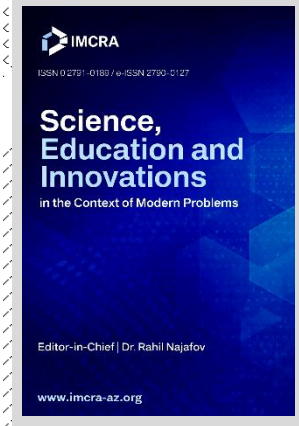

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RESEARCH ARTICLE

Civil Liability for Damages Caused by Artificial Intelligence Systems: A Comparative Study

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Abstract

This study addresses the issue of civil liability for damages caused by artificial intelligence systems, which is one of the most pressing legal challenges in light of the rapid proliferation of smart technologies and the increasing reliance of individuals and institutions on them across various fields. The study begins by questioning the adequacy of civil liability rules—both contractual and tortious—in addressing the material, moral, economic, and social damages caused by systems characterized by complexity, self-learning, and multiple actors in their technical chain, which complicates the issues of fault allocation and establishing causation. The study adopts a comparative approach to analyze liability models adopted in selected legal systems from Europe, the Americas, and some Arab countries, focusing on fault-based normative models, strict liability models, and conciliatory approaches that balance litigation with technical expertise. In this context, it examines the liability of the manufacturer, developer, operator, and service provider, as well as the mechanisms for sharing liability among them. The study also addresses the types of harm associated with artificial intelligence systems, the standards of verification and assessment (reasonable care, causation, technical liability), and the role of mediation, arbitration, and specialized insurance contracts in alleviating the burden of proof and providing effective compensation to victims, The study concludes by highlighting the need for a flexible and comprehensive legislative framework that draws on comparative experiences and balances the protection of victims with the promotion of innovation, through a reconsideration of the foundations of liability and rules of evidence, and the establishment of standards for transparency, safety, and governance of AI systems.

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1. Introduction

Civil liability for damages resulting from artificial intelligence systems is a topic of paramount importance within the context of ongoing technological development. These systems have become an integral part of various economic and social sectors, necessitating a clear legal framework to address potential damages arising from them. Legal systems vary across countries in adopting different models regarding AI liability. Some countries adopt standard models based on general or strict liability, while others rely on a balance between adhering to accountability principles and considering the

evolving technological aspects. The importance of this study lies in analyzing the legal literature and practical applications to classify damages associated with these systems. These damages are primarily divided into material and moral damages, economic damages, and the social and ethical risks they pose with their increasing use. The study also highlights the need to identify the legal foundations governing liability, such as contractual and tortious liability, while examining how liability overlaps and is shared among various parties, such as producers, operators, and developers. Furthermore, proving damages and adopting precise standards to verify the extent of party liability requires considering the elements of care, causation, and negligence, in addition to continuously updating technical standards to keep pace with technological advancements. Rapid developments in the field of artificial intelligence (AI) also highlight the importance of out-of-court settlement procedures, such as mediation and arbitration, as well as the need for appropriate insurance tools to mitigate related risks. All of this reflects the challenges facing public policy, as data protection, transparency, and error response require flexible and adaptable regulatory frameworks. The need for a sophisticated legal framework that respects individual privacy and rights, and balances innovation with accountability, is evident. This framework aims to establish clear foundations for enhancing trust in AI systems and effectively mitigating their potential harms.

1.1 Problem Statement

The central problem of this study revolves around the adequacy of civil liability rules in addressing the diverse damages resulting from autonomous and learning AI systems. The problem is further complicated by the variation in legal models, ranging from normative and strict liability to technical-judicial approaches. This necessitates a comparative study of their suitability for protecting victims while simultaneously encouraging innovation. Therefore, the following questions arise:

To what extent are traditional civil liability rules (contractual and tortious) adequate for addressing damages resulting from AI systems in the selected legal systems? How do standard models, strict liability, and formulas for balancing litigation and technical liability reflect the differing approaches of countries in distributing the burden of responsibility among technical actors?

 To what extent do verification and evaluation standards, out-of-court settlement mechanisms, and insurance contribute to building a balanced legal framework that protects victims and enhances trust in artificial intelligence systems?

1.2 Importance of the Study

 It keeps pace with the legislative and regulatory transformations related to artificial intelligence systems and fills a theoretical gap regarding the suitability of traditional civil liability rules for this emerging technology.

 It highlights the fundamental differences between standard models, strict liability, and formulas for balancing technical and judicial liability, thus enriching national and Arab efforts to benefit from comparative experiences in Europe and the Americas.

 It contributes to clarifying the classification of damages (material, moral, economic, social, and ethical) and determining the impact of each on choosing the appropriate legal basis for liability. • Supports decision-makers and legislators in developing flexible regulatory frameworks that consider data protection, privacy, and digital rights, and achieve a balance between innovation and responsibility.

1.3 Study Objectives

• Analyzing the theoretical and practical framework of civil liability for damages caused by artificial intelligence systems, by distinguishing between types of damages and the foundations of contractual and tortious liability.

• Examining the legal models adopted in some European, American, and Arab countries, in terms of adopting normative, strict, or dual liability.

• Explaining how responsibility is distributed and shared among system developers, operators, service providers, and users, in light of the elements of reasonable care, causation, negligence, and technical liability.

