Journal of Human Security | 2024 | Volume 20 | Issue 1 | Pages 11-18
DOI: https://doi.org/10.12924/johs2024.20102
ISSN: 1835–3800

Journal of Human Security

Research Article

# The Legal Nature of Artificial Intelligence Hardware and Software (Smart Robots)

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Submitted: 28 November 2023 | Revised: 13 April 2024 | Accepted: 24 May 2024 | Published: 30 June 2024

**Abstract**: Smart robots represent a pivotal application within the domain of artificial intelligence, embodying automated systems imbued with specialized software facilitating either predetermined actions akin to conventional robots or independent decision-making capabilities akin to autonomous entities. However, an inherent dilemma emerges regarding accountability when such robots cause harm. This prompts inquiry into the allocation of responsibility and the applicability of established legal frameworks to contemporary circumstances. Furthermore, consideration is given to the prospect of endowing these entities, particularly autonomous robots, with legal personhood, as exemplified by the concept of general rules for robots. Delving into the European Parliament's stance on this matter elucidates current perspectives and anticipates potential future trajectories concerning the attribution of legal personality to autonomous robots. Consequently, this qualitative investigation endeavours to elucidate the legal status of Artificial Intelligence (AI) hardware and software, with a particular focus on intelligent robots. Employing a normative research methodology, the study aims to discern that the unique nature of robots necessitates bespoke legislative measures. Ultimately, the findings of this study serve as instrumental insights for regulatory bodies and lawmakers, facilitating the development of judicious and targeted platforms rooted in AI technology.

**Keywords**: Autonomous Robot, Smart Robot, Legal, Artificial Intelligence (AI).

## 1. Introduction

Artificial Intelligence (AI) was initially defined by John McCarthy in 1956 as "the science and engineering of making intelligent machines." Various definitions of AI acknowledge its evolving nature; for instance, Ellen Rich described it as "the study of how to get computers to do things," while AI pioneer Patrick Winston characterized it as "the study of ideas that enable computers to be intelligent" [1]. AI encompasses programs capable of emulating human thought processes, such as observing inputs for problem-solving and discerning and classifying objects and their attributes. Legal discourse centres on delineating rights and responsibilities stemming from AI deployment, emphasizing the autonomy of AI entities themselves. Nevertheless, some argue that despite being rooted in computer programming, AI reflects intellectual effort akin to artistic creation, thereby positioning software-driven robots as creators in their own right [2].

Meanwhile, AI stands as a pivotal focal point in an ongoing industrial and digital revolution, amalgamating diverse methodologies to emulate human cognitive processes. This entails the integration of various technologies aimed at enabling machines to replicate genuine forms of intelligence [3]. Foremost among the applications of AI and its notable accomplishments lie in the realm of robotics, which has progressively infiltrated numerous sectors of industry, even venturing into tasks traditionally deemed challenging for human endeavour. A smart robot, characterized by its multifaceted abilities, operates either under direct human supervision or autonomously through pre-programmed instructions embedded within its software. The tasks undertaken by smart robots typically encompass endeavours demanding precision, endurance, accuracy, and hazard mitigation, such as mine or radioactive waste detection [4]. Consequently, a robot is a mechanized entity programmed to execute a sequence of actions, representing a human-created apparatus endowed with intelligent functionalities, often operating with minimal human intervention [5].

Given the increasing ubiquity of AI technology across various societal domains [6], a comprehensive understanding of its legal standing becomes imperative. However, scant attention has been directed towards the legislative frameworks governing AI hardware and software. To address this gap, a qualitative inquiry into the legal dimensions of smart robots is undertaken, with the aim of elucidating pertinent issues. This study endeavours to furnish policymakers, legal practitioners, and stakeholders with nuanced insights into the legal ramifications of AI technology through qualitative exploration, facilitating comprehension of requisite regulatory measures for responsible AI deployment. Such research is instrumental in unravelling the legal intricacies surrounding AI hardware and software, particularly in the context of intelligent robotics. As AI technology continues to evolve and permeate diverse societal spheres, an enhanced comprehension of associated legal challenges becomes indispensable. This study endeavours to underscore the complexity inherent in legal deliberations concerning AI entities, encompassing discussions pertaining to personhood and the attendant matrix of responsibilities. Through this research, regulatory authorities and legal experts can gain insight into the intricate legal frameworks governing AI technology, enabling a discernment of requisite measures for fostering an ethically centred advancement and utilization of AI technology. Additionally, this study aims to facilitate the development of robust and equitable legislative frameworks governing AI software and hardware, thereby fostering an environment conducive to innovation while safeguarding the rights of individuals and the interests of society amidst a rapidly evolving technological landscape.

Section 1 of the study delineates the research's contextual backdrop, articulates the problem statement, elucidates the research objectives, and underscores the study's significance. Section 2 conducts a comprehensive review of existing literature. Section 3 meticulously outlines the research methodology employed. Section 4 presents the research findings and

corresponding results. Section 5 offers conclusions drawn from the study, while Section 6 furnishes pertinent recommendations. Section 7 delineates the theoretical, practical, and policy implications stemming from the study's findings. Finally, Section 8 deliberates on the limitations inherent in the study.

## 2. Literature Review

### 2.1 The Robot is a Movable Thing

Initially, it is essential to elucidate the concept of a robot by examining various definitions put forth in scholarly discourse. One such definition characterizes a robot as an intelligent apparatus capable of executing tasks typically performed by humans, possessing the capacity to autonomously make decisions devoid of human intervention [7]. Alternatively, some scholars contend that a robot constitutes a mechanical contrivance engineered to undertake activities ordinarily carried out by humans. Nonetheless, the majority of robots are underpinned by software frameworks that operate independently of direct human oversight. These robots are imbued with programming intended to mimic and assimilate human cognition, notions, perceptions, decision models, and even verbal and motor expressions [8]. Furthermore, a robot is delineated as a mechanized entity programmed to operate autonomously, either through explicit directives from a human operator or via indirect commands emanating from its internal software architecture [9].

A smart robot is delineated as a machine intricately programmed utilizing AI technology, endowed with the capacity to discern and enact judicious decisions across diverse environmental and situational contexts [10]. Conversely, others conceptualize a robot as a facet of artificial intelligence amalgamating various technologies encompassing locomotion, language processing, planning, learning, and knowledge synthesis, augmented by elements of autonomy and perceptiveness [11]. However, upon meticulous examination of these definitions, it becomes evident that they converge on certain foundational elements. Foremost among these is the software interface, followed by human-driven programming infused with artificial intelligence principles, operational autonomy, and a propensity for learning and prognostication. Notably, the conventional notion of a robot as a "mechanical device" is increasingly inadequate, given instances where robots manifest solely as software entities, such as communication-responsive software. Thus, a robot may be succinctly defined as a software-integrated device, programmed by human agents leveraging artificial intelligence principles, operating autonomously, and possessing the capacity for adaptive learning and environmental prediction. Hence, in essence, robots represent electronically orchestrated devices, diverging from the traditional perception of moveable mechanical entities.

