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Artificial intelligence and legal responsibility

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Abstract---The article discusses the rapid development of artificial intelligence (AI) and the legal challenges it raises in determining responsibility for the actions of intelligent systems. It emphasises the difficulties of allocating responsibility among manufacturers, programmers and users, particularly when algorithms are capable of making semi-independent decisions. The article also emphasises the need to update current legal frameworks to keep pace with modern technological capabilities. It emphasises the importance of enacting clear legislation that protects individuals and society without hindering innovation. Ultimately, the article advocates a balanced legal approach to ensure accountability and transparency in the era of artificial intelligence.

Keywords---artificial intelligence, software systems, legal responsibility, technological reality, analytical algorithms.

Introduction

In recent decades, the world has witnessed remarkable technological advancements, one of the most prominent being the emergence of artificial intelligence (AI) technologies that impact various aspects of life, including medicine, education, industry, commerce and even sovereign decision-making. AI is defined as the ability of software systems to simulate intelligent human behaviour through learning, thinking and making independent decisions. However, despite its positives, this development has raised complex legal questions that were not previously considered, particularly with regard to the concept of legal responsibility for the actions of these intelligent systems.

If an AI system causes harm, such as a self-driving car being involved in an accident or a medical diagnostic program leading to a treatment error, the question of legal responsibility arises.

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Who is legally responsible? Should the fault be attributed to the system's programmer? Or to the producing company? Or to the user? Or do we need to rethink traditional concepts of responsibility to accommodate this new type of non-human actor?

This issue is further complicated by the absence of clear or unified legislative frameworks addressing AI as a potential legal actor, particularly in Arab legislation, where developments are largely monitored without specific rules being established to regulate this rapidly evolving field.

Issue of the Article
To what extent can AI be held legally responsible for its actions or the damage it causes, and how should contemporary legal systems respond to this challenge?

Importance of the Research
The importance of the research:
This research is important because it focuses on one of the most pressing legal issues in the digital age. It examines how traditional legal rules can adapt to the new technological reality while aiming to contribute to the construction of a balanced legal framework that protects rights without hindering innovation.

Objectives of the research:
- To analyse the legal issues arising from the actions of AI systems.
- Study international legislative approaches to dealing with the legal responsibility of AI.
- Provide legal proposals that could contribute to the development of legislative systems, particularly in an Arab context.

Methodology of the research:
This research takes a comparative analytical approach, examining relevant legal texts and doctrinal literature, and comparing several international and Arab legal models. The aim is to reach a comprehensive understanding of the legal responsibility of AI.

Section One: The Conceptual Framework of Artificial Intelligence and Its Distinction from Traditional Systems

Subsection One: Definition of Artificial Intelligence and Its Types

First: Definition
There are multiple definitions of artificial intelligence, depending on the discipline in question. From a computer science perspective, AI is defined as 'the capability of machines or software to perform tasks that require human intelligence, such as learning, reasoning and problem solving'[1]. Legally, AI is considered a system or digital tool that can act relatively independently of human intervention, which complicates the determination of responsibilities associated with its actions[2].
In 2021, the European Commission proposed a legislative definition of AI in a draft law, describing it as follows: 'a software system developed using specific techniques that can generate outputs such as recommendations or decisions affecting the environments in which it operates'[3].

Second: types of artificial intelligence
Artificial intelligence can be classified into several types based on its learning and decision-making abilities:
1. Narrow AI:
This type is limited to performing specific tasks, such as machine translation or voice assistants. It lacks awareness or understanding beyond its programmed capabilities[4].

2. General AI:
This type has the potential to perform any cognitive task that a human can perform. It is still in the research phase and has not yet been realised[5].
3. Superintelligent AI:
This type surpasses human capabilities in all areas and is a theoretical and future topic that raises deep philosophical and ethical debates regarding its potential.

Subsection Two: Distinguishing artificial intelligence from traditional systems
Applications of artificial intelligence and their legal impact

First: Distinguishing AI from traditional systems
The fundamental difference between AI systems and traditional software systems lies in the characteristics of 'autonomy' and 'self-learning'. While traditional systems rely on explicit instructions, AI systems analyse data, learn from it and adapt their behaviour based on experience. This makes their actions harder to predict and consequently complicates legal accountability.