• Evaluating the effectiveness of verification and assessment criteria (reasonable care, statute of limitations, notification, causation, and continuous technical updates) in establishing liability for damages caused by artificial intelligence. Proposing the features of a comparative legal framework more suitable for the specificities of artificial intelligence systems, based on a balanced mix of liability rules, alternative settlement mechanisms, and specialized insurance contracts.

1.4 Methodology

This study adopts the comparative method as the most suitable tool for analyzing the problems arising from civil liability for damages caused by artificial intelligence systems across different legal systems. This method is based on an induction of legislative texts, judicial interpretations, and relevant jurisprudential trends in selected systems from Europe, some countries of the American continent, and a number of Arab countries, with a focus on how damages are defined and classified, and how the foundations of liability are determined and distributed among the actors. Through comparison, the points of agreement and difference are revealed in the adoption of standard liability models and strict liability, and the formulas for balancing the judiciary and technical expertise, and the extent to which each model is consistent with the specificities of artificial intelligence in terms of technical complexity and difficulty of proof. (Ibrahim, 2018, p. 115)

2. The Legal Framework for Civil Liability

The legal framework for civil liability for damages caused by artificial intelligence systems is characterized by its diversity and evolution, depending on the legal system model adopted in each country. The foundations and standards used to determine liability and distribute responsibility among the parties involved vary. In some countries, such as France, Germany, and Spain, legislation adopts standard models based on general principles of liability, focusing on proving fault and negligence, while applying traditional provisions of tort liability. This entails the necessity of proving that the damage resulted from a wrongful act or negligence on the part of the perpetrator, which requires strong evidence and a meticulous judicial process. (Baali, 2022, p. 45)

In countries that adhere to strict liability, as proposed in several recent European proposals on high-risk systems and as seen in some product legislation in countries like the Netherlands and the Nordic countries, the law requires technology providers to be directly liable for damages caused by their systems, without needing to prove negligence or fault. This model is characterized by greater flexibility in dispute resolution, as those affected have access to means of compensation quickly and effectively, while placing great importance on ensuring the protection of consumers and individuals from the potential risks associated with such systems. (European Parliament, 2020, p. 27)

Within the framework of balancing litigation and technical liability, some countries, such as the United Kingdom, the United States, and Canada, adopt legal policies that allow for a closer alignment between the liability of technology providers and the technical measures taken to ensure system safety. This includes imposing strict technical standards for installation and operation, as well as procedures for continuous evaluation of use and technical updates, so that legal liability keeps pace with rapid technological development. (Reed, 2018, p. 1157)

Furthermore, legislation in several legal systems, including those of the European Union, the United States, and Japan, places particular emphasis on the principles of contractual liability, especially in cases involving the provision of artificial intelligence services or the deployment of software systems under binding contracts. This obligates service providers to adhere to stipulated quality and security standards. At the same time, liability for negligence or collusion remains a cornerstone of the systems for protecting rights and the public interest in most of these systems. (Khairy, 2021, p. 112)

2.1 Countries with Standardized Liability Models

Many countries, particularly in Europe, adopt clear standardized models for determining civil liability for damages resulting from artificial intelligence systems. These models adapt traditional liability rules—especially tort liability—to the specific characteristics of these systems. They are largely based on the concepts of indirect liability, vicarious liability, and producer and service provider liability (Ahmed Hassan, 2022, p. 45). The focus is on identifying the person or entity that has effective control over the system and benefits economically from its operation. These approaches emphasize the preventive dimension by requiring technical and regulatory safety standards, obligating stakeholders to update and maintain systems, and ensuring compliance with transparency and governance requirements. They also maintain effective compensation mechanisms that consider the interests of the injured party without sacrificing the dynamism of innovation. (Al-Sharari, 2022, p. 372)

2.2 Countries Adopting Strict Liability for Technology Enterprises

Many countries have adopted a strict liability system for technology enterprises, especially those developing and producing artificial intelligence systems. This approach is more stringent than traditional models, as it does not require proof of negligence or fault on the part of the responsible party to hold them liable for the resulting damages. Under strict liability, the mere existence of damage is considered sufficient to impose liability on the enterprise, thus reinforcing

the principle of victim protection and encouraging enterprises to take more serious preventive measures to ensure the safety and reliability of their systems. (Hassanein, 2023, p. 185)

These legal systems require that institutions automatically bear responsibility for damages, regardless of their level of commitment or the obstacles to compliance that may arise in the development and operation of artificial intelligence systems. Companies and technology institutions are often required to insure their products and services, with the aim of facilitating compensation payments to those affected and making the obligation more clear and transparent. This approach is distinguished from others by its focus on protecting rights and freedoms, especially in light of the rapid growth and increasing complexity of artificial intelligence systems, which may cause unexpected or unguaranteed damages. (Al-Shoubri, 2016, p. 112)