### 2.2 Robot is an Object

In the realm of legal classification, a robot, by virtue of its tangible presence, falls within the purview of general regulations, occupying physical space and thereby being perceptible. Consequently, liability ensues for any damage caused by such objects, as stipulated in Article 291 of the Jordanian Civil Code, which mandates accountability for individuals possessing objects requiring special care or mechanical devices. However, a nuanced examination of Article 291 reveals that the Jordanian legislature has devised specific provisions to delineate responsibility for objects, particularly emphasizing the notion of possession. Herein, possession denotes actual custodianship rather than merely legal ownership, while the designation of "objects requiring special care" underscores the imperative to exercise caution and vigilance over entities with inherent hazards. Nonetheless, the degree of vigilance necessitated is contingent upon the nature of the object and the prevailing circumstances, entailing scrutiny of both internal and external factors. Notably, the legislature employs the term "mechanical machines" to describe such objects, prompting inquiry into the applicability of these standards to robots. Indeed, the characterization of robots as movable entities and mechanical machines governed by sophisticated electronic programs permits the extension of Article 291 to encompass their regulatory framework. Nevertheless, the intangible nature of the software programming raises complexities regarding the conceptualization of robots as objects, as software transcends materiality. Thus, the obligation to exercise due diligence over a robot extends beyond ownership or usage to encompass control and supervision, necessitating recourse to general legal principles. Nevertheless, proponents argue that artificial intelligence programs, being instantiated on digital mediums, possess a physical essence akin to objects recognized under civil laws. This perspective finds support in a ruling by the Paris Court, which equated reproducible and preferable images with objects, a premise congruent with the nature of artificial intelligence programs residing on electronic substrates. Conversely, unsaved images are excluded from such classification [12]. Upon examination, it becomes apparent that the legislature adheres to existing legal frameworks when addressing instances of detrimental actions perpetrated by smart robots. Notably, Jordanian laws do not specifically address robots, thus necessitating their classification as machines, rendering them subject to prevailing legal norms. Legal statutes, characterized by their inflexibility, mandate civil liability for any harm inflicted on others, imposing responsibility on the perpetrator, irrespective of their mental state, as delineated in Article 256 of the Jordanian Civil Code. Consequently, the liability associated with robots falls within the ambit of liability for objects, as stipulated in Article 291 of the Jordanian Civil Code. Some contend that holding guardians of artificial intelligence systems, i.e., robots, accountable under the principles of object liability presents significant challenges. While robots possess autonomy in decision-making and are inherently risk-averse, any damages resulting from erroneous decisions necessitate compensation by the guardian. In such cases, the guardian is deemed responsible as an owner of an object, absolved only by demonstrating an external causative factor, a formidable task [13].

The researcher argues against classifying robots as inanimate objects, as they operate beyond the realm of inertia. Moreover, inanimate objects cannot possess legal personality, prompting efforts to confer legal status upon robots. This study is dedicated to exploring solutions to grant legal personality to robots.

### 2.3 A Robot is a Movable Object

Regarding the classification of a robot as a movable asset, Article 58 of the Jordanian Civil Code delineates the distinction between real estate and movables. According to this provision, real estate pertains to entities firmly rooted in a specific location, incapable of relocation without sustaining damage or altering their form, whereas movables encompass entities that can be transported without adverse consequences. Consequently, a robot qualifies as a movable asset, as it can be relocated from one location to another without incurring damage. Furthermore, certain perspectives equate artificial intelligence devices with components of the Internet of Things, positing their interconnectedness with external entities. These software entities, endowed with the capability to manipulate physical objects, transform conventional movables into intelligent devices capable of mimicking human behaviour. By interfacing with information transmission networks, these devices facilitate the exchange of data [14].

AI is categorized as a form of property, constituting movable assets subject to classification as either tangible or intangible property, distinct from legal entities due to their lack of legal personality. Despite the incorporation of both tangible and intangible components in artificial intelligence systems, their classification as movable property remains unaffected by the nature of their operation. In the context of robots, the physical aspect of the entity takes precedence over the presence of intangible elements within it. Consequently, artificial intelligence operates through a composite framework comprising both tangible and intangible elements, wherein one may predominate over the other, resulting in a coherent structure whose legal status remains unaffected by the diversity of its constituents [15]. Opponents of granting legal personality to robots contend that current challenges preclude the recognition of such personality, highlighting the complexities inherent in establishing and maintaining a distinct personality for entities classified as unique movable objects. They also speculate about the potential for acknowledgment of digital legal personality for robots in future developments [12].

### 2.4 A Robot is a Movable Object at the Disposal of a Person

According to the provisions of Article 291, which delineates the objects falling under the responsibility of the individual in control, the term implies the presence of a natural person overseeing the operation of the machine (the object) in a direct and active capacity. Consequently, it follows that a robot falling within the scope of this general rule is one subject to the direct supervision and guidance of a specific individual to whom the robot is entrusted. Thus, highly advanced robots capable of autonomous operation and decision-making, devoid of direct human oversight, but governed by software enabling independent decision-making based on environmental stimuli, fall outside the purview of Article 291. The liability framework outlined in Article 291 of the Jordanian Civil Code pertains to situations where inanimate objects are set in motion by commands from the user of these machines. Liability is attributed to whoever exercises control over these objects at the time of damage, in accordance with the principle of "blessing is equal to the curse," which applies in this context as well.

An inquiry arises as to whether a smart robot can be equated with movable objects subject to human supervision and control, thereby invoking the rules governing liability for objects and applying the doctrine of presumed fault to its guardian. However, the answer is likely negative, given that the autonomy and distinct characteristics of a robot diverge from the traditional notions pertaining to the supervision of objects.

Traditional theories, which no longer align with contemporary technological advancements and their complexities, fail to adequately address the unique attributes and capabilities inherent in smart robots.

# 3. Methodology

## 3.1 Research Type and Problem Approach

This legal study utilized a normative legal research methodology, which assesses legal norms and principles based on their adequacy, coherence, and operationality in addressing contemporary legal challenges [16]. Consequently, this approach proved invaluable in analysing the legal ramifications of AI hardware and software, colloquially referred to as "smart robots." It facilitated a comprehensive examination of existing legal frameworks and the determination of their historical application.

## 3.2 Sources of Legal Materials

This study primarily relied on authoritative legal documents including court judgments, regulatory statutes, rules, and governmental publications concerning AI technologies for its legal analysis of smart robots within the legal system. Additionally, to bolster the study's credibility, secondary legal sources such as scholarly articles, books, and legal journals were consulted. These secondary sources furnished analytical academic discourse and theoretical frameworks pertinent to the forefront legal challenges intertwined with AI hardware and software.