Second: Applications of Artificial Intelligence and Their Legal Impact
AI has become an integral part of many fields, including:
- Healthcare:
Through disease diagnosis programmes and patient monitoring, questions about liability in the case of incorrect diagnoses are raised.
- Self-driving vehicles:
These systems make critical decisions on the road, such as stopping or avoiding collisions, and responsibility must be determined in the event of an accident.
- Smart contracts and financial transactions:
These are executed automatically using blockchain technology, creating a new avenue for accountability in the event of breaches.
- Judiciary and analytical algorithms:
AI systems are used to provide judicial recommendations or analyse legal data, which could have a direct impact on justice.

Section Two: Legal Responsibility in the Age of Artificial Intelligence and Existing Legal Challenges

Subsection One: Legal Responsibility in the Age of Artificial Intelligence
First: The traditional concept of legal responsibility
Whether civil or criminal, legal responsibility is based on three essential elements: a harmful act, damage, and a causal relationship. In civil law, the aim is to compensate the harmed party for damages resulting from a breach of a legal obligation. In criminal law, the aim is to punish individuals who commit an act defined as a crime by law[6].
However, this legal framework is based on the assumption that the actor is always a human being with legal capacity. This means they are capable of perception and will, and can therefore be held legally accountable for errors or crimes. This raises issues when dealing with artificial intelligence, as it does not possess 'will' in the traditional legal sense.

Second: the issue of legal attribution for actions executed by artificial intelligence.
When an AI system causes harm, complex questions arise:
Is it merely a tool in the hands of the programmer or user?
Can it be considered an independent 'actor'?
What are the limits of the responsibility of designers and operators in this case?
There are several doctrinal approaches to this issue:[7]

1. Considering the system as merely a tool:

In this model, AI is viewed as a tool for which the user is accountable, in the same way that a surgeon is accountable for their scalpel.

2. Shared responsibility:

Here, responsibility is shared among several parties, such as the developer, the manufacturing company and the user, according to their respective contributions to any error.

3. Granting AI 'Electronic Legal Personality':

This radical proposal, advocated by some European legal scholars[8], suggests that certain AI systems could be legally treated as independent, responsible entities, similar to commercial companies.

Third: case studies

Self-driving vehicles:

In several incidents involving self-driving cars, it has proven challenging to attribute blame to a specific individual. For example, in a case against Uber following the death of a pedestrian, it was found that the system failed to recognise the target, and that the backup driver was also not paying attention. This case highlighted the challenges involved in identifying the responsible party[9].

Medical Algorithms:

When a medical algorithm provides an incorrect diagnosis or recommends an inappropriate treatment that causes harm, the question of who is at fault arises: is it the doctor's responsibility? The company that developed the programme? Or the person who trained it using data?

- Smart Contracts:

These are contracts that are executed automatically through software on blockchain networks. In the event of a malfunction or breach, it can be difficult to take traditional legal action due to the system's complexity and its reliance on software that is not linked to a clear legal entity.

Fourth: the difficulty of applying traditional rules to artificial intelligence.

Some of the main challenges include:

- Lack of legal capacity:

Machines lack intent and awareness, preventing them from being held criminally or civilly accountable in the traditional sense.

- The predictive nature and self-learning of the system:

This makes the outcomes of its actions sometimes unpredictable, even for its developers.

- Technical complexity and legal ambiguity:

Judges find it challenging to assess the degree of 'fault' in algorithms, as this requires technical expertise.

Subsection Two: Existing Legal Challenges

Despite the significant advantages offered by artificial intelligence (AI), integrating it into daily life presents a series of complex legal challenges that hinder the adaptation of traditional legislative frameworks to the reality of AI. The main challenges can be summarised as follows:

First: The absence of legal capacity for machines

Legal capacity is the ability of a person to acquire rights and bear obligations; it is a fundamental condition for holding an actor legally responsible. However, no matter how advanced they are, AI systems are not considered legal entities; they are tools managed by human or corporate parties[10].

This raises two fundamental issues:

How can one hold accountable a being that lacks legal capacity?

If they are exempt from responsibility, who bears the consequences of their harmful actions?

Some propose granting certain highly autonomous systems "electronic legal personality", akin to that granted to corporations. However, this proposal still lacks legal consensus and raises ethical and rights-related concerns[11].

