Journal of the West
ISSN: 0022-5169 / **E-ISSN:** 1930-0115
https://journalofthewest.com/jw

The Legal Personality of the Surgical Robot

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Received: 08/12/2025 ; Accepted: 28/05/2026 ; Published: 07/08/2026

Abstract
This research falls within the scope of civil law and examines the issue of the legal personality of surgical robots in light of the rapid advancement of artificial intelligence applications in the medical field. It aims to analyze the legal status of surgical robots as intelligent systems possessing varying degrees of autonomy in performing surgical procedures and to assess the adequacy of traditional legal rules in addressing the legal implications arising from their use. Furthermore, the study explores the possibility of granting surgical robots legal personality, thereby enabling them to acquire rights and assume legal obligations, and examines the impact of such recognition on determining legal liability for damages resulting from their operation. The research also reviews the principal jurisprudential and legislative approaches concerning this issue. It concludes that existing legal systems, including Algerian legislation, do not recognize legal personality for surgical robots, thereby necessitating legislative intervention to establish a comprehensive legal framework capable of regulating the use of surgical robots, allocating legal responsibility, and striking an appropriate balance between promoting medical innovation and ensuring the legal protection of patients.
Keywords: Legal Personality; Surgical Robot; Artificial Intelligence; Civil Liability; Criminal Liability.

Introduction

Artificial intelligence (AI) technologies, particularly surgical robots, represent one of the most significant technological advancements in contemporary medicine. These technologies have fundamentally transformed methods of diagnosis, treatment, and surgical intervention. Surgical robotic systems are now capable of performing highly precise and complex tasks that traditionally required an exceptional level of human expertise, including real-time analysis of medical data, accurate guidance of surgical instruments, and the reduction of intraoperative errors. Consequently, their integration into medical practice has significantly enhanced the quality of healthcare services and improved surgical outcomes.

With the rapid advancement of these technologies, the role of the surgical robot has evolved beyond that of a mere technical instrument operating under the direct control of the surgeon. Owing to sophisticated algorithms and data-processing capabilities, surgical robots have acquired varying degrees of functional autonomy, enabling them to participate in certain

decision-making processes during surgical procedures. This technological evolution has given rise to complex legal issues that extend beyond the traditional framework of legal liability, which has historically been founded upon direct human conduct.

The central legal issue concerns the extent to which existing legal frameworks are capable of addressing the potential harm arising from the use of surgical robotic systems, particularly in situations where it is difficult to determine whether liability should be attributed to the supervising surgeon, the software developer, the manufacturer, or, potentially, to the intelligent system itself.

Furthermore, these developments raise important theoretical questions regarding the concept of legal personality and whether it should be reconsidered to encompass intelligent technological entities possessing a degree of autonomous decision-making capacity, or whether such systems should continue to be regarded merely as legal instruments for which human actors alone bear responsibility. This debate has significant implications for the determination of civil and criminal liability, the allocation of legal responsibility, the scope of legal guarantees, and the mechanisms governing compensation for damages.

In order to address these issues, this study is structured as follows:

Chapter One: The Concept of the Surgical Robot and Legal Personality

Chapter Two: The Legal Personality of the Surgical Robot

Chapter One: The Concept of the Surgical Robot and Legal Personality

Surgical robots represent one of the most prominent applications of artificial intelligence in the medical field. They have brought about a fundamental transformation in surgical practice through their exceptional precision, speed, and ability to assist in performing highly complex surgical procedures. This technological advancement has significantly enhanced the efficiency of healthcare services and increased the success rates of numerous surgical interventions. With the growing reliance on this technology and the continuous development of its level of autonomy, new legal challenges have emerged, most notably those concerning the determination of the legal status of surgical robots and whether they should remain subject to the traditional rules of law or be governed by a special legal regime that reflects their distinctive technological nature.