## 3.3 Legal Material Collection Technique

Multiple methodologies were employed in the procurement of legal materials aimed at securing relevant and reliable sources. Essential insights into the legal implications of AI technology were garnered through meticulous examination, citation, and interpretation of primary legal sources including statutes, regulations, and judicial rulings. Furthermore, to access pertinent legal documents and scholarly literature pertaining to this subject, a systematic exploration of legal databases, online libraries, and academic publications was undertaken.

## 3.4 Analysis of Legal Materials

The methodology encompassed techniques of description, evaluation, and argumentation in the analysis of legal materials. Evaluation relied on arguments substantiated by both deductive and inductive legal reasoning.

# 4. Findings

## 4.1 A Robot is a Natural or Legal Person

As AI systems continue to advance and assume greater societal significance, there are two primary rationales supporting the notion of granting them legal personhood. Firstly, assigning legal personhood provides a mechanism for accountability in instances of malfunction or error, addressing potential gaps in accountability arising from the rapidity and autonomy of AI systems. Secondly, bestowing legal personhood ensures recognition of contributions and facilitates the allocation of rewards when AI systems perform optimally [1].

Robots have evolved to possess autonomous agency and extensive cognitive and physical capabilities surpassing those of humans. Consequently, there is a growing imperative to establish legislative frameworks and regulations governing their activities and consider the possibility of granting them legal personhood. However, determining the legal personhood of a robot poses challenges distinct from those encountered with natural or legal persons. While there may be some overlap in outcomes, fundamental differences in nature and physiology preclude direct comparison between robots and natural persons. Conversely, the analogy between robots and legal persons may be more apt, as both lack the physiological characteristics inherent to natural persons. This has sparked a divergence of opinions regarding the feasibility and implications of granting legal personhood to robots, prompting further examination [2].

The Jordanian legislature, akin to other Arab legal systems, accords legal personhood to both natural and legal entities, accompanied by detailed legal provisions governing their respective statuses. However, the emergence of robots has raised questions regarding their classification and entitlement to legal personhood. The debate centres on whether robots should be classified within existing legal frameworks or granted a distinct form of legal personhood. While likening robots to natural persons poses challenges due to inherent differences in nature and physiology, the comparison to legal persons may be more applicable, given their shared absence of physiological attributes. Consequently, divergent perspectives have emerged regarding the desirability and implications of granting legal personhood to robots, a topic to be explored further herein.

Some argue against granting legal personhood to robots, citing potential future complications. Granting legal personhood may blur distinctions between errors attributable to robots and those resulting from human involvement, such as developers, designers, users, or owners. This poses challenges in attributing accountability and distinguishing technical errors from human mistakes within the context of smart machines [1]. Estimating the individual behaviour of the smart machine poses challenges, particularly in delineating responsibility between the machine itself and other involved parties such as the owner or user. It is also arduous to distinguish errors attributable to the robot from those of its supervisor, barring instances of blatant negligence on the part of the user. Additionally, instances of deviant behaviour or incorrect data leading to errors that harm others further complicate the attribution of accountability.

## 4.2 Robot is a Natural Person

The Jordanian civil law draws a clear distinction between natural persons, as articulated in Paragraph (1) of Article 30, where the personality of an individual commences upon birth and ceases upon death. Unlike humans, robots inherently lack the attributes of natural persons due to their distinct nature. Consequently, any rights granted to and acknowledged for robots are construed as legal rights rather than natural rights, commonly referred to as human rights [9].

Opponents of granting legal personality to robots as natural persons have articulated various reasons for their stance. They argue against conferring natural person status upon non-living entities, asserting that such a designation diminishes human status to that of a machine. Moreover, they caution against equating humans with machines, citing concerns over potential erosion of human sovereignty and existential threats posed by robots. Additionally, robots lack free will and may engage in illegal behaviour without bearing accountability for their actions. Describing robots as natural persons overlooks key human attributes such as consciousness, moral sensibility, personal identity, and other personal characteristics, thereby giving rise to numerous legal and ethical dilemmas. Granting robots legal personhood could lead to claims for nationality, wages, dignity, and other personal rights, despite their lack of consciousness and inability to experience physical or emotional pain. Consequently, humans are distinct from robots, as they are not mere products of programming and are not constrained by such programming. Moreover, robots lack perceptual abilities, free will, and financial autonomy [9].

It is noteworthy that some argue for a distinction between the legal personality recognized by legislators and the independent legal personality of a robot. The former is not contingent upon perception and full cognitive capacity, as legal personality is conferred by law to children under the age of seven and individuals deemed mentally incapacitated, who lack awareness and discernment, in contrast to the capacity for performance which necessitates a certain level of perception and discrimination. Regarding the latter, pertaining to the personality of a smart robot, despite its advanced intelligence surpassing human thought, determining its accountability for actions remains elusive, particularly concerning matters of perception and awareness where doubts persist regarding robots. Despite the cognitive abilities of these smart robots enabling them to think and innovate, their awareness is manufactured and distinct from the innate perception of humans. Therefore, substantiating the personal accountability of smart robots, even in cases of aggressive actions diverging from general norms, remains uncertain [2].

However, some argue that what distinguishes humans is their capacity to comprehend legal norms and adhere to them, a feat not achievable by AI systems. Consequently, rights and responsibilities are intrinsically tied to the possession of legal personality, which emanates from human identity and the organization of social relations among them [17]. Conversely, some perceive the recognition of legal personality for robots akin to natural persons as an encroachment on human rights. Nevertheless, given the advancement of smart robots, there is a growing call to confer legal personality upon them, not necessarily to endow them with full personhood rights, but rather to assign accountability for damages incurred [10]. The researcher aligns with perspectives that reject the notion of treating robots as natural persons, particularly in the present era, citing aforementioned reasons, and highlighting the presence of a moral agency better suited to handle such matters. However, the researcher does not dismiss the possibility of future advancements in autonomous robots to such an extent that they achieve cognitive and operational parity with or surpass human

capabilities. In such a scenario, reconsideration of granting them natural personhood may be warranted under specific circumstances. Presently, there are instances of robots being granted citizenship, albeit primarily symbolically, as this concept remains largely aspirational for the time being.

### 4.3 Robot is a Legal Person

Regarding legal entities, Paragraph (1) of Article (51) of the Jordanian Civil Code delineates that a legal entity possesses all rights except those inherent to natural human capacity, as delineated by law. Paragraph (2) of the same article denotes that a legal entity maintains independent and legal financial liability as per the incorporation document or statutory regulations, along with the right to legal recourse and an autonomous legal domicile, with a designated representative expressing its volition. Article (50) of the Jordanian Civil Law outlines the definition of legal (moral) entities. Furthermore, Article (52) underscores that legal entities are subject to the stipulations of their respective special laws.

