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Subjectivity of artificial intelligence in criminal law: New challenges

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Abstract: The article aims to evaluate which changes in criminal law can influence the improvement of defining the legal personality of artificial intelligence. To achieve this, the object of study is AI-based technologies that could become subjects of criminal law. The scientific objective of the article is to identify and organize the most necessary changes in Jordan's criminal legislation to establish the legal personality of artificial intelligence. The research methodology involves applying a consolidated ranking of the proposed changes in criminal law. As a result, a list of proposed amendments to Jordan's criminal legislation is presented, which enhances the definition of artificial intelligence as a legal subject. A model for organizing these changes from the most significant and necessary today to the less influential is also presented. Prospects for further research should involve a deeper assessment of the moral and ethical issues of artificial intelligence and the regulation of its activities.

Keywords: *Artificial intelligence, Challenges, Criminal law, Jordan, Law, Changes in criminal law.*

1. Introduction

1.1. Interpretation of Key Terms Used in the Article

Technologies based on artificial intelligence encompass a broad range of systems and applications that emulate human cognitive functions such as learning, reasoning, problem-solving, and decision-making. These technologies utilize algorithms, machine learning, neural networks, and data analytics to process vast amounts of information, recognize patterns, and make predictions or autonomous decisions without explicit programming for every specific task. Artificial intelligence technologies are integrated into various sectors, including healthcare, finance, transportation, and entertainment, enhancing efficiency, accuracy, and innovation. Their ability to adapt and improve over time through continuous data input and feedback mechanisms makes them pivotal in driving advancements and addressing complex challenges in modern society. Criminal law is a fundamental branch of the legal system that defines offenses against the state or society as a whole and prescribes penalties and rehabilitation measures for those who commit such offenses. Its primary purpose is to maintain public order, protect individual rights, and deter unlawful behavior through the establishment of clear norms and consequences. Criminal law encompasses a wide range of activities, from minor infractions to serious crimes, each categorized based on severity and intent. It operates on principles of legality, ensuring that no act is punishable without prior legislative authorization, and incorporates safeguards to uphold the rights of the accused, such as the presumption of innocence and the right to a fair trial. By delineating acceptable behavior and providing mechanisms for enforcement, criminal law plays a crucial role in sustaining societal harmony and justice.

The subjectivity of artificial intelligence in criminal law pertains to the debate over whether artificial intelligence systems can or should be recognized as legal subjects capable of bearing rights and responsibilities. Traditionally, criminal law assigns accountability to human individuals or legal entities, such as corporations, based on their capacity for intent, consciousness, and moral judgment. However, as artificial intelligence systems become more autonomous and sophisticated, questions arise about their ability to comprehend and adhere to legal and ethical standards. The essence of this subjectivity involves examining whether artificial intelligence can possess the requisite attributes for legal

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personhood, such as intentionality and the ability to understand consequences, and determining the implications for liability and accountability. Addressing the subjectivity of artificial intelligence in criminal law requires a reevaluation of existing legal frameworks and the development of new regulations that account for the unique characteristics and potential risks associated with autonomous artificial intelligence systems.

1.2. Relevance of the Research Topic

The rapid advancement of artificial intelligence technologies has fundamentally transformed various aspects of society, including the legal landscape. As artificial intelligence systems become increasingly autonomous and capable of performing complex tasks without direct human intervention, the traditional frameworks of criminal law are being tested. The topic "Subjectivity of artificial intelligence in criminal law: New challenges" is highly relevant as it addresses the pressing need to evaluate and adapt existing legal principles to accommodate the unique characteristics of artificial intelligence. Understanding whether artificial intelligence can be considered a legal subject and the implications of such recognition is crucial for ensuring that the law remains effective and just in the face of technological innovation.

Furthermore, the integration of artificial intelligence into critical sectors such as healthcare, transportation, and finance raise significant questions about accountability and liability. Incidents involving autonomous vehicles, medical diagnostic systems, or financial trading algorithms highlight scenarios where determining responsibility becomes complex when artificial intelligence is involved. The subjectivity of artificial intelligence in criminal law explores the extent to which these systems can be held accountable for their actions, and whether existing legal entities, such as corporations or developers, can be held responsible in cases where artificial intelligence causes harm or engages in unlawful behavior. This examination is essential for developing clear guidelines and regulations that protect individuals and society while fostering the responsible development and deployment of artificial intelligence technologies (Figure 1).