Since examining the possibility of recognizing legal personality for surgical robots requires a thorough understanding of the relevant fundamental legal concepts, this chapter begins by defining the concept of the surgical robot, outlining its essential characteristics, and examining its principal categories, given that the degree of autonomy exhibited by such systems may significantly influence their legal characterization. It also explores the concept of legal personality and its various forms in legal doctrine and jurisprudence as the legal framework through which an entity acquires rights and assumes obligations. This discussion provides the necessary foundation for assessing whether the concept of legal personality may legitimately be extended to surgical robots and for identifying the legal grounds upon which such recognition, if any, may be based.

Section One: Definition and Types of Surgical Robots

Before defining the concept of the surgical robot, it is necessary to clarify the concept of Artificial Intelligence (AI), since surgical robots constitute one of the most significant

applications of AI systems. Artificial intelligence has been defined as *"the ability of a system to correctly interpret external data, learn from such data, and use the acquired knowledge to achieve specific objectives and perform designated tasks through flexible adaptation."[1]

A robot is generally defined as an electromechanical machine composed of structures resembling those of the human body, which can be programmed to perform difficult, repetitive, or hazardous tasks that would otherwise be carried out manually by human beings. Such tasks are performed with greater strength, higher speed, enhanced accuracy, and without fatigue, while ensuring a higher degree of operational safety.

Artificial intelligence technology has introduced remarkable innovations into the medical field, providing advanced solutions that have significantly contributed to the diagnosis and treatment of numerous diseases. Moreover, many complex surgical procedures have become considerably easier to perform. Robotic surgery has therefore emerged as one of the most significant applications of artificial intelligence in medicine, enabling a wide range of surgical procedures to be carried out with greater efficiency and precision.

A surgical robot is defined as :"an electromechanical system based on computer technology and pre-programmed with commands and information enabling it to perform a surgical procedure in accordance with a predetermined surgical plan, without exceeding its programmed operational limits or interacting with unintended anatomical structures within the patient's body."[2]

It has also been defined as :"an electronically programmed machine based on artificial intelligence technologies, capable of performing surgical procedures by making appropriate operational decisions in accordance with the surrounding circumstances and operating environment, while maintaining a high degree of precision and speed throughout the surgical procedure."[3]

A surgical robot refers to a medical technological system that enables a surgeon to perform highly precise surgical procedures through robotic instruments inserted into the patient's body and remotely controlled via a dedicated console or separate operating platform. The widespread adoption of such systems in modern medical practice has yielded significant clinical benefits, particularly by enhancing surgical precision, minimizing the invasiveness of procedures, and improving patient outcomes.

The surgical medical robot known as Heartthrob is regarded as the world's first surgical medical robot. It was developed and first introduced in Vancouver, British Columbia, Canada, in 1983. The system was designed by the biomedical engineer and physician Dr. James McEwen, the

[1] Andreas Kaplan & Michael Haenlein, Siri, Siri, in My Hand: Who's the Fairest in the Land? On the Interpretations, Illustrations, and Implications of Artificial Intelligence, Business Horizons, Vol. 62, No. 1, 2019, pp. 15–25.

[2] Mohammed Saadallah, Artificial Intelligence and Life in 2030, Future Foresight and Decision Support Center, Dubai Police, 2017, p. 66.

[3] Zahra Mohammed Omar Al-Jabri, Artificial Intelligence Technology in the Medical Field: A Jurisprudential and Legal Study, Ph.D. Dissertation, University of Sharjah, United Arab Emirates, 2020, p. 26.