### 4.4 Opinions Supporting a robot being a Legal Person

Some proponents advocate for the notion of attributing legal personhood to robots, drawing parallels between the legal standing of intelligent machines and that of human entities [18]. They argue that since both lack inherent human characteristics, recognizing the legal personhood of robots holds practical and scientifically significant implications. They contend that just as traditional legal entities play crucial roles, artificial intelligence entities may possess even greater significance, thereby necessitating legislative acknowledgment of their legal status. Moreover, they suggest the possibility of artificial intelligence systems having legal representation akin to their creators, manufacturers, or owners [4]. Conversely, critics of granting legal personhood to artificial intelligence entities argue against potential misalignment, asserting that such recognition fails to address the responsibilities of designers or owners. They also challenge the notion that social benefit does not warrant legal personhood for these advanced technologies, highlighting their substantial impact on societal dynamics [4].

Certain individuals advocate for granting legal personhood to robots based on their capacity to acquire rights and assume obligations autonomously. They posit that artificial intelligence systems are evolving toward attaining legal personhood akin to natural persons, with their personality delineated by the fulfilment of their objectives. Regarding financial autonomy, one proposed solution involves the owner or user establishing a bank account for the artificial intelligence entity to finance its operational requirements, as it may not practically exercise its acquired rights independently. Conversely, artificial intelligence systems can operate without direct ownership of financial assets, serving as intermediaries in facilitating transactions on behalf of their clients, such as withdrawing subscription fees from customer bank accounts. Consequently, the conferment of legal personality onto artificial intelligence systems will likely be accompanied by the gradual development of distinct identities, possibly through the categorization of various robot types [15].

### 4.5. Criticism of Considering a Robot a Legal (Moral) Person

The challenge of applying conventional legal frameworks to robots stems from the intrinsic disparities between human and robotic entities. Unlike human workers who possess legal personhood and cognitive faculties, robots lack these attributes. Consequently, the contractual relationship between employers and human workers, governed by labour contracts, cannot be directly extended to robots due to their absence of legal personality. Robots currently lack the capacity to engage in contractual agreements with employers and rely on their owners for operational direction [10].

Critics argue that for robots to attain legal personhood, they must demonstrate capacities such as learning, self-correction, environmental adaptation, and initiative. Thus, the criteria for endowing robots with legal personality encompass intelligence, capability, and autonomy, enabling them to address various challenges independently [18].

AI exhibits creative attributes derived from its software architecture, enabling it to pursue objectives effectively. However, likening AI to corporate entities, which possess legal personhood, lacks justification under existing standards of rights and obligations within corporate law [17]. Opponents of granting legal or moral personhood to robots argue against such recognition, citing concerns about the blurring of distinctions between humans and machines, the absence of inherent moral agency in robots, and the potential evasion of manufacturer responsibility for product defects. Moreover, the lack of sufficient control over robots' actions complicates assigning accountability and legal liability, making current legal frameworks deemed adequate [9].

Even within the realm of tort law, there exists applicability of general principles that can be extended to encompass robots, including regulations pertaining to object liability, vicarious liability, product liability, and other specific provisions tailored to distinct circumstances [9]. While some argue that moral personality lacks autonomy vis-à-vis its controller, the electronic persona embodied by a robot presents a contrasting paradigm, possessing the potential for autonomous development akin to a legal entity [18].

This researcher diverges from the dissenting view on the moral personhood of robots, advocating instead for their recognition as moral agents. However, it is imperative to acknowledge the need for adaptations to moral personality norms within general legal frameworks to suit the unique attributes of robots. Thus, the personality of a robot assumes a distinct character, aligning with principles governing moral personhood. Concurrently, the legal regulation of robot operations entails the development of novel legislative frameworks tailored to address the intricacies of robotic labour. This regulatory endeavour commences with the examination of existing legal provisions concerning intelligent software, which serve as foundational principles guiding the autonomous functioning of robots. Nevertheless, preceding the formulation of draft legislation governing robot labour is the essential task of establishing the legal persona of a robot.

### 4.6. Opinions Supporting a Robot Being a Special Type of Personality

The perspectives outlined above regarding the classification of robots as either natural or legal persons underscore the notable distinction between smart robots and human or legal entities, as delineated by the provisions of Article 30 and Article 50 of the Jordanian Civil Code. Similarly, the European legislative framework refrains from categorizing robots as possessing a virtual electronic personality akin to that of a natural person, primarily due to their ownership by another individual. Moreover, the absence of regulation governing the conferment of moral personality upon robots leads to the recognition of the responsibility lying with their human representatives [13].

There exists a contention regarding the feasibility of granting legal personhood to entities devoid of human or corporate attributes, such as inanimate objects or software. This notion is viewed as a conceptual aspiration, given the absence of inherent human characteristics or commercial status. Consequently, the exploration for a distinct form of personality imbued with traits compatible with artificial intelligence or software remains subject to contextual variations, particularly concerning the operational environments of such intelligent systems like robots. Notably, the Legal Affairs Committee of the European Parliament has denoted the term "electronic personality" in this discourse [17].

On the contrary, there are proponents of the notion that bestowing legal personality upon a smart robot is feasible. However, the term "feasible" encompasses four distinct meanings. Firstly, there's the scientific feasibility, substantiated by the robot's capacity to interact with its environment. Secondly, there's practical feasibility, evident in the ubiquitous presence of robots across various spheres of life. Philosophical or logical feasibility constitutes the third aspect, where the concept aligns with rational thought, albeit differing from natural or moral persons. Lastly, legal feasibility necessitates legislative intervention to confer legal personality onto robots within the existing legal framework [11].

Others contend that rejecting the recognition of independent legal personality for artificial intelligence technologies and instead categorizing them as a unique category of legal entity serves practical and jurisprudential considerations. Examples abound, showcasing the boundless advancements in technology, particularly in the realm of artificial intelligence. However, the grant of legal personality to robots necessitates the assurance of functional and technical safeguards to ensure accountability and indemnity for damages, safeguarding against the potential negligence of designers or developers [4].

The researcher posits that acknowledging legal personality entails a shift in accountability from an inanimate object to an entity, in this case, the robot. Unlike traditional legal entities managed by designated individuals through established legal mechanisms, robots manage themselves. While human oversight remains, it is more of a general supervision rather than direct management akin to traditional legal persons. Consequently, the researcher aligns with viewpoints characterizing robots as a unique form of personality.

After deliberating on the array of perspectives regarding the legal personality of robots, the researcher advocates for a postponement in addressing the issue of recognizing their legal persona. This delay is deemed necessary until the establishment of foundational rules and infrastructures in the near future. Subsequently, the recognition of legal personality can be contemplated within a more extensive timeframe, adhering to stringent legal principles. By first completing the organizational framework to delineate the responsibilities of robots, the groundwork is laid for the eventual recognition of legal personality, especially concerning

highly intelligent robots capable of autonomous operation, independent decision-making, and self-directed business development.

