeure (Law No. 7 of 2017 on Consumer Protection, 2017, Articles 6(b)(2), 20, and 21). This framework ensures that human actors remain fully accountable for damages, reflecting the material basis of AI.

2.3. The extent to which EU legislation accommodates the material nature of AI technologies

2.3.1. The legal status of AI technologies in EU laws

The European Council's 2018 Ethics Guidelines for Trustworthy AI were the first EU rules addressing AI use. The EU Artificial Intelligence Act of 2024 made compliance mandatory. AI systems are defined as machine-based systems capable of varying degrees of autonomy, self-learning, and output generation from input data (Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence, 2024; Council of Europe, 2024, Article 2). Article 3 of the EU AI Act and Article 2 of the European Framework Convention on AI confirm that AI technologies do not possess legal personality (European Parliament resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics, 2017).

Some recent studies (Lu & Tie, 2025; Akpan, 2025) have highlighted the importance of integrating ethical guidance with enforceable legal requirements in order to comprehend AI within the context of civil liability. This is especially important in developing jurisdictions which are Jordan.

2.3.2. How European laws treat AI technologies

The EU regulates AI through a single, integrated framework covering digital products, intellectual property, and defective products. Article 4(1) of Directive (EU) 2024/2853 of the European Parliament and of the Council of 13 March 2024, on liability for defective products, establishes strict liability for AI and digital systems. A product is defective if it fails safety standards, lacks interoperability, or cannot adapt over time.

New commentary (Hacker & Passoth, 2022) emphasises that it is essential for modern artificial intelligence systems to incorporate interoperability and adaptability into defect definitions. This is because these criteria have a direct impact on civil liability.

European legislation applies both subjective and objective bases of liability.

Subjective: The EU AI Act classifies AI systems into five risk categories: prohibited, high-risk, general/systemic risk, limited risk, and minimal danger. Developers and operators must follow specific obligations; breaches result in personal liability (Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence, 2024, Articles 5, 6, and 51).

Current research (Hacker, 2023) suggests that risk-based classification is an effective method for bringing legal responsibility into alignment with the material reality and possible effects of AI.

Objective: Article 7 of Directive (EU) 2024/2853 of the European Parliament and of the Council of 13 March 2024 on liability for defective products enforces strict liability for defective AI products. Court cases, such as the Regional Court of Kiel, Germany (Judgment of February 29, 2024 — 6 O 151/23, Kiel Regional Court, 2024), confirm that AI cannot shield operators from civil responsibility for harm caused by its outputs.

Researchers (Pagallo, 2022) assert that objective liability safeguards impact parties, even in instances of unpredictable AI system behaviour, underscoring material and operational responsibilities.

This framework emphasizes human accountability while acknowledging the complexity and material characteristics of AI systems. It provides a legal model that balances technological innovation with safety and liability standards.

Comparative research by Al-Hmesat et al. (2025) indicates that EU approaches may serve as benchmarks for Jordan, especially in establishing enforceable responsibility norms and risk-based oversight procedures.

3. RESEARCH METHODOLOGY

This study adopts a descriptive, analytical, and comparative methodology to examine the material nature of AI technologies and their treatment under Jordanian and EU legislation. The research is primarily qualitative, focusing on legislative texts, ethical frameworks, and existing regulatory instruments.

Descriptive approach: Documents the material characteristics of AI technologies and their legal recognition in Jordan and the EU. This includes analyzing statutory texts, national charters, EU directives, and regulations concerning defective products and civil liability.

Analytical approach: Evaluates the effectiveness of legal frameworks in addressing civil liability for damages caused by AI systems. The analysis considers both subjective and objective bases of liability, the degree of operator accountability, and the adequacy of ethical principles in preventing harm.

Comparative approach: Compares Jordanian and EU legislation to identify gaps, strengths, and opportunities for reform. This includes examining

the differences in legal personality recognition, enforcement mechanisms, and specific obligations imposed on developers, manufacturers, and operators.

Alternative methods: Doctrinal legal analysis, case studies of AI-related damages, and empirical review of court rulings were considered to complement the main methodology.

The methodology also emphasizes validation and verification. Cross-checking of legislative texts, academic literature, and court rulings ensures the reliability of findings. The study integrates formal analysis of legal provisions, case study assessment, and expert commentary to provide a robust evaluation.

Additionally, data curation and evidence collection included reviewing ethical guidelines, parliamentary resolutions, and academic papers addressing AI liability, focusing on publications between 2017 and 2025. These activities ensure that the study accounts for both emerging regulations and the current state of civil liability frameworks.