physicist Geoff Auchinlek, and Dr. Ber In, with the assistance of a team of engineering students. It was first used clinically on 12 March 1984 at the University of British Columbia Hospital.[4]
Within the Arab region, the da Vinci Surgical System is considered one of the earliest robotic surgical systems introduced into clinical practice. It is a surgeon-controlled robotic surgical platform primarily designed to perform surgical procedures, particularly abdominal operations.[5] The system was first introduced in the Kingdom of Saudi Arabia in 2003 at King Khalid University Hospital, where it was used to perform a rare pediatric surgical procedure involving gastric banding for a young patient suffering from morbid obesity that had severely impaired her mobility. Subsequently, the system was employed in various surgical procedures, including cholecystectomy, cardiac surgery at King Faisal Specialist Hospital, and the successful removal of two benign liver tumors.[6]
Other Arab countries have likewise witnessed remarkable developments in robotic surgery. In Egypt, surgical robots have recently become increasingly utilized, particularly in bariatric surgery, endoscopic procedures, and other minimally invasive interventions. Likewise, in 2022, the King Hussein Cancer Center in Jordan introduced the country's first robotic surgery system for major surgical procedures. During the same year, the medical team successfully performed the first robotic-assisted operation to remove a cancerous tumor.[7]
In light of the foregoing, it is essential to draw a clear distinction between surgical robots and autonomous robots. Surgical robots generally do not operate with complete autonomy; rather, they function as advanced technological instruments that remain subject to the surgeon's direct supervision and control, whether in conventional robot-assisted surgery or in the context of telemedicine.[8] Accordingly, from a legal perspective, surgical robots should not be classified as autonomous robots, since their function is limited to implementing a predetermined surgical or therapeutic plan established by the attending physician or medical practitioner, who retains full professional responsibility for the procedure.

Subsection Two: Types of Surgical Robots

Surgical robots may be classified into different categories according to the level of artificial intelligence integrated into their systems, the degree of autonomy they possess, and the nature of the medical tasks they are designed to perform. Scholars have generally adopted a classification based on the technological capabilities of these systems and the extent to which they simulate human cognitive and behavioral functions. Such a classification is essential for understanding the operational nature of surgical robots, defining the scope of their medical

[4] Asmaa Hassan Amer, Legal Issues Concerning Civil Liability for Damage Caused by Intelligent Robots, The Legal Journal, Faculty of Law, Cairo University, Vol. 31, No. 7, 2022, p. 1825.
[5] Safat Salama, Robotics Technology: A Future Vision from an Arab Perspective, 1st ed., Academic Library, Cairo, 2006, p. 45.
[6] Wahba Sayed Ahmed Abdel Razzaq, Civil Liability for Damage Caused by Artificial Intelligence: A Comparative Analytical Study, Jeel Journal of Deep Legal Research, No. 43, 2020, p. 11.
[7] Omar Badawi, Telemedicine: A Comparative Study between French Law and the UAE Federal Medical Liability Law, Dubai Judicial Institute Journal, No. 6, 2020, pp. 87–98
[8] Salam Abdullah Karim, The Legal Regulation of Artificial Intelligence, Ph.D. Dissertation, College of Law, University of Karbala, 2022, p. 22

applications, and determining the legal liability arising from their involvement in medical practice.

This classification distinguishes between limited-capability surgical robots, whose functions are confined to performing specific tasks within predefined operational parameters, and general-purpose surgical robots, which are presumed to possess broader capabilities that more closely resemble human cognitive and intellectual abilities. Accordingly, the principal categories of surgical robots may be identified and examined as follows:

First: Limited-Capability Surgical Robots

A limited-capability surgical robot refers to a technological system designed to perform specific medical or surgical tasks within a predefined operational scope and in accordance with pre-programmed software and algorithms, beyond which it cannot operate. This category represents the most widely used type of surgical robot at present, owing to its ability to perform highly precise medical tasks with a level of efficiency that may, in certain circumstances, exceed human capabilities.

This category includes medical robots that operate alongside physicians as assistive tools rather than autonomous substitutes. Their role is confined to narrowly defined functions, such as assisting in surgical procedures or executing highly precise movements under the direct supervision of the attending surgeon. The rapid advancement of this category has encouraged researchers to develop more sophisticated systems by integrating advanced intelligent capabilities that more closely approximate human cognitive functions into medical robots.[9]

Second: General-Purpose Surgical Robots

The general-purpose surgical robot, also referred to as the strong surgical robot, represents a more advanced stage of technological development than the limited-capability surgical robot. It is conceived as an intelligent medical system capable of performing a broad range of cognitive and analytical functions traditionally carried out by human practitioners, including reasoning, perception, planning, and decision-making based on specific medical or surgical data.