### 4.7 The Robot (Regular and Autonomous) has a Special Nature

Smart devices can be categorized into two distinct types: single-interaction devices and dual-interaction contractual devices. The researcher contends that the latter category, characterized by absolute autonomy in decision-making and action, exhibits a higher level of advancement compared to other smart devices, a focal point addressed within this chapter.

To delineate between the programming paradigms of robots, single-interaction smart devices perform specific services beyond contractual obligations, operating within a specialized smart system, connecting to information networks, and occasionally incorporating sensors to interact with their external environment and humans. Examples include smart home devices and systems utilized in shopping centres to synchronize control mechanisms with inventory management and customer service, facilitating tasks such as inventory replenishment. These devices function autonomously, with programmers completing understanding and contracting tasks independently or in conjunction with natural persons, culminating in fully automated contract execution. Herein, the programmer initiates orders, after which the smart device independently executes contracts based on input [7]. The programming phase for robotic learning is deemed pivotal as it imbues robots with human-like cognitive processes, enabling them to analyse situations, ideas, perceptions, and make precise decisions, ultimately facilitating verbal and motor expression [18]. The advent of advanced autonomous robots has prompted discussions regarding the creation of specialized legal personalities, termed "electronic personality" by the European Parliament proposal. However, questions surrounding enforceability and accountability, particularly concerning compensation and punitive measures, remain unanswered. Consequently, the lack of solutions to these queries has led to a prohibition on granting legal personality to robots [15].

In autonomous bots, traditional liability rules struggle to attribute responsibility for damage caused, as determining the responsible party is challenging [18]. Acknowledging legal personality for robots, though difficult, could be crucial in cases where errors lead to damages and a clear causal link is established. In Jordanian law, personal responsibility is the norm, with exceptions for superior responsibility, liability for objects, and animal-related responsibility, all aimed at fair compensation for the injured. Civil liability often hinges on perception, but autonomous bots making human-like decisions without direct control pose a dilemma. Legal scholars explore options, including granting legal personality to robots, to address this unique challenge.

### 4.8 Regular Robots

Determining the liability of a robot within existing legal frameworks necessitates a reversal of customary laws to address the issue in the absence of specialized legislation, which is imperative. This is not because these regulations suffice to address the legal ramifications of robot actions, but rather because the actions and accountability of robots demand distinct legal provisions. Nonetheless, delving into robot responsibility remains significant amid the absence of regulations governing artificial intelligence broadly and robots specifically. This legislative void might persist as it requires a comprehensive grasp of intelligent mechanisms and the array of damages they may incur, along with the formulation of tailored legislation to address these mechanisms. However, such legislative measures may unfold incrementally.

Consequently, robot actions are to be addressed through the general tenets outlined in Jordanian Civil Law, alongside the specific provisions governing object responsibility as stipulated in the Civil Code. Additionally, recourse may be taken to information laws and electronic systems, which are broad in scope for robots, serving as interim measures until modern laws addressing intelligent robot operations are enacted. Applying general laws to conventional robots might prove more feasible than to autonomous counterparts due to the latter's distinctiveness in decision-making. Subsequently, the challenges associated with applying general rules will become evident. Conventional robots constitute standard (traditional) apparatuses, albeit modified or equipped with additional components, thus transitioning into smart devices. This transformation occurs as traditional machines lack the capacity for cognition and interaction [7].

Hence, it's conceivable that conventional robots could evolve into autonomous ones through development, adjustments, and tailoring of the device's capabilities. Thus, these modified conventional robots might function as either regular or autonomous robots. Nonetheless, it's currently untenable to attribute independent legal personality to conventional robots given their limitations in sophisticated operations. Consequently, meticulous attention will be directed towards understanding autonomous robots, given their greater complexity, and the challenge of applying broad regulations to them. It's worth noting that conventional robots largely share the general provisions applicable to autonomous robots.

### 4.9 Autonomous Robots

This category of robot is primarily crafted to embody a level of intelligence distinct from that of conventional robots, which are confined within narrow parameters. Consequently, this section will initially explore the feasibility of endowing robots with legal autonomy and personality, alongside demonstrating their autonomy through their operational nature. Furthermore, it will examine the European Parliament's stance regarding the adoption of this characteristic and any indications suggesting the potential granting of legal personality to intelligent autonomous robots in the future.

### 4.10 Autonomous Robots and the Granting of Legal Personality

This category of robotic systems exhibits enhanced autonomy and is equipped with sophisticated technologies, software, and electronic information systems, facilitating electronic interactions [7]. This prompts inquiries into whether such robots, programmed with advanced intelligence, can be attributed legal personhood akin to entities like corporations or associations. Granting legal personhood to robots would entail imbuing them with legal responsibilities. While some contend that robots cannot possess the attributes of natural or legal persons, citing the absence of characteristics like name, domicile, and legal capacity, rendering them ineligible for obligations and performance requirements, others argue against endowing them with moral personhood. Moral personhood entails various rights, including independent financial liability, the right to litigate, and establishing domicile, which are challenging to confer upon robots [12]. Autonomous robots are characterized by sensor-equipped systems capable of exchanging information with their environment. They possess self-learning capabilities, enabling them to accumulate experience and interact with events, as well as adapt their behaviour to their surroundings. However, it's crucial to note that despite these capabilities, robots lack biological life [15].

The researcher maintains that while it is untenable to equate robots with natural persons, it is equally unjustifiable to exempt them from legal personhood. They argue that even though robots are non-human entities, those responsible for their operation should bear liability for any resultant damages. Therefore, applying principles governing the establishment of legal persons to robots is both feasible and justifiable.

The emergence of autonomous robots presents a complex challenge regarding the allocation of responsibility in instances where they inflict harm upon others. Unlike traditional entities, such as individuals or organizations, pinpointing accountability for such robots becomes intricate, involving considerations of designers, programmers, manufacturers, and other stakeholders. Moreover, as some advanced robots possess cognitive capabilities enabling independent decision-making, the conventional framework for assigning liability appears inadequate. In contemplating whether robots should be deemed accountable for their actions and thus be attributed legal personality, a fundamental question arises: to whom should such responsibility be assigned? Given that robots represent non-human entities, the conventional legal paradigms seem ill-suited for addressing the complexities of their liability.

Should it be determined, for argument's sake, that robots indeed bear responsibility for their conduct and are liable for damages they cause, it becomes imperative to confer upon them legal personhood, albeit under a designated appellation. This attribution of legal personality is deemed necessary to enable accountability and facilitate compensation for inflicted harm. The researcher posits that the discourse surrounding the assignment of legal personality to robots gains prominence with advancements in their sophistication, adaptability, and autonomy, particularly as they evolve to make decisions through learning and programming. Consequently, the existing principles governing liability prove insufficient in addressing the distinct circumstances wherein robots operate as independent entities detached from their creators, programmers, operators, or owners. Thus, legal scholars are compelled to embark on the development of comprehensive frameworks tailored to navigate this novel phenomenon effectively.