2.3 Countries Balancing Litigation and Technical Liability

Some countries, particularly Anglo-Saxon legal systems such as the United Kingdom, the United States, and Canada, adopt strategies that balance traditional litigation and technical liability. Their aim is to develop an effective legal framework that addresses the nature of damages resulting from artificial intelligence systems, while maintaining the jurisdiction of ordinary courts to adjudicate disputes and determine the legal basis for liability (Al-Shoubri, 2016, p. 118). These countries rely on flexible models that allow for the accountability of parties involved according to the rules of contractual and tortious liability. Simultaneously, they regulate recourse to technical expertise through experts, technical arbitrators, and specialized technical committees. This ensures the protection of rights and security while preventing technical opinion from replacing the judge's discretionary power (Al-Sharari, 2022, p. 379). The adopted policies focus on establishing clear standards for holding system providers and manufacturers accountable by linking traditional legal obligations (such as the obligation to guarantee safety and due professional care) with compliance requirements. For technical standards, cybersecurity and data governance standards and algorithms, continuous updates and technical tests are taken into account when assessing the availability of error or negligence. Despite the challenges associated with measuring the extent of technical impacts and algorithmic breaches, these countries tend to dedicate an organized institutional interaction between legal knowledge and technical expertise, by enabling the judge to seek the assistance of technical advisors and issue orders to disclose evidence related to algorithms and data, which enhances the ability to ascertain the causal relationship and limits of liability more accurately (Hassanein, 2023, p. 194). In this context, it is important to develop procedural policies that allow for an independent technical investigation to verify the causes of damages, with the adoption of technical assessment tools based on internationally recognized standards and specifications, including technical standards and guidelines issued by international organizations and relevant regulatory bodies. Some of these countries are also working on establishing flexible compensation mechanisms that allow for out-of-court settlements through technical mediation, specialized arbitration, and rules specific to managing AI disputes, along with insurance contracts tailored to these risks. This is all within a regulatory environment that supports technological innovation while subjecting stakeholders to effective oversight and accountability. This balance between litigation and technical liability embodies a progressive vision aimed at avoiding excessive overlap between the judiciary and experts, while ensuring the protection of users' and victims' rights, enhancing trust in AI systems, and increasing their reliability across various application fields. (Al-Shoubri, 2016, p. 123)

3. Damages Resulting from AI Systems

AI systems can cause material damages such as physical injuries and property damage, as well as moral damages affecting reputation, dignity, and privacy due to automated decisions or data leaks. They may also cause direct and indirect economic losses due to system malfunctions or biases, in addition to social and ethical risks manifested in discrimination, mass surveillance, and the erosion of trust in technological institutions. The handling of these damages is complicated by the overlapping causes of technical malfunction, human error, and misuse, necessitating precise standards for verification and the allocation of legal responsibility to protect those affected and ensure improved safety standards. (Khuzaimiyah, 2020, p. 45)

3.1 Material and Moral Damages

Material and moral damages resulting from artificial intelligence (AI) systems often involve these systems causing tangible losses or intangible harm to both individuals and organizations. Material damages include the destruction of property or equipment due to malfunctions or technical errors in AI systems, particularly those used in vital sectors such as industry, transportation, or healthcare. If an AI-based machine or system malfunctions, property may be damaged or destroyed, necessitating repairs and incurring significant financial costs. (Bouya, 2024, p. 39)

Moral damages include loss of trust or psychological and emotional harm suffered by individuals due to unexpected or erroneous outcomes from AI-based systems. For example, the inappropriate or incorrect use of algorithms related to

medical examinations or employment decisions can lead to psychological harm or discrimination, leaving deep scars on the victims. Furthermore, errors or biases in AI software can damage the reputation of individuals or organizations, leading to legal and financial repercussions. (Al-Qabbani, 2024, p. 70)

The responsibility of operators or developers changes, especially when damages result from a technical malfunction, inadequate protection, or weak technical standards. Operators are assumed to be responsible for modifying the software and correcting errors to prevent similar damages, while developers' responsibility remains tied to ensuring the quality of the software from its creation to its practical use. (Buya, 2024, p. 41)

3.2 Economic Damages for Users and Businesses

The economic damages incurred by users and businesses are among the main challenges posed by the spread of artificial intelligence systems. These damages range from financial losses and a decline in business opportunities to negative impacts on the reputation of organizations. In the event of an intelligent system malfunctioning or a software error occurring, users and businesses incur direct costs related to correcting the malfunctions or replacing equipment, which places a significant financial burden on the affected parties. (Bakouch, 2025, p. 112)

At the level of institutions and companies, the economic damages resulting from artificial intelligence systems can cause an increase in operating costs, whether through the need for a specialized technical team to monitor the systems or through the potential legal liabilities resulting from errors committed by these systems, which may lead to lawsuits and large financial compensations. The risks also increase through excessive reliance on artificial intelligence systems in the business decision-making process, which may expose institutions to uncalculated or unexpected risks, such as wrong decisions that lead to significant losses. (Al-Saadi, 2025, p. 162)

3.3 Social and Ethical Risks and Digital Rights

The social and ethical risks associated with artificial intelligence systems have profound effects on the social fabric and individual rights. Excessive reliance on smart technologies leads to radical changes in work models and social interaction, increasing dependence on electronic systems and reducing opportunities for direct human intervention. This raises issues of collective responsibility in managing potential harms. Ethical challenges also arise concerning decisions made by AI systems, particularly in highly sensitive areas such as healthcare, justice, and security, where errors or biases can lead to harmful outcomes for individuals and groups. (Bakoush, 2025, p. 119)

The impact is not limited to social aspects but extends to individuals' digital rights, such as privacy and protection from intrusion. The risks of personal data leaks or misuse are increasing. Protecting digital rights requires strict legislation and regulations to ensure that technological systems are not exploited in ways that threaten individuals' dignity and fundamental rights. (Al-Saadi, 2025, page 175)