This methodology is designed to answer the research questions presented in the introduction and provide a detailed, systematic evaluation of civil liability issues related to AI, ensuring both practical relevance and academic rigor.

4. RESULTS AND DISCUSSION

The research indicated that both Jordanian and European legal systems uniformly classify AI technologies as tangible things rather than autonomous legal entities. This distinction is essential for the allocation of civil culpability, as legal responsibility resides with human agents rather than the AI systems themselves.

In Jordan, AI does not possess legal personality and is regulated mainly by civil law principles, ethical guidelines, and relevant specialized legislation concerning intellectual property, consumer protection, and electronic transactions. AI programs are categorized as intangible products, with liability assigned to the individuals or entities engaged in their design, programming, production, or operation. Although ethical guidelines offer broad directives for acceptable AI utilization, they are non-binding and lack effective accountability systems.

Within the EU, AI systems are acknowledged as machine-based technologies possessing autonomous capabilities, although without legal personality. They are governed by regulations and legislation, including Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence and Directive (EU) 2024/2853 of the European Parliament and of the Council of 13 March 2024 on liability for defective products, which enforces strict accountability for defective AI devices. These agreements delineate explicit responsibilities for developers, operators, and providers, thereby augmenting legal certainty and safeguarding affected parties.

The comparative research reveals a considerable disparity between Jordanian and EU systems. Jordan predominantly depends on ethical standards and ordinary civil law, which may prove inadequate for ensuring accountability in intricate and growing AI systems. Conversely, EU legislation

offers a systematic and legal framework, categorizing AI systems based on risk categories and establishing requirements commensurate with possible harms.

This analysis verifies that civil liability frameworks in both jurisdictions focus on the material and operational characteristics of AI technology, rather than ascribing autonomy or legal personhood to the systems. In Jordan, liability adheres to a stringent framework for autonomous machines, underscoring the imperative of constant oversight and diligence by operators. EU laws enhance this by incorporating risk-based obligations and explicit enforcement mechanisms.

The results indicate that addressing the legislative gap in Jordan necessitates an integration of ethical principles, technical standards, and operational control, consistent with best practices identified in the EU. Rectifying these deficiencies can enhance accountability for AI developers and operators, ensuring that civil liability regimes effectively safeguard users and third parties from possible harms.

The findings offer a thorough insight into the impact of material, operational, and regulatory aspects on civil liability concerning AI. The report compares Jordanian and EU approaches, providing practical insights for enhancing legal frameworks in Jordan and contributing to the worldwide dialogue on AI accountability.

5. CONCLUSION

This study examined the extent to which Jordanian legislation and the legal framework of the EU align with the material nature of AI technologies and the corresponding aspects of civil liability arising from damages caused thereby. The analysis was conducted through two main axes.

The first axis focused on the extent to which the Jordanian and European legislative frameworks comprehend the material nature of such technologies. With respect to Jordanian law, the study revealed significant shortcomings in the current legislative treatment of AI technologies in light of their material characteristics. Conversely,

the EU legal framework demonstrated a more coherent evolution, marked by the enactment of specific legal provisions tailored to the technical nature of these technologies.

The second axis addressed the legal bases of civil liability arising from defects in AI technologies, whether programming-related, operational, or stemming from physical malfunctions.

The study distinguished between objective and subjective bases of liability under both Jordanian and European laws. In particular, Directive (EU) 2024/2853 of the European Parliament and of the Council of 13 March 2024 on liability for defective products exemplified a qualitative legislative development, recognizing the material nature of software and intelligent systems and establishing precise obligations upon relevant actors. Moreover, the study identified potential legal foundations under Jordanian law for holding such technologies accountable, in accordance with their material characteristics.

Implications of the results are acknowledging that the material essence of AI technologies ensures a more coherent legal framework for civil liability. It emphasizes that responsibility should primarily rest with the human actors involved in the design, development, and operation of AI systems, rather than on the technologies themselves.

The study is limited to legislative and regulatory texts of Jordan and the EU. It does not include empirical cases outside these jurisdictions or practical enforcement outcomes, which may affect the generalizability of the findings.

Future research could expand to comparative studies including additional jurisdictions, empirical analysis of AI-related liability cases, and the development of comprehensive models for regulating AI technologies that integrate ethical, technical, and legal considerations.

The study concluded with a strong recommendation to develop Jordanian legislation in a manner that aligns with the advancements of European legal instruments, in order to ensure effective legal protection against the risks posed by AI.