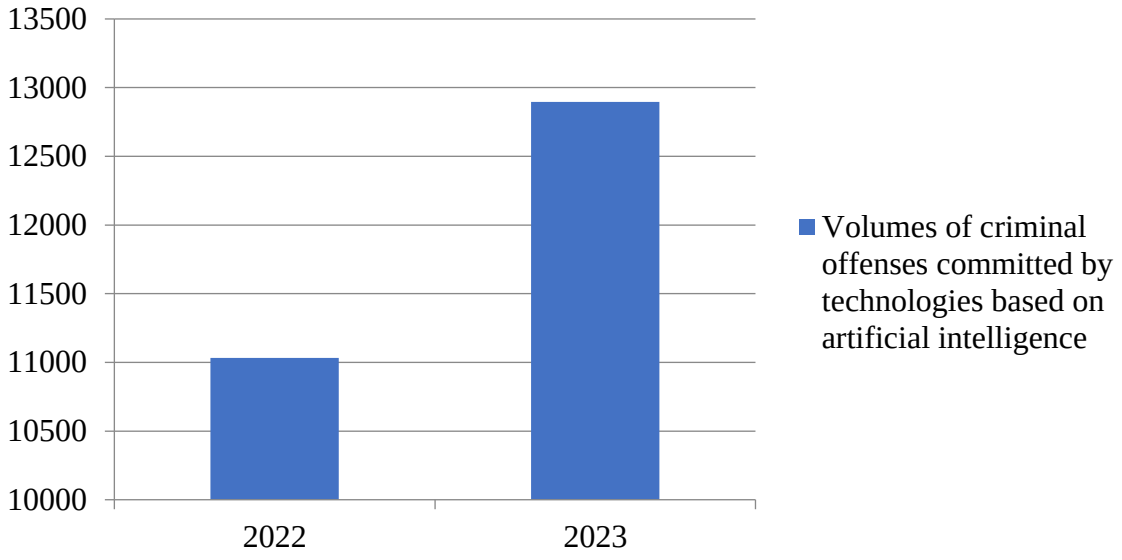

Figure 1.
Volumes of criminal offenses committed by technologies based on artificial intelligence in the world in 2022-2023.

Additionally, the ethical and moral dimensions of artificial intelligence use in society underscore the importance of this topic. As artificial intelligence systems make decisions that can significantly impact human lives, questions arise about the fairness, transparency, and bias inherent in these technologies. Criminal law must grapple with ensuring that artificial intelligence operates within ethical boundaries and that any deviations are appropriately addressed through legal mechanisms. By exploring the

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subjectivity of artificial intelligence, lawmakers and legal professionals can better understand the potential risks and benefits associated with these technologies, leading to more informed and effective legal strategies. Ultimately, addressing the new challenges posed by artificial intelligence in criminal law is imperative for safeguarding human rights, maintaining public trust, and promoting the ethical use of technology in a rapidly evolving world.

1.3. Purpose and structure of the Article

The article aims to evaluate which changes in criminal law can influence the improvement of defining the legal personality of artificial intelligence. To achieve this, the object of study is AI-based technologies that could become subjects of criminal law. The scientific objective of the article is to identify and organize the most necessary changes in Jordan's criminal legislation to establish the legal personality of artificial intelligence. The article contains sections including a literature review, a description of the methodologies used, a presentation of the key research results, their analysis and conclusions.

2. Literature Review

2.1. Review of Literature in the Field of Criminal Law

Criminal law is essential for maintaining societal order by defining unacceptable behaviors and prescribing punishments for offenders. According to Amirthalingam (2017), criminal law plays a pivotal role in reflecting societal values and enforcing moral standards. The author highlights that criminal law not only deters unlawful activities but also rehabilitates offenders, thereby contributing to social stability. Lavery (2010) discusses the challenges and prospects of codifying criminal law. The codification process aims to systematize and clarify legal statutes, making them more accessible and understandable. Lavery argues that while codification is an attainable ideal, it requires meticulous planning and consensus among legal stakeholders to ensure that the codified laws are comprehensive and adaptable to societal changes.