This category is founded upon the concept of enabling intelligent machines to operate with capabilities comparable to human cognitive functions. Accordingly, its role extends beyond merely executing pre-programmed instructions to include analyzing medical data and interacting with it with a degree of operational autonomy. Nevertheless, this level of surgical robotics remains, to a large extent, within the realm of scientific research and technological development, requiring substantial advances in engineering, medicine, and legal regulation before it can achieve widespread practical implementation.

Artificial Neural Networks (ANNs) constitute one of the principal technologies underpinning the development of Artificial General Intelligence (AGI), particularly in the field of robotic surgery. They seek to develop intelligent systems whose functional architecture simulates the operation of the human nervous system. This approach has facilitated the application of certain intelligent technologies in moderately complex surgical procedures. However, the intervention

[9] Musab Thaer Abdul Sattar, Tort Liability Relating to Artificial Intelligence, Journal of Legal and Political Sciences, College of Law and Political Science, University of Diyala, Vol. 10, No. 8, 2021, p. 391

and direct supervision of the attending surgeon remain indispensable for controlling the course of the operation and determining the corresponding professional legal responsibility.[10]

Third: Superintelligent Surgical Robots

A superintelligent surgical robot represents the most advanced stage in the evolution of medical robotic systems. It is theoretically conceived as a system whose cognitive and operational capabilities surpass those of human intelligence, enabling it to perform medical and surgical tasks with a level of efficiency exceeding that of highly specialized medical professionals. In theory, this category of surgical robots possesses a number of advanced characteristics, including autonomous learning, strategic planning, adaptive communication, independent judgment, rapid processing of medical data, and the precise execution of surgical procedures.[11] The underlying objective of this model is to replicate—and ultimately surpass—the full spectrum of human intelligence in the performance of medical and surgical activities. Accordingly, its role would extend beyond the execution of pre-programmed instructions to encompass the analysis of medical information, the selection of appropriate therapeutic alternatives, and the performance of surgical interventions with a degree of precision, speed, and efficiency exceeding human cognitive and biological capabilities.

Within the framework of the European legal approach to civil law governing intelligent robotic systems, certain characteristics have been identified as distinguishing advanced intelligent robots. These include the capacity for autonomous control through sensors, enabling interaction with, analysis of, and response to data received from the surrounding environment, as well as the ability to adapt to changing operational conditions. Nevertheless, such characteristics do not confer life upon the robot in the biological sense; rather, they establish it as an intelligent technological system capable of interacting with external data through sophisticated software and computational mechanisms.

Despite these theoretical characteristics, the superintelligent surgical robot remains, at present, a purely theoretical concept that has not yet been realized in practical medical applications. Although some scientific forecasts suggest that such systems may eventually become feasible, with certain studies hypothetically projecting their emergence around the year 2060, these predictions remain speculative. The prospect of developing such robots has generated considerable legal and ethical debate. Proponents regard them as a revolutionary advancement in medicine and surgery, whereas opponents warn of the potential risks associated with their deployment, particularly those relating to patient safety, the attribution of legal liability, and the ethical principles governing human life and medical practice.[12]

Section Two: Definition of Legal Personality and Its Types

Legal personality constitutes one of the fundamental concepts underpinning the general theory of law. It serves as the legal basis for identifying the entities that are subject to the rules of law

[10] Salam Abdullah Karim, The Legal Regulation of Artificial Intelligence, cited above, p. 47.
[11] Ahmed Ali Hassan Othman, op. cit., p. 1534.

[12] Khalifa Ben El-Hadi Al-Messawi, Artificial Intelligence and Arabic Language Computing: Reality and Prospects, Madarat Journal of Arabic Language and Literature, Madarat Center for Studies and Research, Tebessa, Algeria, Vol. 1, No. 5, 2021, p. 16.

and are capable of acquiring rights and assuming legal obligations. It also functions as a legal mechanism for regulating legal relationships within society, thereby promoting legal certainty and ensuring the protection of legitimate interests.