REFERENCES

- Akpan, M. (2025). Generative artificial intelligence and the future of financial forecasting: Evidence from large language models. *Risk Governance and Control: Financial Markets & Institutions*, 15(4), 142-153. <https://doi.org/10.22495/rgcv15i4p13>
- Al-Dabbas, N. (2024). The scope and procedures of the expert recusal in the arbitration case: A fundamental analytical study in accordance with Jordanian law. *Al-Balqa Journal for Research and Studies*, 27(2), 291-306. <https://doi.org/10.35875/t99vfb66>
- Al-Hawamdeh, A., & Alhasan, T. (2024). Smart robots and civil liability in Jordan: A quest for legal synthesis in the age of automation. *The Jordanian Journal of Law and Political Science*, 16(2). <https://doi.org/10.35682/jjpls.v16i2.743>
- Al-Hmesat, M. M., Albloush, A., Lasassmeh, O., Albuaainai, E. S. A., Al Graibeh, A. M. A., & Altarawneh, H. M. (2025). The impact of digital transformation strategy on human resource development in commercial banks [Special issue]. *Risk Governance & Control: Financial Markets & Institutions*, 15(1), 215-225. <https://doi.org/10.22495/rgcv15i1sip7>
- Alhrerat, K., & Altarawneh, M. (2024). Introducing insolvency crimes and the demise of bankruptcy crimes in Jordanian legislation: An analytical study. *Al-Balqa Journal for Research and Studies*, 27(1), 92-114. <https://doi.org/10.35875/1105.027.001.007>
- Al-Maayta, S., & Al-Afif, I. (2024). The legal nature of the crime of environmental terrorism in accordance with international law. *The Jordanian Journal of Law and Political Science*, 16(2). <https://doi.org/10.35682/jjpls.v16i2.669>