In the Jordanian context, Farah and Zaid (2021) examine the progress and remaining challenges related to judicial independence. They emphasize that an independent judiciary is crucial for the fair application of criminal law. Despite reforms, Jordan faces obstacles such as external influences and limited resources, which can impede the effective enforcement of criminal justice. Hassan (2020) delves into cybercrime legislation in Jordan, highlighting the challenges posed by rapid technological advancements. The proliferation of digital technologies has led to new forms of crime that traditional criminal laws may not adequately address. Hassan suggests that updating legal frameworks to encompass cyber offenses is imperative for effective law enforcement and the protection of citizens in the digital age. Iskajyan et al. (2022) explore the importance of the information environment in assessing a country's economic security within the digital economy. While their study focuses on economic aspects, it underscores the intersection between information technology and legal systems. The authors argue that a secure information environment is essential for national security, which includes robust legal measures to combat cyber threats and information crimes.

Alazzam et al. (2023) contribute to the discourse by developing an information model for e-commerce platforms, emphasizing modern socio-economic systems in the context of global digitalization and legal compliance. Their research highlights the need for legal systems to evolve alongside technological advancements to ensure that laws remain effective in regulating new business models and technologies.

2.2. Literature Review in the Field of Subjectivity of Artificial Intelligence

The rise of technologies based on artificial intelligence introduces complex challenges to existing legal frameworks, particularly concerning the subjectivity and accountability of artificial intelligence systems. Kim and Shin (2021) investigate the development of a test for artificial intelligence ethical awareness. Their study aims to establish whether artificial intelligence can comprehend ethical principles, which is a foundational step in considering artificial intelligence as a subject within legal

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contexts. Kwon (2023) examines changes in ethical awareness and education in a society increasingly influenced by artificial intelligence. The author emphasizes the necessity of integrating ethical considerations into artificial intelligence development and education. By enhancing ethical awareness, developers can create artificial intelligence systems that align more closely with societal values, potentially impacting how the law perceives and regulates artificial intelligence. Adaileh and Alshawawreh (2021) focus on measuring the impact of digital transformation in Jordan, proposing a framework that assesses technological advancements, including artificial intelligence. Their research indicates that as artificial intelligence becomes more embedded in various sectors, there is a growing need to understand its implications for legal subjectivity and accountability. Kopytko and Sylkin (2023) discuss modeling information support for combating corruption within the state's economic security management system. They highlight how artificial intelligence can be utilized to detect and prevent corrupt practices. The integration of artificial intelligence in legal processes raises questions about the system's autonomy and responsibility, contributing to the debate on artificial intelligence subjectivity in criminal law. Hassan (2020) also touches upon the relevance of artificial intelligence in the realm of cybercrime legislation. As cybercrimes become more sophisticated with the use of artificial intelligence, there is an urgent need to revisit legal definitions and frameworks. The author suggests that recognizing the role of artificial intelligence in committing or preventing crimes is crucial for effective legal regulation.

Collectively, these studies underscore the emerging challenges that artificial intelligence poses to criminal law. The subjectivity of artificial intelligence pertains to whether these systems can be considered legal entities capable of bearing rights and responsibilities. Addressing this issue requires a multidisciplinary approach, combining legal theory, technological understanding, and ethical considerations to adapt the law to the realities of an artificial intelligence-influenced society.

3. Methodology

3.1. Experts' Analysis Method

To identify the specific changes in criminal law that can enhance the definition of the legal personality of artificial intelligence, we employed an expert consultation method. This approach involved assembling a panel of professionals with extensive knowledge and experience in criminal law, artificial intelligence technology, and legislative processes within Jordan. The experts included legal scholars, practicing attorneys, judges, and technologists who are familiar with the implications of artificial intelligence on the legal system.

The experts participated in a series of structured interviews and focus group discussions aimed at eliciting their insights on the current legal framework and its adequacy in addressing the challenges posed by artificial intelligence. They were asked to identify gaps in the existing criminal legislation concerning artificial intelligence and to propose specific amendments or new provisions that could address these gaps. The discussions also focused on the potential impact of recognizing artificial intelligence as a legal subject, including ethical considerations and compatibility with international legal standards.