4. Foundations of Legal Liability for Various Entities

The foundations of liability for damages caused by artificial intelligence systems are based primarily on the distinction between contractual and tortious liability, depending on the existence of a contractual relationship. In contractual liability, the system or service provider is held responsible for non-performance or defective performance of their obligations to the user, provided a valid contract and a direct link between the breach and the damage are established. In tortious liability, however, proof of independent fault is required, such as negligence, misconduct, or failure to observe the duty of reasonable care in design, operation, or maintenance, in addition to the occurrence of the damage and a causal link (Tuck, 2025, p. 229). Modern systems highlight the central responsibility of system developers and service providers for ensuring safety and continuous updates, with the possibility of sharing responsibility among them according to their roles in the technological value chain. This framework is further complemented by out-of-court settlement and compensation mechanisms, such as mediation, technical arbitration, and AI risk insurance, to reduce the burden of proof and expedite compensation while maintaining the deterrent role of civil liability rules. (Bouzian, 2025, p. 31)

4.1 Contractual Liability and Contractual Obligations in Artificial Intelligence Services

Contractual liability in the context of artificial intelligence systems services necessitates defining the contractual obligations between the parties, whether the producer, the provider, or the end user. Contracts related to the provision of AI solutions require clarity in defining the scope of performance, the responsibilities of the parties, and the terms of warranty and maintenance, thus ensuring the protection of the rights and obligations of all parties. (Abdelrahman, 2024, p. 115)

Contractual obligations arise primarily from agreements related to the provision of services or products. In the event of damage resulting from a malfunction or error in the system, the contracting party is responsible for rectifying the damages according to the terms specified in the contract. This liability is directly applicable to the legal relationship between the user and the provider and revolves around the obligation to provide performance that is compliant and secure. (Mu'azzi, 2024, p. 322)

In cases of negligence or breach of contractual terms, the affected party has the right to claim compensation for damages incurred as a result of using artificial intelligence systems. Contractual liability requires a balance between the obligation to provide sound and error-free services and the guarantee of protecting personal data and mitigating risks through continuous system updates in accordance with the latest technical standards. (Al-Shroufi, 2025, p. 15)

4.2 Tort Liability and its Effects on Damages

Tort liability is a key principle that sparks legal debate when discussing damages caused by artificial intelligence systems. It is based on the idea that the perpetrator of the damage bears the consequences of their unlawful act, whether directly or indirectly. This liability is imposed on the party proven to have been negligent or derelict in performing its duties or providing an insufficiently protected service, whether it be a manufacturer, service provider, or user of the intelligent systems. (Mu'azzi, 2024, p. 329)

Tort liability frameworks address multiple elements, including proving fault or negligence, the causal link between the act and the harm, and the availability of safety and security procedures applied to artificial intelligence systems. It is also important to assess the extent to which perpetrators adhere to technical standards and the degree of continuous system updates, especially since the potential for new or unforeseen harms necessitates strengthening legal safeguards to avoid liability. (Al-Attiyah, 2025, p. 818)

Furthermore, the challenges arising from the interaction between liability and the technological framework are highlighted. Various assessments reveal the need to develop accurate fault assessment tools for intelligent systems, taking into account ongoing technological updates that may lead to changes in liability standards. (Moazzi, 2024, p. 332)

4.3 Liability of System Establishers and Service Providers and Liability Sharing

The liability of AI system Establishers and service providers is a fundamental principle for ensuring that damages resulting from the application of this technology are addressed effectively and fairly. Liability sharing is considered a strategic option that enhances the level of protection for users and society in general, as stakeholders share in identifying and addressing faults and damages. Liability can be divided between system Establishers and service providers according to their roles. Programmers and developers are responsible for designing secure and reliable systems, while operators and service providers are responsible for ongoing maintenance and updates to ensure continued performance in accordance with legal and ethical standards. (Al-Attiyah, 2025, p. 824)

Within the framework of shared responsibility, the adoption of flexible liability models that take into account the complexities of various modern technologies is encouraged. This ensures a fair distribution of responsibility and incentivizes improvements in the quality of software and services provided. Furthermore, agreeing on specific responsibilities and defining preventative measures strengthens the accountability of the parties, reduces the likelihood of legal disputes, and encourages collaborative efforts to mitigate technical and ethical risks. (Al-Shroufi, 2025, p. 19)

5. Verification and Evaluation Standards in AI-Related Issues

Verification and evaluation standards for liability in AI systems focus on verifying the availability of reasonable care—that is, whether developers and operators have taken the expected safety measures given the level of technology and risk. They also rely on the causation standard to establish an acceptable causal link between negligence or technical malfunction and the harm, and the technical liability standard, which measures adherence to technical standards, continuous updates, and incident reporting procedures. (Mahjoub, 2021, p. 58)

5.1 Reasonable Care Standard, Statute of Limitations, and Notification

The reasonable care standard relates to the need to prove that the parties involved exercised a reasonable level of caution and prudence in the design and operation of artificial intelligence systems to avoid potential harm. This is demonstrated by assessing the extent to which developers or users adhered to approved precautionary measures and technical guidelines, as well as the conformity of their practices with recognized professional standards. Establishing reasonable care is fundamental in determining the liability of the parties, as the claimant is required to prove that the respondent should have taken the necessary measures to prevent harm and that they failed to do so. (Al-Janbihi, 2020)