### 4.11 Autonomous Decisions of Robots at Work

AI exhibits a considerable degree of autonomy in decision-making processes, thereby transcending strict user control due to its cognitive and educational capabilities. This autonomy precludes predetermined actions through the presence of regulating software, leading proponents of this view to reject the notion of oversight [18].

As robots become increasingly autonomous, they transform into entities not subject to direct control by stakeholders such as manufacturers, designers, operators, or owners [9]. These intelligent machines leverage machine learning attributes to make proactive decisions, encompassing aspects of comprehension, analysis, perception, environmental adaptation, and goal attainment, thus operating beyond human oversight [17].

Yet, the crux of the issue lies in the dichotomy between traditional delineations of human and object, which delineated clear responsibilities and limitations for each category. With the rapid advancement of high-tech, autonomous robots, the distinction blurs, necessitating a reconsideration of legal frameworks to ascertain the personality and liabilities of these new entities. Existing Jordanian legislation falls short in addressing this complexity.

Independence from direct user control implies that smart software executes actions and responses without immediate human intervention, highlighting a shift towards automated decision-making processes [7].

The scholar posits that despite the considerable autonomy in decision-making exhibited by artificial intelligence, accountability cannot be evaded. While endorsing the notion of AI's capacity to operate and decide independently, it is imperative to acknowledge that users cannot absolve themselves of responsibility. Thus, prudent utilization of these intelligent systems is paramount, with users bearing the responsibility for any resulting harm despite the high degree of autonomy possessed by these devices. Consequently, prioritizing the protection of the injured party over that of the user is crucial, with the latter potentially seeking compensation from the device's owner or designer in the event of damages incurred. For instance, in the scenario of a medical device operating on a smart robot system malfunctioning unexpectedly, it would be untenable to deny compensation to the patient on the grounds of AI's decision-making independence. Indeed, adherence to the principle of "with great power comes great responsibility" underscores the obligation to indemnify for damages caused by objects, placing the burden on those benefiting from their use, irrespective of the autonomy of AI decisions. Nonetheless, users are ultimately liable for any damages arising from their interaction with these systems.

Some argue that traditional principles of strict liability are inadequate for addressing robots capable of autonomous learning within their environment, given the challenge of pinpointing the specific flaw leading to damages. Consequently, current regulations fall short in accommodating the unique characteristics and privacy concerns surrounding such robots, which are deemed to engage in inherently risky activities, necessitating a clear delineation of liability [10].

As Jordan moves towards regulating the operation of smart robots in the near future, it is proposed to categorize them into two distinct groups. The first category comprises ordinary robots whose software merely supports the functioning of a particular device, posing minimal risks. However, this classification is deemed irrelevant to the scope of our research, which advocates for relying on overarching principles to assign responsibility. In contrast, autonomous smart robots, the focus of our study, encompass the second and third categories. The former operates independently of human intervention, prompting a suggestion to prohibit the import and manufacture of such advanced technologies initially, with potential reconsideration in the future if ordinary autonomous smart robots demonstrate tangible benefits with limited associated risks.

## 4.12 The Position of the European Parliament to Grant Autonomous Robots Legal Personality

The European Parliament made a significant effort to address the legal status of robots, albeit without success in attributing direct responsibility to the robots themselves. This endeavour is elucidated in the following analysis. In 2017, a European Parliament report suggested a paradigm akin to corporate legal personality, envisioning the establishment of a distinct legal identity for robots in the long run, thereby affording the most sophisticated autonomous robots a semblance of accountability as electronic entities. Within this report, various approaches were proposed by the European Parliament to construct this legal framework. These included the imposition of mandatory insurance coverage and the establishment of a compensation fund to redress accidents caused by robots. Additionally, the suggestion to assign a registration number to facilitate bot identification featured prominently in the proposal [3].

Nevertheless, a pivotal decision by the European Parliament in 2017 took a definitive stance by acknowledging the legal personhood of robots themselves, thus holding them directly accountable for compensating damages inflicted upon others. This decision aimed to supplant the traditional assignment of responsibility to designers, manufacturers, owners, or users for any adverse consequences resulting from the robot's actions, instead placing this burden squarely on the robot. However, this attribution of responsibility was earmarked specifically for advanced robots capable of autonomous decision-making or acting independently from external influences. Despite these proposals to confer legal personhood upon robots, they faced opposition from the Committee of Experts convened by the European Commission in 2020, as well as from the European Parliament itself in 2020 [18].

Nonetheless, Article 59 of the European Parliament's recommendations at the time advocated for "the establishment of a distinct legal status for robots, ensuring that the most sophisticated autonomous robots are at least recognized as electronic entities responsible for any damages they may cause." It was suggested that this electronic personhood could be applied in situations where robots autonomously make decisions, independent of direct human interaction with third parties.

Among the European Parliament's recommendations was the creation of a specialized registry to record information about robots, along with the endorsement of a dedicated insurance system to mitigate the risks associated with robots. Additionally, the application of general liability principles was proposed. However, some commentators critiqued these recommendations, arguing that the proliferation of smart robots had not yet reached a threshold necessitating the enactment of specialized legal provisions for compensating damages caused by robots. They justified their opposition by contending that granting legal personhood to robots would absolve manufacturers, users, workers, and programmers of their responsibilities. Consequently, the omission of granting independent legal personality to these robots renders them perilous, perpetuating a climate of potential negligence and imprecision in their manufacture.

However, proponents of this viewpoint argue that presently, both traditional and smart robots remain categorized within the legal framework governing movable objects [18].

Alternatively, there is a contingent advocating for the endowment of electronic legal personality to robots, albeit with a deferred implementation timeline, a trajectory endorsed by the European legislative body. This entails imbuing the robot with responsibility and eligibility to execute tasks [7].

Certain perspectives posit that the principles of European civil law necessitate the recognition of the full agency of autonomous intelligent robots, conceding to the deferred agency of a robot vis-à-vis a human, premised on the presumption of representation between them. Hence, human representation assumes responsibility [8].

In response to the European Parliament's proposal and subsequent rejection to confer independent legal personality upon robots, along with supporting viewpoints for such refusal, citing concerns over anomalies resulting in harmful outcomes perpetrated by robots, safety and security emerge as paramount considerations, particularly given the burgeoning nature of this scientific field and its myriad applications. Nonetheless, it is envisaged that such apprehensions will dissipate over time, especially in light of the remarkable advancements witnessed in the field of artificial intelligence, potentially paving the way for the incorporation of software recognition within legal frameworks, particularly for those with minimal adverse impacts on individuals. This trajectory may ultimately culminate in the acknowledgment of legal personality for sophisticated programs, such as robots undertaking complex medical procedures.