Data collected from these consultations were systematically recorded and analyzed to compile a comprehensive list of proposed legal changes. The qualitative data analysis involved identifying common themes, consensus points, and divergent opinions among the experts. This process ensured that the proposed changes reflected a wide range of professional perspectives and that the list was thorough and representative of the necessary legal adaptations required to define the legal personality of artificial intelligence effectively.

3.2. Consolidated Ranking Method

After compiling the list of proposed legal changes through expert consultations, we applied the Consolidated Ranking Method to prioritize these amendments based on their significance and urgency. The Consolidated Ranking Method, inspired by Saaty's analytical techniques, is a decision-making tool that facilitates the ranking of multiple items by consolidating individual assessments into a unified

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hierarchy. This method allows for a systematic evaluation of each proposed change against specific criteria.

Each expert was provided with the consolidated list of proposed amendments and was asked to rank them according to predefined criteria, including the potential impact on legal clarity, feasibility of implementation, urgency, ethical implications, and alignment with international legal practices. The experts performed pairwise comparisons of the proposed changes, assigning weights to reflect the relative importance of each amendment concerning the others. This process enabled the quantification of subjective judgments into measurable data.

The individual rankings and weights assigned by the experts were then aggregated to produce a consolidated ranking of the proposed legal amendments. Statistical methods were employed to ensure consistency and to address any discrepancies in the evaluations. The resulting prioritized list reflects the collective judgment of the expert panel, highlighting the most critical and immediate legal changes required to improve the definition of the legal personality of artificial intelligence in Jordan's criminal law. This prioritized framework serves as a practical guide for legislators and policymakers in addressing the legal challenges posed by the integration of artificial intelligence into the legal system.

4. Research Results

4.1. Prioritized List of Proposed Changes to Jordan's Criminal Law Regarding Artificial Intelligence

1. Introduce a Clear Legal Definition of Artificial Intelligence. The most immediate and essential change is to incorporate a precise and comprehensive legal definition of artificial intelligence into Jordan's criminal law. This definition should encompass the various forms and capabilities of artificial intelligence technologies, including machine learning systems, neural networks, and autonomous decision-making processes. By defining artificial intelligence clearly, the law can eliminate ambiguity and ensure consistent interpretation and application across legal proceedings. This foundational step is crucial because it sets the parameters for how artificial intelligence is recognized and treated within the legal system. It also provides a basis for further legislative developments concerning artificial intelligence's role and responsibilities.

2. Establish Legal Personality for Artificial Intelligence Entities. The second priority is to amend the criminal law to recognize artificial intelligence systems as entities that can possess certain legal rights and obligations, effectively granting them a form of legal personality. This change involves acknowledging that artificial intelligence can, in some contexts, act independently in ways that have legal consequences. Granting legal personality to artificial intelligence allows the legal system to attribute actions and responsibilities directly to these systems when appropriate. It facilitates holding artificial intelligence accountable for offenses and enables the application of legal remedies and sanctions specifically tailored to artificial intelligence entities.

3. Define Liability and Accountability Mechanisms for Artificial Intelligence Actions. The third recommended change is to develop specific legal provisions that outline liability and accountability mechanisms for actions undertaken by or through artificial intelligence systems. This involves clarifying who is responsible when an artificial intelligence system causes harm or commits an offense—whether it is the developers, operators, owners, or the artificial intelligence system itself (if granted legal personality). By establishing clear liability rules, the law can ensure that victims have avenues for redress and that responsible parties are held accountable. This also provides guidance to those involved in the creation and deployment of artificial intelligence systems regarding their legal obligations and potential risks.

4. Integrate Ethical Standards and Compliance Requirements into Legal Framework. The fourth priority is to incorporate ethical guidelines and compliance requirements into the criminal law framework governing artificial intelligence. This includes mandating that artificial intelligence systems adhere to established ethical principles, such as fairness, transparency, and respect for human rights. Integrating ethical standards into the law promotes the development and use of artificial intelligence technologies in a manner that aligns with societal values and legal norms. It also provides a basis for prosecuting actions that, while not explicitly illegal under existing statutes, violate ethical expectations and cause harm.

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Let the set of proposed changes to improve the subjectivity of artificial intelligence in criminal law be some set D= {d1, d2, ..., dn}.