As for the statute of limitations, it is a crucial element in determining the continued validity of the claim. The legal principle stipulates that the right to claim compensation for damages must be exercised within a specific timeframe, commencing from the date of the occurrence or discovery of the harm. The statute of limitations varies according to legal systems and the nature of the harm. However, the user or client is generally obligated to file a claim within a period ranging from one to five years from becoming aware of the harm or its occurrence, depending on local legislation. (Amara, 2024, p. 77)

Regarding notification, parties are required to inform the competent authorities of the harm as soon as possible so that the judge or regulatory body can initiate the necessary investigation and take corrective measures. Immediate notification, or notification within a reasonable timeframe, is a prerequisite for the validity of the claim. This aims to improve the effectiveness of legal interventions and reduce the likelihood of manipulation or tampering with evidence. Furthermore, delaying notification may lead to the suspension or termination of legal proceedings, reflecting bad faith or a weak commitment to legal responsibility. (Mahjoub, 2021, p. 65)

5.2 The Criterion of Causation, Intentional Role, and Negligence

The criterion of causation, intentional role, and negligence is of paramount importance in assessing the extent of liability of parties for damages resulting from artificial intelligence systems. It focuses on the causal relationship between the actions of the instigator and the resulting damage. This criterion requires proof that the act or omission by the user or system developers was the direct cause of the damage. A careful analysis of this approach can determine the extent of liability of the entity concerned. Focusing on intentional role highlights the actor's intent and will to cause the damage, as the presence of intention or deliberate conduct increases the inevitability of liability (Mamdouh, 2022, p. 132). In contrast, negligence is characterized by the absence of sufficient precautionary measures according to established legal standards. It relies on proving collusion or negligence leading to the damage, which requires evidence of failure to take the necessary measures or failure to comply with the necessary security and technical procedures to prevent the damage. However, applying this standard faces significant challenges in the context of artificial intelligence systems, due to the complexity of the system's components and the nature of machine learning processes, which may involve multiple factors, making it difficult to accurately determine responsibility. (Ben Amara, 2023, p. 245)

5.3 Technical Responsibility and Continuous Updates Standard

The technical responsibility and continuous updates standard is based on the necessity of ensuring that intelligent systems keep pace with technological advancements and the evolving potential threats that may arise from them. The sustainable and accurate performance of systems requires continuous updates and development to guarantee their efficiency and reduce the likelihood of unforeseen damages, especially with the increasing advancement of technology and its integration into various fields. Reliance on renewable technical infrastructures is an important means of maintaining the system at a level of performance that reduces the risk of errors and defects, thus enhancing user confidence and preventing the responsible party from bearing the burden of damages that may result from technological obsolescence or the failure to implement necessary updates. (Mashali, 2022, p. 150)

In this context, technical responsibility is inextricably linked to the existence of clear controls and standards for utilizing periodic updates. Update processes must comply with the security and performance requirements set by the relevant authorities. Furthermore, continuous system review enables the early detection of vulnerabilities and the analysis of potential malfunctions, contributing to the development of proactive tools to prevent damage. On the other hand, adherence to transparency and disclosure standards related to update processes helps strengthen responsibility, as it allows stakeholders to assess the extent to which developers and technology companies adhere to quality and security standards in releasing updates. (Mamoun, 2021, p. 412)

6. Public Policy Challenges and Regulatory Adaptation

The most prominent public policy challenges lie in the difficulty of keeping pace with the rapid development of artificial intelligence, the ambiguity surrounding the boundaries of responsibility between developers and users, and the necessity of maintaining fairness and transparency. States also face significant challenges in protecting data and privacy, and in mitigating bias and widespread surveillance. This necessitates standards for transparency, interpretability, and periodic review of regulations. Legislators are required to strike a balance between encouraging innovation and guaranteeing individual rights through mechanisms for continuous evaluation and rapid, effective error correction. The transnational nature of artificial intelligence technologies further complicates matters, demanding international cooperation and more coherent and flexible common standards. (Abdul-Baqi, 2022, p. 95)

6.1 Data Protection and Privacy as a Central Element

Data protection and privacy are crucial elements within the framework of civil liability for damages caused by artificial intelligence systems. Protecting personal information is the cornerstone of ensuring individual rights and maintaining seamless interaction between users and intelligent systems. AI-based systems require the collection, storage, and processing of massive amounts of data, exposing individuals to the risks of privacy violations and data leaks or misuse. (Ghoneim, 2023, p. 201)

It is emphasized that independent oversight mechanisms must be activated to review processing operations and ensure compliance with established legal and ethical frameworks. This includes imposing deterrent penalties on those who violate these controls. It also involves activating the concept of informed consent, ensuring that users are fully and clearly informed about how their information will be used and their rights regarding its use. This guarantees their control over their personal data and limits its exploitation without their consent. Furthermore, regularly updating security measures and developing advanced technical tools for detecting breaches enhances protection levels, which is essential to address the constantly evolving threats that may target stored data. (Abdel-Baqi, 2022, p. 105)

6.2 Transparency and Algorithmic Transparency

Transparency and algorithmic transparency are fundamental factors in ensuring civil liability for damages caused by artificial intelligence systems. Transparency relates to how users and stakeholders are informed about the identity of the data and the standards adopted by the systems. This facilitates error analysis and the assignment of responsibility. Algorithmic transparency, on the other hand, relates to the ability of stakeholders to understand how algorithms make their decisions and the procedures they follow to reach specific results. This is essential for fostering trust and accountability among developers and system operators. Transparency in this context requires providing clear and detailed information about the analysis processes, the algorithm training context, and the evaluation criteria used. This allows stakeholders and affected parties to analyze the underlying causes of any harm resulting from the use of these technologies. (Sayed Suleiman, 2021, p. 310)