Conversely, as an interim measure preceding the formal recognition of legal personhood for robots, the European approach pivoted towards the notion of the "responsible human representative." This concept, formulated by the European Parliament and enshrined in the tenets of private European civil law concerning robots, entails attributing responsibility for the actions of a robot to a designated individual who assumes liability for compensating those harmed due to the robot's erroneous actions under legal mandate. This theory stipulates that a collective of individuals bears responsibility commensurate with their involvement in the robot's manufacture and operation, as well as their level of negligence in foreseeing and averting the robot's anticipated behaviours, without relegating the robot to mere object status. However, this approach encounters legislative hurdles due to its innovative nature, lacking precedent within traditional legal frameworks, thereby impeding its seamless integration into established legal paradigms [19].

The prevailing European stance aims to reassess the application of legal principles to machines operating with artificial intelligence systems. Consequently, endeavours are underway to confer upon robots a legal status distinct from that of conventional entities subject to liability [20]. The researcher herein aligns with this perspective, advocating for ongoing efforts to afford robots legal standing while scrutinizing past and prospective actions undertaken by the European Parliament. Thus, this study will elucidate the mechanisms and potential avenues for endowing robots with legal personality in the foreseeable future.

## 4.13 Granting Smart Robots' Legal Personality in the Future

The imperative of establishing regulations to confer independent legal personhood upon intelligent robots underscores a pressing reality in the realm of artificial intelligence. Traditional legal frameworks, inadequate for addressing the unique attributes and behaviours of autonomous robots, fail to provide enduring benefits. Distinct from mere objects delineated in Civil

law, robots possess a distinct operational paradigm, driven by robotic cognition rather than human mentation. Consequently, a re-evaluation of legal doctrines is warranted to accommodate this fundamental distinction and to devise specialized regulations governing robot conduct. Despite the necessity for such reforms, obstacles loom large, with entrenched legal philosophies and conventional legislators inclined to view technological advancements through the lens of objecthood rather than personhood. The apprehension regarding potential legal ramifications engenders reluctance towards endowing robots with legal personality, fearing the emergence of a non-human entity that may challenge human authority and resist compliance with directives. In light of these challenges, the researcher proposes a framework for regulating the future legal status of robots through a series of measures. These include the assignment of digital serial numbers, installation of black box recorders to preserve pertinent data, and the establishment of mandatory insurance protocols. These safeguards aim to ascertain legal accountability for robotic actions, ensuring adherence to agreed-upon legal norms. To formalize this regulatory framework, akin to the European Union's 2017 directives on civil law for robots, the Jordanian legislature is urged to institute a specialized registry for robot registration. This registration process, modelled after procedures for registering companies in Jordan, would categorize robots into distinct types based on their autonomy levels and assign corresponding regulatory requirements. Highly autonomous robots, for instance, may necessitate registration exclusively by public shareholding entities, subject to stringent insurance provisions and other specified criteria. Noncompliance with registration requirements would constitute a legal violation, underscoring the imperative of adherence to regulatory protocols to mitigate potential societal risks posed by unregistered or inadequately regulated robots. Importantly, exemptions may be considered for ordinary robots designated for specific, low-risk tasks, though strict customs standards should govern their importation and subsequent registration to ensure compliance with established regulations. Given Jordan's burgeoning status in the field of smart robotics, a phased approach encompassing both customs regulations and registration procedures is advocated to bolster societal protection against potential misuse or harm arising from the deployment of these technologies.

## 5. Conclusion

This research underscores that while robots are commonly categorized as movable objects, their unique attributes necessitate special consideration. Consequently, applying conventional legal principles to autonomous robots becomes impractical, thus prompting the potential future recognition of legal personhood for such entities. This shift in recognition is particularly pertinent when autonomous robots exercise discretion independent of direct human oversight, thus transitioning from mere objects to entities with legal accountability. To facilitate this transition, the study advocates for the establishment of a dedicated registry for mandatory robot registration, coupled with a nuanced classification system based on varying degrees of autonomy and associated risks. Furthermore, it proposes the formulation of specialized legislation to govern the operations and liabilities of autonomous robots post-legal personhood recognition.

## 6. Recommendations

Here are some recommendations proposed:

1. Commence with establishing the legal definition encompassing AI hardware and software, notably smart robots. This entails delineating regulations that comprehensively cover the constituent elements, distinctive attributes, and functionalities of AI systems to establish a robust legal framework.
2. Endeavour to formulate a comprehensive legal framework encompassing various aspects such as liability, responsibility, data protection, safety regulations, and ethical considerations pertinent to AI hardware and software.
3. Adopt risk-based regulatory strategies to assess the impact of AI and oversee the applications of hardware and software. This may involve categorizing AI systems based on their level of automation or autonomy, potential environmental and societal impacts, among other relevant factors.
4. Promote accountability and transparency throughout the architecture, evaluation, and deployment phases of AI applications and hardware. This includes advocating for transparency regarding algorithms, data sources, decision-making processes, and addressing the potential for biases.
5. Establish legal mechanisms to address situations where AI hardware or software causes harm to individuals, property, or broader society. This entails addressing indemnity issues related to faulty machinery, negligence, and third-party liabilities within the realm of AI technology.
6. Facilitate cross-border regulatory frameworks and harmonization of legal norms across jurisdictions by fostering international cooperation in AI governance. This could involve developing standardized frameworks for international oversight of AI hardware and software, as well as facilitating knowledge exchange and harmonizing guidelines.
7. Emphasize the promotion of ethical principles and guidelines governing the development and deployment of AI software and hardware. These principles should be grounded in universally recognized ethical concepts such as accountability, justice, transparency, and human rights.
8. Invest in educational and research initiatives to deepen understanding of the social, ethical, and legal implications of AI technology. This encompasses funding multidisciplinary research projects, developing legal training programs for professionals, and conducting awareness campaigns to enhance public understanding of AI-related legal matters.

## 7. Implications

### 7.1 Theoretical Contributions

This study has delved into the intricate legal dimensions surrounding intelligence hardware and software, with a primary focus on smart robots, aiming to enhance understanding in the intersection of legal and AI studies. By navigating the intricate legal landscape of AI technologies, the study has contributed to the broader understanding of this domain. Moreover, by elucidating the unique characteristics of AI processing hardware and software within a legal framework, it has established a robust foundation for legal discourse. Consequently, this research has pinpointed areas of ambiguity and unearthed discoveries concerning the application of traditional legal doctrines in the context of AI technology, through meticulous examination of existing laws and regulatory frameworks. Furthermore, the research has shed light on theoretical considerations regarding AI agency and autonomy. By exploring the legal status of AI systems as self-directed entities with considerable decision-making abilities, it has sparked discussions on matters of responsibility and liability in cases of AI-related incidents or harm. Additionally, this study has expanded theoretical understanding of the ethical and societal implications of AI technology within legal frameworks. The exploration of moral issues such as justice, accountability, and transparency within the realm of legal systems lays the groundwork for establishing ethical principles and norms for the governance of AI.