4.2. Modeling Process

We will build a consolidated graph of connections between selected amendments to Jordan's legislation. The set of graph edges is recorded in the form of a square binary dependency matrix A according to the principle - 'presence or absence of connection between adjacent vertices' (fig.2).

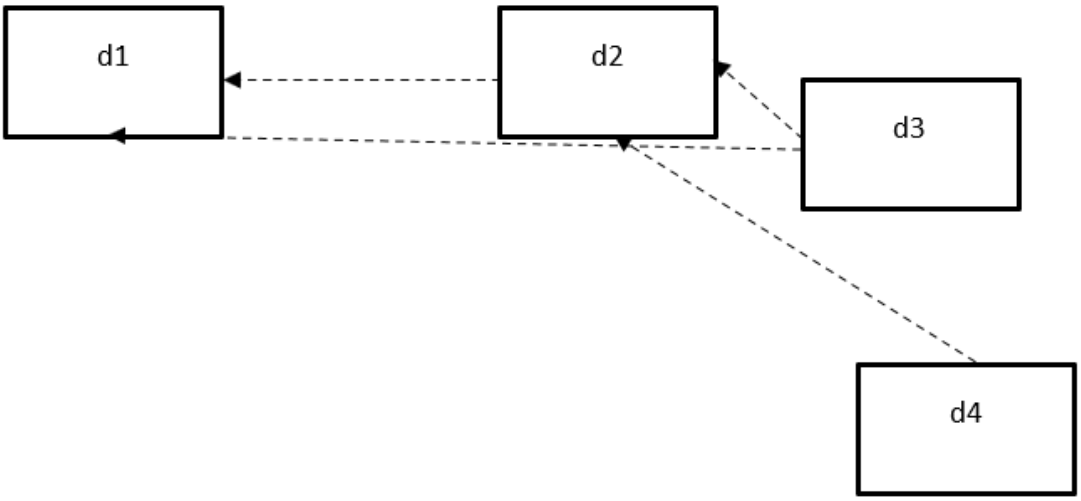

Figure 2.
Consolidated graph of connections.

Next, the matrix of consolidated reachability in the implementation of these changes is filled out (Table 1).

Table 1.
The matrix of consolidated reachability.

	$\mathbf{d_1}$	$\mathbf{d_2}$	$\mathbf{d_3}$	$\mathbf{d_4}$
d_1	Expert assessment:1	Expert assessment:0	Expert assessment:0	Expert assessment:0
d_2	Expert assessment:1	Expert assessment:1	Expert assessment:0	Expert assessment:0
d_3	Expert assessment:1	Expert assessment:1	Expert assessment:1	Expert assessment:0
d_4	Expert assessment:1	Expert assessment:1	Expert assessment:0	Expert assessment:1

If in the graph (fig.2) there is a path leading from vertex di to vertex dj, meaning vertex dj is reached from vertex di, then such a vertex is called reached. For convenience, let's denote the subset of similar vertices as Z (di). Similarly, vertex di is a predecessor of vertex dj if it is reached from this vertex. Let the set of predecessor vertices form a subset P(di). If P(di) = X(di) is reached, then a level of influence is formed. Thus, bypassing intermediate calculations, we immediately present the order of importance and significance of making changes to criminal legislation (Figure 3).