6.3 Error and Malfunction Response in Large Systems

Large systems operating in the field of artificial intelligence require effective error and malfunction response mechanisms to minimize damage and ensure reliable business continuity. These systems are characterized by their ability to handle massive and complex data continuously, which increases the likelihood of technical errors affecting their performance and reliability. This underscores the importance of having clear and actionable procedures to identify the source of any error or malfunction, whether it stems from poor design, software flaws, or human error during maintenance and updates. (Abdel-Aal, 2022, p. 188)

Early detection and periodic maintenance are essential elements of error response, ensuring a reduction in their impact on users and society. Effective early warning systems help identify problems before they escalate, enabling rapid and effective correction. Furthermore, implementing continuous updates and technical modifications is recommended to ensure systems remain resilient against vulnerabilities and problems, and to minimize the recurrence of errors. (Sayed Suleiman, 2021, p. 314)

7. A Comparative Study of Selected Legal Systems

A comparative study of selected legal systems reveals a clear diversity in how they address the issue of civil liability for damages arising from artificial intelligence systems. In European systems, laws often adopt standard models that emphasize strict liability, holding system developers and operators directly accountable for damages, regardless of whether there was fault or negligence. This approach aims to enhance protection and ensure swift and effective compensation for victims, relying on a unified liability or insurance fund to share the risks. (Hassan, 2022, p. 56)

In the Americas, however, there is a trend toward achieving a balance between tort liability and the liability of technology companies. A clear framework for determining the liability of stakeholders is encouraged, focusing on elements of negligence or direct cause of damage, while considering the nature of modern technologies and the need for continuous updating of legislation to keep pace with rapid technological development. (Al-Madawi, 2021, p. 286)

In Arab countries, legal systems sometimes lack comprehensive legal frameworks specifically for artificial intelligence. This often leads to reliance on general rules of tort and contractual liability, with attempts to adapt them to the specificities of modern technology. Some Arab countries have begun to adopt new concepts related to transparency and the need to codify the liability of system developers through simplified legislation, but these still require further implementation and development. (Ahmed Hassan, 2022, p. 58)

Disparities between legal systems are evident in the strictness and flexibility of their laws, with a general tendency towards adopting models that focus on achieving a balance between protecting victims and reducing the burden of liability on system developers. Many legal models also include alternative dispute resolution mechanisms, such as mediation and arbitration, to resolve disputes quickly and efficiently, in addition to developing fair insurance tools that ensure the continuity of innovation and reduce financial risks. (Al-Madawi, 2021, p. 289)

7.1 The Legal System in Europe

The legal system in European countries is characterized by its adoption of a comprehensive framework that reflects the advanced state of legislation concerning civil liability for damages caused by artificial intelligence systems. This system is based on fundamental principles, including the protection of individual rights and the guarantee of justice, with a focus on addressing the risks associated with the use of modern technology. European legislation emphasizes the importance of clearly defining responsibilities among the parties involved, whether developers, users, or service providers. It also relies on the principle of balancing the responsibility of technology institutions with precautionary measures, while providing mechanisms for verifying causation and damages and achieving effective justice. (Takook, 2025, p. 229)

In this context, European laws adopt strict liability systems that require institutions to adopt clear policies to ensure the safety and security of their systems, and impose penalties on violators in cases of negligence or recklessness. The liability system in Europe strengthens the framework for continuous monitoring and evaluation of systems, requiring the existence of technical procedures to maintain continuous updates and analyze potential damages. At the same time, the system ensures effective compensation mechanisms through recourse to the courts and, sometimes, through extrajudicial mechanisms such as mediation and technical arbitration in accordance with international standards. (Mamdouh, 2022, p. 132)

The European system encourages diversifying methods of interaction between parties, focusing on the responsibility of system developers and service providers, while promoting a fair sharing of liability. European regulations also strike a balance between the need to protect digital rights and privacy and ensuring the effectiveness of modern technological systems. This framework is relatively flexible, allowing for adaptation to ongoing technological developments, while adhering to the principles of transparency and reporting in the event of any errors or malfunctions. Consequently, the European legal system contributes to establishing a model for regulating civil liability in a comprehensive and balanced manner, serving to achieve justice and efficiency in addressing the harms caused by artificial intelligence systems. (Al-Madawi, 2021, p. 293)

7.2 The Legal System in the Americas

The legal system in a country within the Americas is characterized by its flexibility and legal foundations, reflecting a balanced approach between protecting individual rights and encouraging technological innovation. Many countries rely on a legal framework that includes strict liability models focused on holding technology companies fully responsible for damages resulting from their systems. This aims to enhance oversight and reduce risks to user and societal safety. Clear rules have been adopted regarding liability for damages that may arise from artificial intelligence systems, particularly those related to material and moral damages, as well as economic and social damages that may have serious repercussions on individual rights and the reputation of institutions. The legislation in some of these countries also strives to create a balance between the traditional principle of civil liability and modern technological necessities. This entails imposing liability on system developers and providers, while adopting technical standards that ensure procedures are updated in line with technological advancements and their rapid response to errors or malfunctions. (Tuck, 2025, p. 234) Emphasis is also placed on procedures for investigating and verifying the cause of harm, along with mechanisms for compensating those affected, either through settlements or AI liability insurance schemes. This includes adopting arbitration and technical analysis tools that adhere to international standards and enhance the effectiveness of external settlements. The regulatory framework in these countries is characterized by its continuous responsiveness to emerging challenges, primarily data protection and privacy, the necessity of algorithmic transparency, and the establishment of procedures for responding to and effectively correcting technical errors to ensure the stability and security of AI systems. This is part of a broader strategy that aims to ensure effective liability that keeps pace with the rapid development of technology and works to minimize the harm caused by the use of these technologies in a fair and equitable manner. (Mamdouh, 2022, p. 145)