### 7.2 Practical Implications

This research project holds pragmatic significance in elucidating the intricate legal ramifications of AI technology for diverse stakeholders. Through an exploration of AI software and hardware, it has enhanced stakeholders' comprehension of the legal complexities inherent in AI deployment. Furthermore, it enables groups of enterprises integrating AI to advance their risk management endeavours and compliance initiatives. Since the emergence of AI, organizations have strategically prioritized proactive measures, risk mitigation, and regulatory adherence to address the legal intricacies associated with AI hardware and software. Additionally, this research has streamlined the implementation challenges of dependable and efficient AI technology by furnishing substantiated justifications for its utilization. By delineating legal aspects concerning data security, intellectual property obligations, and regulatory compliance, this endeavour empowers manufacturers, software and hardware developers, as well as consumers, to make informed ethical and legal decisions across the product lifecycle. Moreover, it has fostered a legal landscape conducive to the resolution of disputes pertaining to AI, thereby shifting the judiciary's stance from hesitancy towards acceptance and adjudication of AI-related cases. Legal practitioners and entities, including courts and arbitrators, benefit from this initiative by leveraging legal precedents and pertinent case studies in the realm of AI.

### 7.3 Policy-Related Implications

This research underscores the importance of policy adjustments to accommodate advancements in AI technology. It advocates for proactive legal frameworks tailored to address key concerns such as liability, accountability, safety, and ethics. These frameworks should strike a balance between fostering innovation and regulating potential risks, offering clarity to developers while safeguarding against negative consequences. Additionally, clear classification of AI systems within legal structures is crucial for consistency across jurisdictions, reducing ambiguity and enhancing legal clarity for all involved parties. Furthermore, policymakers must consider the evolution of regulatory strategies towards a risk-based approach, where the depth of scrutiny and formulation

regarding AI devices and software applications is commensurate with their potential risk levels. This targeted approach ensures the allocation of science-based resources to address pressing societal, ethical, and safety concerns, thereby enhancing the efficiency and effectiveness of regulatory interventions. Additionally, political leaders should prioritize transparency and accountability in AI development and deployment practices, which may include mandating developers to disclose information regarding data sources, algorithms, and decision-making processes. Policymakers should also intensify efforts to analyse and mitigate potential biases and risks associated with AI technology, while fostering trust and confidence through transparency advocacy. To facilitate innovation and technology transfer across borders, state authorities need to foster multilateral relations and cooperation on international AI standards. Establishing common principles and facilitating information exchange among policymakers globally can promote consistency and coherence in AI legislation.

## 8. Limitations of the Study

The study is not without its limitations. Given the rapid and dynamic evolution of legal frameworks and interpretations alongside advancements in AI technology, the relevance of the findings may vary over time. Furthermore, the research scope is somewhat narrow, focusing solely on smart robots while overlooking other categories of AI hardware and software. This limitation poses a significant challenge, particularly considering the intricate and multifaceted nature of AI governance within the complex legal systems of various countries.

## References


[1] Chesterman S. Through a Glass, Darkly: Artificial Intelligence and the Problem of Opacity. The American Journal of Comparative Law. 2021;69(2):271-94. Doi: https://doi.org/10.1093/ajcl/avab012.

[2] Saeed M. The Role of Intellectual Property Rules in Facing the Challenges of Artificial Intelligence: A Comparative Analytical Legal Study. Journal of Legal and Economic Research: Mansoura University. 2021; 75:1628-742.

[3] Diraison M. The Framework of Artificial Intelligence at the European Level In the light of European Law. Dodo Books Indian Ocean Ltd Moldova. 2021

[4] Othman A. Implications of Artificial Intelligence on Civil Law, "A Comparative Study". Journal of Legal and Economic Research. 2021(76).

[5] Pasquale F. New laws of robotics. Harvard University Press; 2020. Available From: https://www.hup.harvard.edu/books/9780674975224.

[6] Perc M, Ozer M, Hojnik J. Social and juristic challenges of artificial intelligence. Palgrave Communications. 2019;5(1). Doi: https://doi.org/10.1057/s41599-019-0278-x.

[7] Alhamowri N. The adequacy of the prevailing legal regulation for dealing with artificial intelligence devices. Faculty of Law - Mansoura University, the twentieth international conference. 2021.

[8] Abdul Karim M. Responsibility of Autonomous Machine Operators with Artificial Intelligence and the Required Egyptian Legislation. Mansoura University, the Twentieth International Conference. 2021.

[9] Mohammed A. Legal System for Smart Robots. Dar Al-Nahda Al-Ilmiyya for Publishing and Distribution. Dubai, United Arab Emirates. 2022.

[10] Al-Wali A. Civil Liability for Damages Caused by Artificial Intelligence Applications in UAE Law. Dar Al-Nahda Al-Arabiyya United Arab Emirates. 2021.

[11] Al-Fatlawi A, Al-Mushahdi A. Civil Liability for Complex Artificial Intelligence Technology. Darwab Al-Ma'rifa for Publishing and Distribution. Arab Republic of Egypt, Alexandria; 2022.

[12] Fathelbab M. The Legal Nature of Civil Liability for Robot Damages (A Comparative Analytical Study). Faculty of Law - Mansoura University, the twentieth international conference. 2021.

[13] El-Meshed M. Towards a Comprehensive Legal Framework for Civil Liability of Uncontrolled Artificial Intelligence Systems' Damages. Faculty of Law - Mansoura University, the twentieth international conference. 2021.

[14] Al-Hamrawi HMO. The Basis of Civil Liability for Robots between Traditional Rules and Modern Trends. Journal of the College of Sharia and Law, Tafhouna Al-Ashraf, Dakahlia. 2021;23(8):3059-102.

[15] Youssef C. Civil Liability for Artificial Intelligence Actions. Al-Halabi Human Rights Publications. Beirut, Lebanon; 2022.

[16] Yusa IG, Hermanto B, Ardani NK. Law Reform as the Part of National Resilience: Discovering Hindu and Pancasila Values in Indonesia's Legal Development Plan. In: International Conference for Democracy and National Resilience (ICDNR 2021). Atlantis Press; 2021. p. 1-10. Doi: https://doi.org/10.2991/assehr.k.211221.001.

[17] Ibrahim K. Legal regulation of artificial intelligence. Dar Al-Fikr, Alexandria. 2022.

[18] Abdul Latif M. Responsibility for Artificial Intelligence between Private and Public Law. Journal of Legal and Economic Research (Mansoura). 2021;11(4):2-52.

[19] Al-Qousi DH. The problem of the person responsible for operating the robot (the impact of the theory of the human representative on the feasibility of the law in the future)-a forwardlooking analytical study on the rules of European civil law on robots. Jill Journal of In-depth Legal Research, Jill Scientific Research Center, Tripoli, Lebanon. 2018(25).

[20] Hekmatnia M, Mohammadi M, Vaseghi M. civil Liability for damages caused by robots based on autonomous artificial intelligence. Islamic Law. 2019;16(60):231-58. Available from: https://hoquq.iict.ac.ir/article_36476_en.html.