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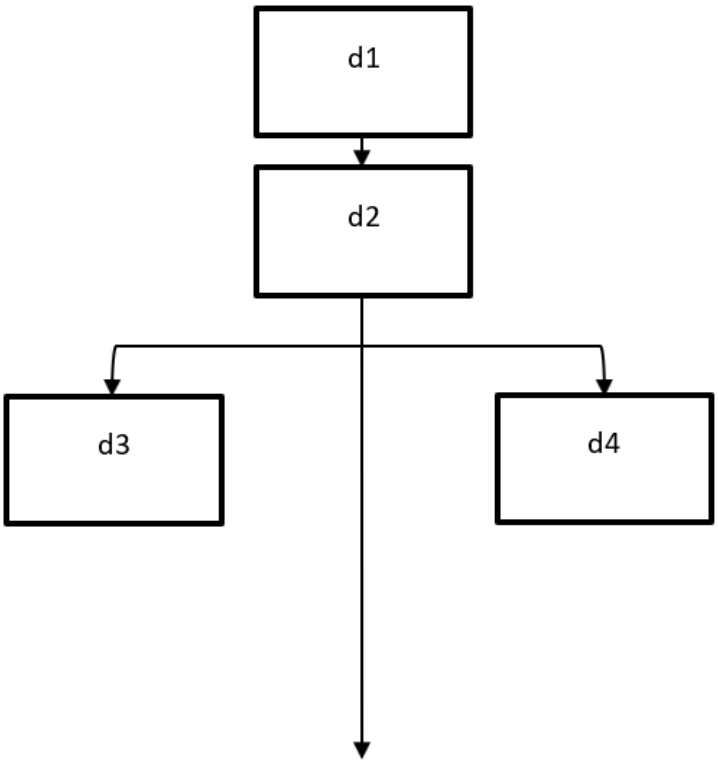

Figure 3.
The order of importance and significance of making changes to criminal legislation.

The analysis of the obtained model allows us to assert that in terms of importance, d1 should be introduced first.

4.3. Model of Integration of the Most Critical Changes

Introducing a clear legal definition of artificial intelligence (d1) into Jordan's criminal law is a foundational step toward effectively regulating AI technologies and addressing legal challenges (Figure 4).

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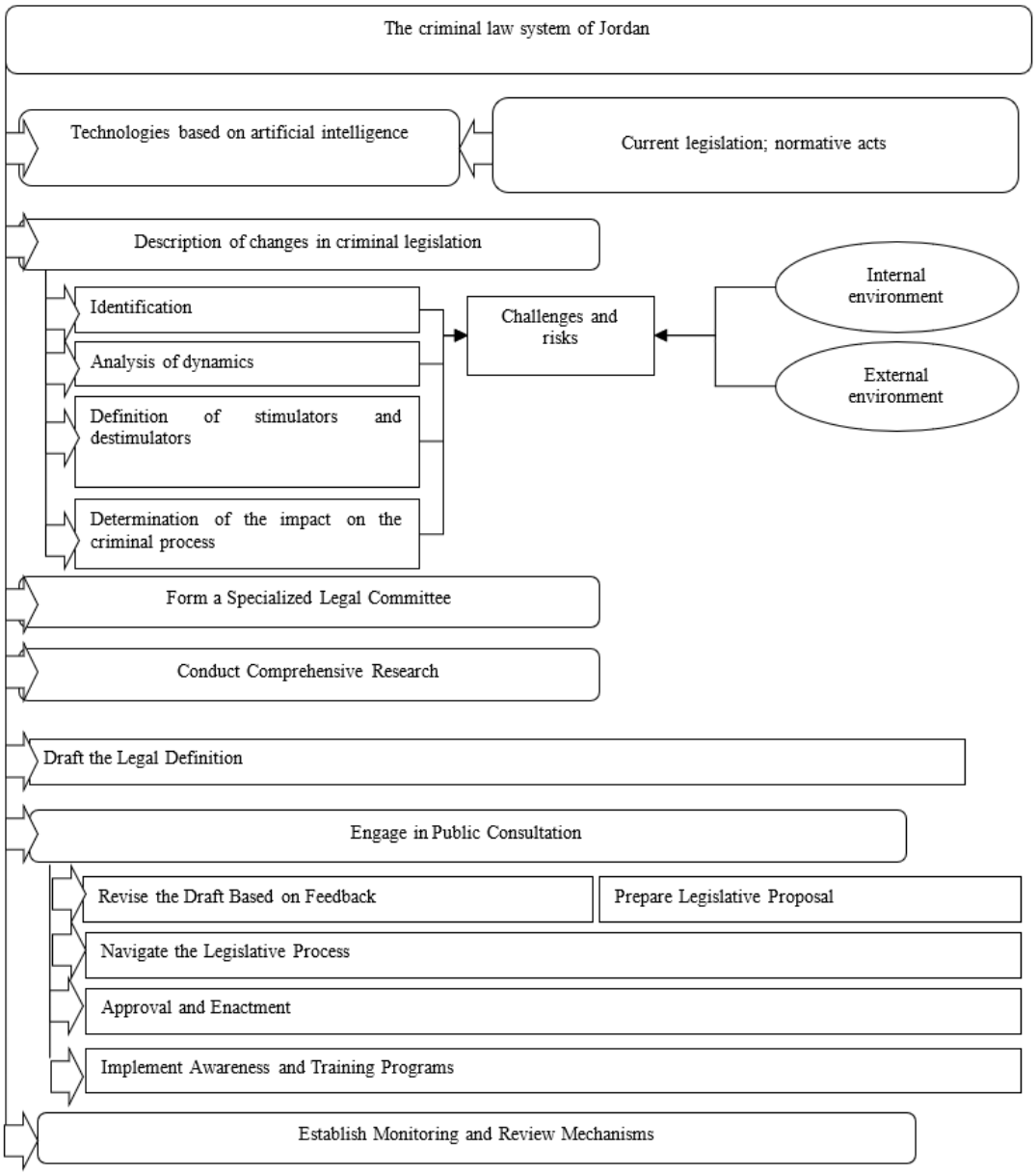