7.3 The Legal System in Arab Countries

The legal system in Arab countries is characterized by a growing interest in regulating liability for damages resulting from artificial intelligence systems, while striving to balance protecting individual rights with ensuring responsible technological development. This system attempts to incorporate the fundamental principles of civil liability, taking into account the

specificities of the legislative and cultural environment. This is evident in the diversity of legislation, ranging from regulating the liability of technology institutions to formulating rules for determining damages and defining compensation and reconciliation procedures. The challenges lie in the absence of a unified legislative framework for liability related to intelligent systems. This necessitates the development of laws that keep pace with the rapid evolution of technology and are compatible with the conditions of Arab society. Legislation in some countries often relies on the principles of tort liability, focusing on proving fault and negligence (Takook, 2025, pp. 236-238), while other countries are moving towards adopting models that place explicit or strict liability on service providers and developers. This reflects a trend towards unifying standards on the one hand, and finding flexible solutions that accommodate the diversity of intelligent systems and their challenges on the other. The laws in Arab countries also seek to expand the circle of responsibility to include producers and operators, while giving importance to legal guarantees and ensuring the rights of victims. In light of the existing ambiguity, the competent authorities are working on developing standard regulatory regulations to ensure transparency, ensure response to errors, and enhance legal protection for users. Despite the tangible progress, there is still a pressing need to update legislation periodically to keep pace with technological changes, and to provide clear and flexible frameworks for holding all parties accountable, taking into account the social and ethical considerations imposed by new artificial intelligence systems. (Mamdouh, 2022, p. 148)

Conclusion

The findings indicate the importance of developing a flexible and effective legal framework to address the challenges of civil liability for damages arising from artificial intelligence systems. This can be achieved by adopting approaches that align with technological advancements and contribute to protecting rights and achieving justice. Traditional legal systems alone are insufficient to address AI-related liability issues. This underscores the need to develop unified and comprehensive standards that consider the complexities of the technological system, particularly regarding direct causes and shared responsibility. Furthermore, verification and assessment mechanisms must be strengthened to ensure transparency and fairness in addressing damages, while activating alternative dispute resolution methods to alleviate the burden on the judiciary and reduce time and costs. This includes the importance of establishing clear rules regarding the liability of system developers and users, with a focus on the liability of manufacturers, providers, and service providers. Additionally, harmonization between national and international legislation is essential to ensure uniform application, especially given the overlap between data and privacy laws, algorithmic transparency, and technological ethics. On the other hand, it is imperative to design public policies that strengthen the protection of fundamental rights and support the volatility of technological advancements, while addressing shortcomings and errors swiftly and effectively. Ultimately, enhancing accountability and defining responsibilities requires flexible and balanced legislative and regulatory changes, along with improving and ensuring fair compensation mechanisms. This is essential to mitigate future harm and bolster confidence in the future of artificial intelligence systems, addressing their challenges and keeping pace with their ongoing development.

Ethical Considerations

This study has been conducted in full compliance with internationally recognized standards of academic integrity and research ethics. The research is based exclusively on doctrinal legal analysis, comparative examination of legislative frameworks, and publicly available scholarly and legal sources. No human participants, personal data, or confidential information were involved in the study. The author confirms that all sources have been appropriately cited and that the work is original, free from plagiarism, fabrication, or falsification. The research adheres to general ethical principles applicable to legal scholarship and comparative research.

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Conflict of Interest

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References:

1. European Parliament. (2020). Civil liability regime for artificial intelligence: European added value assessment. European Parliamentary Research Service (EPRS).
2. Reed, C. (2018). Responsible AI: Why accountability is the key to controls. Computer Law & Security Review, 34(5).
3. Ahmed Elsayed Elbahy Elshoubry. (2016). Civil Liability for Technological Risks. Egypt: Dar Elgamaa Elgedida, First Edition.
4. Ahmed Galal Khairy. (2021). The Legal System of Civil Liability Arising from Artificial Intelligence Technologies. Egypt: Dar Elnahda Elarabia, First Edition.
5. Ahmed Amara. (2024). The Legal Adaptation of the Liability of Artificial Intelligence Systems: A Comparative Study. Egypt: National Center for Legal Publications, First Edition.
6. Ahmed Mohamed Ali Hassan. (2022). Civil Liability for Robot Damages. Egypt: Dar Elnahda Elarabia for Publishing and Distribution, First Edition.
7. Iman Mahmoud Mamoun. (2021). Civil Protection of Personal Data in the Context of Artificial Intelligence. Egypt: Journal of Legal and Economic Research, Volume 33, Issue 1.
8. Jalal Ibrahim. (2018). Methodology in Legal Research: An Analytical Study of the Comparative Approach. Cairo, Egypt: Dar Al-Nahda Al-Arabiya, First Edition.
9. Jalil Hassan Al-Saadi. (2025). The Fluctuation of Damage Arising from Artificial Intelligence Between Personal and Objective Liability. Iraq: Ashur Journal of Legal and Political Sciences, Volume 4, Issue 2.
10. Jihad Mu'zi. (2024). The Functional Development of Tort Liability: A Trend Towards Strengthening the Preventive Function in Light of New Perspectives. Algeria: Algerian Journal of Law and Justice, Volume 10, Issue 2.
11. Khaled Ibrahim Mamdouh. (2022). Legal Aspects of Artificial Intelligence. Egypt: Dar Al-Fikr Al-Jami'i, First Edition.
12. Zoubaida Takouk. (2025). The Reflection of the Specificity of Artificial Intelligence in Determining the Legal Nature of Civil Liability. Algeria: Journal of Legal and Political Studies, Volume 14, Issue 1.
13. Tariq Abdul Rahman. (2024). Civil Liability for Artificial Intelligence Damages in Qatari Law (A Look at Contractual Obligations). Qatar: International Journal of Law, Vol. 12, No. 3.
14. Abdel Rahman Sayed Suleiman. (2021). European Legislative Trends Towards Regulating Civil Liability for Artificial Intelligence. Egypt: Journal of the Faculty of Law for Legal and Economic Research, Vol. 41, No. 2.
15. Abdullah Bouziane. (2025). The Problem of Holding Artificial Intelligence Contractually Liable. Algeria: Al-Bahith Journal for Academic Studies, Vol. 12, No. 2.
16. Adnan Hashem Jawad Al-Shroufi. (2025). Problems of Civil Liability in Compensating Victims of Artificial Intelligence and its Legislative Treatments (A Comparative Study). Iraq: Journal of the College of Law, University of Karbala, Vol. 12, No. 1.
17. Ali Jaber Mahjoub. (2021). Civil Liability for Artificial Intelligence Damages. Egypt: Dar Al-Nahda Al-Arabiya, First Edition.
18. Ali Hamza Al-Attiyah. (2025). The Legal Basis for Determining Liability Arising from Errors in Artificial Intelligence Applications (A Study of Programmer Liability). Iraq: Journal of Legal and Political Sciences, Volume 14, Issue 1.
19. Omar Muhammad Abdul-Baqi. (2022). Commitment to Transparency in Artificial Intelligence Algorithms. Algeria: Journal of Legal Studies, Volume 8, Issue 2.
20. Fatima Al-Zahra Ghoneim. (2023). Inadequacies of Traditional Rules of Civil Liability for Compensation for Artificial Intelligence Damages in Arab Legislations. Iraq: Journal of Legal Sciences, Vol 15, Issue 3.
21. Laila Bakouch. (2025). Civil Liability for Artificial Intelligence Damages - Robots as a Model. Egypt: Al-Nahda Al-Ilmiya for Publishing and Distribution, First Edition.
22. Majda Bouya. (2024). Civil Liability Arising from Artificial Intelligence Systems in Moroccan Legislation. Morocco: Electronic Journal of Legal Research, Volume 5, Issue 14.
23. Muhammad Ibrahim Hassanin. (2023). Artificial Intelligence and Civil Liability for Damages from its Application. Sudan: An Analytical and Fundamental Study, The Legal Journal, Volume 15, Issue 1.

24. Muhammad Ahmad Al-Sharari. (2022). Intelligent Civil Liability for Artificial Intelligence Damages: A Comparative Survey. Kuwait: Kuwait International Law School Journal, Vol. 10, No. 3.
25. Mohamed Ahmed Al-Madawi. (2021). Civil Liability for Artificial Intelligence Robots: A Comparative Study. Egypt: The Legal Journal, No. 54.
26. Mohamed Hussein Abdel-Aal. (2022). Tort Liability for Robot Damages in American and French Law. Egypt: Dar Al-Nahda Al-Arabiya, First Edition.
27. Mohamed Saghir Baali. (2022). Civil Liability for Artificial Intelligence Damages: A Comparative Analytical Study Between Traditional Rules and Modern Trends. Algeria: Journal of Law and Humanities, University of Djelfa, Vol. 15, No. 2.
28. Mohamed Ali Ahmed Hassan. (2022). Civil Liability for Robot Damages. Egypt: Dar Al-Nahda Al-Arabiya, First Edition.
29. Mohamed Mustafa Al-Qabbani. (2024). Civil Liability of the Robotic Surgeon: A Comparative Study. Egypt: Dar Misr for Publishing and Distribution, First Edition.
30. Mohamed Mansour Khalil Khuzaymiya. (2020). Civil Liability for Damages Caused by Artificial Intelligence. Palestine: A Comparative Study. Dar Al-Shamel for Publishing and Distribution, First Edition.
31. Mansour Ben Amara. (2023). Civil Liability Arising from Intelligent Software Errors. Algeria: Journal of Law and Political Science, Volume 10, Issue 1.
32. Munir Muhammad Al-Janbihi. (2020). Artificial Intelligence and Civil Liability. Egypt: Dar Al-Fikr Al-Jami'i, First Edition.
33. Walid Amin Mashali. (2022). The Obligation of Artificial Intelligence Technology Producers to Ensure Safety. Egypt: Journal of Legal and Economic Studies, Volume 8, Issue 2.