The study of legal personality extends beyond merely defining the concept; it also encompasses an examination of its various forms and the legal foundations upon which each is based. The law does not confine the recognition of legal personality to human beings as **natural persons**; rather, it also confers legal personality upon certain entities that it establishes or recognizes, granting them an independent legal existence to enable them to exercise rights and fulfill obligations in furtherance of the purposes for which they were created.

Accordingly, the study of the concept of legal personality and its various types constitutes an essential foundation for understanding the scope of the application of legal rules and for determining the entities that possess the legal capacity to acquire rights and assume obligations, in a manner consistent with the requirements of contemporary legal, social, and economic life.

Subsection One: Definition of Legal Personality

Legal personality is regarded as one of the fundamental concepts of law. It refers to the legal status conferred by law upon any entity capable of acquiring rights and assuming legal obligations. Accordingly, in the eyes of the law, a legal person is any entity that possesses the capacity to hold rights or be bound by legal duties, even where such capacity extends to only a single right or obligation.[13]

A distinction must be drawn between the concepts of a legal person and legal personality. A legal person is the entity upon which the law confers legal personality, whereas legal personality is the legal status or attribute granted by law that enables such an entity to acquire rights and assume obligations within the limits prescribed by law.[14]

The significance of legal personality lies in the fact that it constitutes the legal foundation of a separate patrimony. Rights and obligations cannot exist in the abstract but must be attributed to a legal person. Consequently, once legal personality is recognized, the person acquires an independent patrimony comprising both assets and liabilities.[15]

Modern legal systems recognize the legal personality of every human being upon the fulfillment of the legal conditions prescribed by law, without requiring the individual to possess legal capacity, discernment, or free will. Accordingly, legal personality is recognized even in respect of minors and persons lacking or having limited legal capacity, although the exercise of their rights and the validity of their legal acts remain subject to the rules governing legal capacity and legal representation.[16]

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[13] Anwar Sultan, General Principles of Law, Dar Al-Jami'a Al-Jadida Publishing House, Alexandria, 2005, p. 200.

[14] Nabil Ibrahim Saad, General Principles of Law: Theory of Law and Theory of Rights, Dar Al-Jami'a Al-Jadida, Alexandria, 2013, p. 167.

[15] Yahya Qasim Ali Sahl, Introduction to the Study of Legal Sciences: A Comparative Study, 1st ed., Komit Distribution, Cairo, Egypt, 1997, p. 190.

[16] Ali Filali, "Legal Personality as a Means of Protecting Nature," Ijtihad Journal for Legal Studies, Algeria, Vol. 9, No. 1, 2020, p. 29.

Subsection Two: Types of Legal Personality

First: Natural Personality

Natural legal personality is vested in every human being by virtue of being a natural person capable of acquiring rights and assuming legal obligations. From a legal perspective, a natural person is any human being upon whom the law confers legal personality, irrespective of the individual's level of discernment, mental capacity, or free will. Consequently, minors, persons of unsound mind, and individuals with limited legal capacity all enjoy legal personality, although the exercise of their rights and the validity of their legal acts remain subject to the legal rules governing capacity and legal representation.[17]

The Algerian legislature has adopted this principle by providing that the legal personality of a human being commences upon live birth and terminates upon death. At the same time, it recognizes certain legal rights of the unborn child (foetus), provided that the child is subsequently born alive. This principle is reflected in the provisions of the Algerian Civil Code, particularly Article 25, which establishes live birth as the commencement of legal personality and death as its termination.[18]

Natural legal personality is fundamentally associated with two principal legal concepts: patrimony and legal capacity. Patrimony refers to the aggregate of a person's pecuniary rights and financial obligations, whether existing or future. It consists of a positive element represented by assets and rights, and a negative element represented by liabilities and obligations. Legal capacity, on the other hand, denotes a person's ability to acquire rights, assume obligations, and perform legal acts. It is traditionally divided into capacity to enjoy rights (capacity for rights), which is acquired upon live birth and enables a person to hold rights and bear legal obligations, and capacity to exercise rights (capacity to act), which refers to the legal competence to perform juridical acts independently with legally recognized effects. The latter varies according to age, discernment, and the soundness of one's will.