Figure 4.
Model of integration of the most critical changes.

By following these steps, Jordan can effectively integrate a clear legal definition of artificial intelligence into its criminal law framework. This proactive approach will provide clarity and guidance for legal practitioners, technologists, businesses, and the public. It will also position Jordan as a forward-thinking nation that responsibly addresses the challenges and opportunities presented by artificial intelligence, ensuring that the legal system remains robust and capable of protecting the rights and safety of its citizens in the digital age.

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5. Discussions

5.1. Analysis in Context: Comparison of Results with Existing Research

Lee and Oh (2016) examine the robot ethics of autonomous vehicles and their legal implications, highlighting the challenges in assigning liability and responsibility when artificial intelligence systems are involved in incidents. Their study emphasizes the need for legal frameworks to address the unique characteristics of artificial intelligence technologies. Our research builds upon this by proposing specific amendments to Jordan's criminal law to define the legal personality of artificial intelligence, thereby providing a foundation for assigning responsibility and accountability within the legal system. Lim (2017) discusses moral education in the age of artificial intelligence from the perspective of consumer ethics. The author underscores the importance of integrating ethical considerations as artificial intelligence becomes more prevalent in society. Similarly, our research recognizes the necessity of addressing moral and ethical issues related to artificial intelligence. We suggest that a deeper assessment of these issues is crucial for effectively regulating artificial intelligence activities within criminal law.

Raso et al. (2018) explore the opportunities and risks of artificial intelligence concerning human rights. They highlight the potential for artificial intelligence to impact individual rights and the importance of regulatory measures to mitigate risks. Our study aligns with this perspective by proposing legal changes that aim to establish artificial intelligence as a legal subject, which could facilitate better protection of human rights in interactions involving artificial intelligence systems. Mayson (2020) delves into the fundamental concepts of criminal law, discussing how legal principles adapt to societal changes. While not specifically focused on artificial intelligence, her work provides a theoretical foundation for considering how criminal law can evolve in response to new challenges. Our research applies these foundational concepts to the context of artificial intelligence, suggesting that criminal law must evolve to address the emergence of artificial intelligence as potential legal subjects.

Palmer (2023) examines the interplay between criminal law, intelligence legislation, and protective security requirements. The study reflects the broader need to adapt legal frameworks in response to evolving security challenges posed by technological advancements. Our research echoes this necessity by proposing amendments to criminal law that account for artificial intelligence technologies, which are increasingly relevant to national security and intelligence contexts.

Zhang and Dong (2023) analyze criminal law regulation of cyber fraud crimes from the perspective of personal information protection in the era of edge computing. Their work highlights how technological advancements necessitate updates in legal regulations to effectively protect citizens. Our study complements this by addressing how criminal law can be amended to consider artificial intelligence not only as a tool used in crimes but also as entities that could possess legal personality and therefore bear responsibility. Williams et al. (2022) focusses on artificial intelligence ethics curricula for middle school youth, emphasizing the importance of education in addressing ethical issues associated with artificial intelligence. While their research centers on educational curricula, it reflects a societal acknowledgment of the challenges posed by artificial intelligence, which our study also recognizes in the context of legal regulation and the need for ethical considerations within criminal law.