- Al-Qaisi, A. H., Abu Elzeet, R. N., Heif, M. K., Altarawneh, S. M. D., Aldaoud, L. Y., & Altarawneh, M. H. (2026). Electoral justice in Jordan: Judicial oversight of appeals between legitimacy and participation. *Laws*, 15(1), Article 4. <https://doi.org/10.3390/laws15010004>
- Amoush, A. H. (2025). Impact of artificial intelligence applications in reducing fraud diamond in commercial banks: A governance context [Special issue]. *Journal of Governance and Regulation*, 14(4), 332-341. <https://doi.org/10.22495/jgrv14i4siart10>
- Awaisheh, S. M. (2023). Digital justice in Jordan: The role of virtual arbitration sessions in modernizing the legal system. *International Journal of Cyber Criminology*, 17(1), 146-155. <https://cybercrimejournal.com/menu-script/index.php/cybercrimejournal/article/view/159/58>
- Awaisheh, S. M., Alkhamaiseh, M. A., Al-Maagbeh, M. M., Khalailah, L., Khreisat, M. K., & AlAtiyat, M. (2024). Artificial intelligence and its impact on administrative decision-making. *Journal of Human Security*, 20(1), 99-103. <https://jhumansecurity.com/menu-script/index.php/jhe/article/view/205>
- Civil Code No. 43 of 1976, Jordan. (1976). WIPO. <https://www.wipo.int/wipolex/en/legislation/details/2612>
- Council of Europe. (2024). *Framework Convention on Artificial Intelligence and Human Rights, Democracy and the Rule of Law* (Council of Europe Treaty Series No. 22). <https://rm.coe.int/1680afae3c>
- Custers, B., Lahmann, H., & Scott, B. I. (2025). From liability gaps to liability overlaps: Shared responsibilities and fiduciary duties in AI and other complex technologies. *AI & Society*, 40(5), 4035-4050. <https://doi.org/10.1007/s00146-024-02137-1>
- Cybercrime Law of 2023. (2023). Jordan Open Source Association (JOSA). <https://www.josa.ngo/publications/33>
- Directive (EU) 2024/2853 of the European Parliament and of the Council of 13 March 2024 liability for defective products and repealing Council Directive 85/374/EEC. (2024). *Official Journal of the European Union*, L(2024/2853). <http://data.europa.eu/eli/dir/2024/2853/oj>
- Electronic Transactions Law No. 15 of 2015. (2015). <https://cyrilla.org/api/files/17304080885323zn57fdluck.pdf>
- European Parliament resolution of 12 February 2019 on a comprehensive European industrial policy on artificial intelligence and robotics (2018/2088(INI)). (2019). *Official Journal of the European Union*, C 449, 37-58. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=oj:JOC_2020_449_R_0007
- European Parliament resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics (2015/2103(INL)). (2017). *Official Journal of the European Union*, C 252, 239-257. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52017IP0051>
- Farajpour, R., & Gunkel, D. J. (2025). Legal and comparative analysis of civil liability of artificial intelligence in automated decision-making. *AI and Tech in Behavioral and Social Sciences*, 3(1), 168-176. <https://doi.org/10.61838/kman.aitech.3.3.4>
- Hacker, P. (2023). The European AI liability directives: Critique of a half-hearted approach and lessons for the future. *Computer Law & Security Review*, 51, Article 105871. <https://doi.org/10.1016/j.clsr.2023.105871>
- Hacker, P., & Passoth, J.-H. (2022). Varieties of AI explanations under the law: From the GDPR to the AIA, and beyond. In A. Holzinger, R. Goebel, R. Fong, T. Moon, K.-R. Müller, & W. Samek (Eds.), *xxAI - Beyond explainable AI* (Vol. 13200, pp. 343-373). Springer. https://doi.org/10.1007/978-3-031-04083-2_17
- Jordanian Ministry of Digital Economy. (2020). *Jordan digital transformation strategy*. https://modee.gov.jo/EBV4.0/Root_Storage/EN/1/Jordan_Digital_Transformation_Strategy_2020_English_Unofficial_Translation.pdf
- Kim, B.-J., Jeong, S., Cho, B.-K., & Chung, J.-B. (2025). AI governance in the context of the EU AI Act. *IEEE Access*, 13, 144126-144142. <https://doi.org/10.1109/ACCESS.2025.3598023>
- Law No. 7 of 2017 on Consumer Protection, Jordan. (2017). WIPO. <https://www.wipo.int/wipolex/en/legislation/details/19690>
- Lu, Y., & Tie, F. H. (2025). A comparative analysis of artificial intelligence regulation in ASEAN and the European Union [Special issue]. *Journal of Governance and Regulation*, 14(4), 401-411. <https://doi.org/10.22495/jgrv14i4siart16>
- Pagallo, U. (2022). The politics of data in EU law: Will It succeed? *Digital Society*, 1, Article 20. <https://doi.org/10.1007/s44206-022-00021-3>
- Personal Data Protection Law No. 24 of 2023. (2023). MODEE. https://www.modee.gov.jo/EBV4.0/Root_Storage/EN/1/PDP_Law_-_English_Version_-_official_translation.pdf
- Rahman, M., Khatoonabadi, S., Abdellatif, A., Samaana, H., & Shihab, E. (2024). The impact of environment configurations on the stability of AI-enabled systems. In M. A. Babar, A. Tosun, Wagner, S., & V. Stray (Eds.), *EASE '25: Proceedings of the 29th International Conference on Evaluation and Assessment in Software Engineering* (pp. 512-523). Association for Computing Machinery. <https://doi.org/10.1145/3756681.3756953>
- Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence and amending Regulations (EC) No 300/2008, (EU) No 167/2013, (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1139 and (EU) 2019/2144 and Directives 2014/90/EU, (EU) 2016/797 and (EU) 2020/1828 (Artificial Intelligence Act). (2024). *Official Journal of the European Union*, L(2024/1689). <http://data.europa.eu/eli/reg/2024/1689/oj>
- The Ministry of Digital Economy and Entrepreneurship (MODEE). (n.d.). MODEE presents the draft of *National Charter on the Ethics of (AI) for general consultation*. https://www.modee.gov.jo/EN/NewsDetails/MODEE_presents_the_draft_of_the_national_charter_on_the_ethics_of_AI_for_general_consultation
- Urteil vom 29.02.2024 — 6 O 151/23, LG Kiel [Judgment of February 29, 2024 — 6 O 151/23, Kiel Regional Court]. (2024). OpenJur. <https://openjur.de/u/2497511.html>
- Wang, L. (2019). The influence of high-tech product complexity on the technological innovation of high-tech industry. In *Proceedings of the 2019 4th International Conference on Financial Innovation and Economic Development (ICFIED 2019)* (pp. 225-229). Atlantis Press. <https://doi.org/10.2991/icfied-19.2019.41>
- Wang, L., Liu, Z., Liu, A., & Tao, F. (2021). Artificial intelligence in product lifecycle management. *The International Journal of Advanced Manufacturing Technology*, 114(3), 771-796. <https://doi.org/10.1007/s00170-021-06882-1>
- Wendehorst, C. (2022). Liability for artificial intelligence. In S. Voeneke, P. Kellmeyer, O. Mueller, & W. Burgard (Eds.), *The Cambridge handbook of responsible artificial intelligence* (pp. 187-209). Cambridge University Press. <https://doi.org/10.1017/9781009207898.016>