Secondly, there is difficulty in determining fault and its source.
One of the main challenges in holding AI systems accountable is identifying 'fault', particularly in machine or deep learning systems, where capabilities evolve based on data and experience.
Fault may not stem from a design flaw, but rather from incorrect or biased data, or from an unexpected interaction between system components. This complicates the identification of the responsible party.
Third: proving causation
A fundamental element of liability is the causal relationship between an act and harm. However, the relationship between a decision made by an AI system and harm may be indirect or complex, involving a chain of actions and individuals.
In the case of a medical error resulting from an algorithm, the potential chain of responsible parties may include:
- The developing company
- The 'data provider'
- The user physician
- the public health system.
This complicates the concept of the 'sole actor', which is relied upon in most legislation[12].

Fourthly, there is an absence of a clear legislative framework.
Most legal systems have yet to amend their laws to keep pace with AI. While some countries, such as those in the European Union, are making legislative efforts, others, such as those in the Arab world, are not responding adequately or strategically.
This legislative vacuum creates legal uncertainty that may:
- hinder investment and innovation
- reduce protection for harmed parties
- lead to discrepancies in the way that AI-related issues are addressed by the judiciary.

Fifth: the issue of compensation and its enforcement.
Even when responsibility has been established, there are practical difficulties in enforcing compensation judgements, particularly if the development entity is a small company or if the intelligent system itself is distributed without a unified legal entity. In cases involving fully autonomous AI, the question of who pays remains, even if responsibility is acknowledged.
This has led to calls for the creation of 'special compensation funds', or for AI developers to be mandated to obtain insurance against risks arising from their products prior to development[13].

Comparative Legislative Models
There is a clear disparity in the world's legal approach to artificial intelligence. Some countries have adopted advanced legislative strategies, while others are still in the monitoring or reactive phases. Understanding these comparative models is vital for identifying and applying best practices to national contexts, particularly in Arab countries.

First: European legislation: towards comprehensive and complex regulation
The European Union is one of the most active international bodies in the regulation of AI. In April 2021, the European Commission proposed the Artificial Intelligence Act, which aims to establish unified rules for the safe use of intelligent tools within member states[14].
The proposal classifies intelligent systems according to their risk levels:
- Unacceptable risk: such as social scoring systems (prohibited).
High risk systems, such as those used in employment, justice and healthcare, are subject to strict oversight.
- Limited or minimal risks: These only require transparency and some ethical obligations.
The law requires developers to assess risks, document their algorithms, and provide mechanisms to explain system decisions. It also encourages the adoption of the 'trustworthy AI' principle[15].

Second: the United States – a flexible, innovation-based model.
The United States takes a more liberal approach to AI, with no federal legal framework addressing it specifically. Efforts are focused on:
- supporting research and development
- encouraging private sector adoption
- avoiding strict regulatory constraints on innovation[16].
However, some states, such as California, have begun to enact partial laws related to digital privacy or self-driving cars. Meanwhile, federal initiatives have emerged to develop ethical principles and non-binding guidelines for AI[17].

Thirdly, Japan and China are taking a culturally informed technological approach.
Japan:
Japan takes an approach that considers ethical and cultural aspects, viewing robots positively. Since 2017, it has launched national strategies to integrate AI into education, health and care[18] while ensuring that intelligent systems are designed to preserve "human dignity".
- China:
In contrast, China focuses on the economic and developmental applications of AI, with the aim of becoming a global leader in this field by 2030. However, there are concerns about the use of AI for mass surveillance and social scoring, which raises questions about respect for privacy and individual rights[19].

Fourth: the situation in the Arab world – absence of a unified legislative framework
Despite some Arab countries, such as Saudi Arabia, the UAE and Egypt, developing national strategies to promote AI, the legal systems in most Arab nations are not sufficiently updated to keep pace with advancements.
- There are no specific laws to regulate AI.
- Legal responsibility in civil and criminal law is still based solely on human actors.
The absence of unified ethical and legal references hinders the balanced application of AI.
International reports have emphasised the need for a 'unified Arab AI legislation' that considers local specifics and draws on comparative experiences[20].

Proposed Legal Framework for Responsibility in the Age of Artificial Intelligence
Given the complexity of issues related to AI responsibility, it is clear that legal systems must radically reconsider their traditional approaches to legal liability in order to keep pace with this profound digital transformation. In this context, several legal frameworks have been proposed that balance legal protection with innovation flexibility.