Quirk and Wortley (2017) discuss the role of criminal law within the Society of Legal Scholars, highlighting the importance of continuous scholarly engagement with evolving legal issues. Our research contributes to this scholarly discourse by addressing the contemporary challenge of artificial intelligence's subjectivity in criminal law, encouraging further academic analysis and debate. Martínez-Peláez et al. (2023) investigate the role of digital transformation in achieving sustainability, mediated by stakeholders, key capabilities, and technology. While their focus is on sustainability in a business context, the study acknowledges the significant impact of technological advancements on various sectors. Our research aligns with this by recognizing the importance of involving experts and stakeholders in identifying necessary legal changes to accommodate artificial intelligence within the criminal law framework. Ramsay (2012) explores the right to security in criminal law theory, discussing how criminal law serves to protect individuals and society from harm. Our study resonates with this theme by proposing legal amendments that aim to enhance security and accountability in the context of

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artificial intelligence, thereby contributing to the overarching goals of criminal law in safeguarding societal interests.

5.2. The novelty is Obtained as a Result of Research

Our article focuses on evaluating the necessary changes in criminal law to improve the definition of the legal personality of artificial intelligence, particularly within Jordan's legal framework. Our research identifies and organizes essential amendments to Jordan's criminal legislation to establish artificial intelligence as a legal subject, aiming to enhance accountability and regulation of artificial intelligence activities. In conclusion, our research addresses a critical gap by proposing specific changes to criminal law to define the legal personality of artificial intelligence, with a focus on Jordan's legal system. This contribution extends the existing literature by providing concrete recommendations and a structured approach to prioritizing legal amendments necessary for adapting to technological advancements. Our work complements and builds upon current discussions regarding the legal and ethical implications of artificial intelligence, emphasizing the need for criminal law to evolve to meet new challenges. By aligning with themes identified in existing research, our study underscores the importance of interdisciplinary efforts to effectively regulate artificial intelligence and address the moral and ethical considerations associated with its integration into society.

6. Conclusions

6.1. General Conclusions of the Study

This study aimed to evaluate the necessary changes in criminal law to enhance the definition of the legal personality of artificial intelligence, with a particular focus on Jordan's criminal legislation. By examining technologies based on artificial intelligence that could become subjects of criminal law, the research identified and organized the most critical amendments required to address the challenges posed by the integration of artificial intelligence into various sectors of society.

Overall, the research affirms that the strategic implementation of legal reforms has been pivotal in enhancing the effectiveness, fairness, and responsiveness of Jordan's criminal justice system. By balancing tradition with modernization, Jordan has positioned itself to better navigate the complexities of a rapidly evolving global landscape, ensuring that its legal framework remains robust and relevant in addressing both longstanding and emerging criminal challenges. The proposed model for organizing these changes prioritizes amendments based on their significance and urgency, providing a practical roadmap for policymakers and legislators. By addressing the most pressing issues first, the legal system can more effectively regulate artificial intelligence and mitigate potential risks associated with its increased autonomy and decision-making capabilities.

The findings of this study highlight the pressing need for criminal law to evolve in response to technological advancements. Recognizing artificial intelligence as a potential legal subject is a crucial step toward ensuring accountability and maintaining the rule of law in an era where artificial intelligence systems play an increasingly significant role in society. Without such legal recognition and corresponding regulatory measures, there is a risk of legal gaps where actions by artificial intelligence could fall outside the scope of current laws, leading to challenges in enforcement and protection of individual rights.

6.2. Prospects for Further Research

Future research should conduct an in-depth examination of the moral and ethical implications of artificial intelligence operating as autonomous agents. This includes exploring philosophical questions about consciousness, intent, and the capacity of artificial intelligence to understand and adhere to societal norms. Analyzing how different jurisdictions address the subjectivity of artificial intelligence can provide valuable insights. Comparative studies can identify best practices and facilitate international cooperation in developing harmonized legal frameworks. By pursuing these research avenues, the academic and legal communities can work toward a more comprehensive understanding of how to integrate artificial intelligence into the legal system effectively. This will help ensure that laws keep

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pace with technological innovations and continue to protect societal interests, promote justice, and uphold ethical standards in the age of artificial intelligence.

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