First: Towards Redefining the Legal Actor
Due to the limitations of the traditional approach, which restricts liability to human actors, the concept of the legal actor should be expanded to include:
- natural and legal persons (as is currently the case);
- highly autonomous AI systems, through the creation of a new legal status referred to as 'electronic personality' or 'legal personality for intelligent systems'[21].
This status does not seek to equate AI with humans, but rather to enable the law to hold AI accountable and allow it to bear specific obligations through a legal entity it represents (e.g. a company or insurance fund).

Second: Distributing Responsibility Among Various Actors
In the context of AI, legal responsibility should be distributed proportionately according to the role of each party in designing or operating the system:[22]
- System developer: responsible for programming flaws or negligence in development.
- System trainer (data provider): responsible for providing the system with inaccurate or biased data.

- User or operator: responsible for misuse or negligence in monitoring performance.
- The intelligent system itself: may bear 'direct' responsibility if a legal mechanism is established for this purpose, such as the creation of an insurance fund or a legal digital identity.

Third: mandatory insurance for intelligent systems.
Similar to existing car insurance practices, a mandatory insurance system could be imposed on developers and users of AI systems. This would aim to:
- ensuring prompt compensation for affected parties
- distributing risks among stakeholders.
- supporting innovation while considering responsibility[23].
The European Union has already proposed this approach as part of its AI risk management policies.

Fourthly, standards for transparency and interpretability should be developed.
One essential condition for legal accountability is the ability to interpret decisions made by machines. Therefore, developers of intelligent systems should be required to:
Design interpretable algorithms
- document decision-making processes within the system;
- Provide performance records when legal investigations are necessary[24].

Fifthly, independent legal and technical oversight bodies should be established.
In order to keep pace with rapid technological developments, it is proposed that independent bodies with a technical-legal remit be established to carry out the following tasks:
- Monitor the legal and ethical compliance of intelligent systems.
- issuing operating licences following safety assessments;
- investigating incidents resulting from AI.
These bodies could be national or regional, as proposed in the European Union, with international coordination regarding the adopted standards.

Sixth: Legislative recommendations for Arab legislators
In light of the above, we recommend that any future Arab legislation on artificial intelligence includes the following:
- A clear legal definition of AI and its types
- A clear mechanism for allocating responsibility among developers, users and other relevant parties.
- The adoption of a mandatory insurance system for AI applications.
- The establishment of a legal personality for highly autonomous systems
- Enhanced transparency and the right to explanation for automated decisions
- Creation of a joint Arab oversight body for artificial intelligence.

Conclusion

It is clear that artificial intelligence is no longer just an emerging technology; it is now a tangible reality with an impact on various aspects of life, including the legal, social and economic spheres. The analysis presented in this research paper makes it clear that the legal responsibility associated with the actions of AI systems is one of the most complex and controversial legal issues in the current digital age.

We have demonstrated that traditional legal systems based on the principle of human responsibility are insufficient to address contemporary dilemmas arising from intelligent systems capable of independent decision-making. We also demonstrated significant variation in how different countries' legislation addresses this issue. The European Union is moving towards strict risk-based regulation, whereas the United States has maintained a flexible approach that fosters innovation. In the Arab context, legal systems still lack a dedicated legislative framework for artificial intelligence.

Key findings:
Legal responsibility is no longer confined to human actors, but now includes multiple parties in the AI environment.
- Artificial intelligence lacks traditional legal capacity, necessitating the consideration of new legal forms, such as 'electronic personality'.
There is a need to adopt a legal responsibility distribution system that reflects the nature of each entity involved in developing and operating intelligent systems.
There is an urgent need to embrace new tools, such as mandatory insurance, ethical standards and specialised oversight bodies.

Recommendations
Urge Arab legislators to draft specialised artificial intelligence legislation that incorporates accountability, transparency, and protection principles.
Establish joint Arab research centres dedicated to studying the legal, technical and ethical aspects of AI.
- Enhance international cooperation in developing unified legal and regulatory standards for intelligent technologies.
Mandating AI-producing and developing companies to implement clear governance systems that are subject to periodic evaluation.

Future research prospects:
This topic opens the door to more specialised studies, including:
- the criminal liability of artificial intelligence in cases of murder or harm;
- The impact of AI on the concept of procedural justice.
- The ethical and value aspects of designing AI systems.
- Challenges related to privacy and the protection of personal data.

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