Second: Juristic (Legal) Personality

As a general rule, legal personality is originally vested in human beings as natural persons. However, the evolution of social and economic life has necessitated the recognition of legal personality for entities other than human beings, commonly referred to as juristic persons (or legal persons). A juristic person may be defined as a group of persons or a pool of assets established to achieve a specific purpose, to which the law grants legal personality to the extent necessary for the fulfillment of that purpose.[19] It has also been defined as an independent legal entity composed of persons or assets, possessing a separate patrimony and legal capacity, thereby enabling it to acquire rights and assume obligations within the limits of the objectives for which it was established.[20]

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[17] Omar Nafea Reda, The Legal Framework of Artificial Intelligence, Master's Thesis, College of Law, University of Mosul, 2021, p. 89.

[18] Article 25 and Article 124 of Ordinance No. 75-58 of 26 September 1975 Establishing the Civil Code, Official Gazette No. 78, issued on 30 September 1975, as amended and supplemented

[19] Abdul Baqi Al-Bakri & Zuhair Al-Bashir, op. cit., p. 301

[20] Khaled Mamdouh Ibrahim, The Legal Regulation of Artificial Intelligence, Dar Al-Fikr Al-Jami'i, Alexandria, 2022, p. 121.

The Algerian legislature regulates juristic personality under the Algerian Civil Code, particularly Articles 49 and 50, which enumerate the categories of juristic persons recognized by law. These include the State, the Wilaya (Province), the Municipality, public administrative institutions, civil and commercial companies, associations, foundations, endowments (waqf), and any other group of persons or assets upon which the law confers legal personality.

Juristic persons are generally classified into public juristic persons, such as the State, the Wilaya, the Municipality, and public institutions, which are governed by the rules of public law, and private juristic persons, such as companies, associations, private foundations, and waqf, which are, in principle, governed by the rules of private law. Their objectives may be commercial, as in the case of companies established for profit, or humanitarian, social, charitable, or non-profit in nature, as in the case of associations and charitable foundations.[21]

A juristic person possesses a legal existence distinct from that of its members or founders. It enjoys an independent patrimony, a separate legal identity, a distinct name, and an independent domicile. Furthermore, it possesses legal capacity within the limits prescribed by its constitutive instrument or by law, and it may initiate or defend legal proceedings through its duly authorized representative. Accordingly, a juristic person constitutes an autonomous legal entity capable of acquiring rights and assuming obligations, except for those rights and duties that are inherently inseparable from the nature of a natural person.[22]

Chapter Two: The Legal Personality of the Surgical Robot

The surgical robot represents one of the most significant manifestations of modern technological advancement in the medical field, owing to its ability to perform certain surgical procedures with an exceptional degree of precision through the use of sophisticated algorithms and artificial intelligence embedded within its operating system. Although such systems are designed, manufactured, and programmed by human beings, technological progress has enabled certain surgical robots to operate with a degree of functional autonomy, allowing them to execute specific tasks without direct human intervention at every stage of the procedure.

This technological development has given rise to a significant legal and doctrinal debate concerning the possibility of recognizing an independent legal personality for surgical robots. One school of legal thought rejects the recognition of legal personality on the grounds that surgical robots remain nothing more than technological instruments or objects under human control, incapable of possessing rights or assuming legal obligations independently. Conversely, another body of legal scholarship argues in favor of granting surgical robots a special or sui generis form of legal personality, taking into account their advanced capabilities, including autonomous learning, relative independence in decision-making, and the ability to interact with and adapt to their surrounding environment.

[21] Ibrahim Al-Desouqi Abu Al-Lail, Principles of Law, Scientific Publishing Council, Kuwait University, 2006, p. 308.

[22] Abdul Baqi Al-Bakri & Zuhair Al-Bashir, op. cit., pp. 304–307

Section One: The Possibility of Granting Legal Personality to the Surgical Robot

Legal personality is generally defined as the legal capacity to acquire rights and assume obligations. Accordingly, recognizing legal personality for artificial intelligence—and, in particular, for the surgical robot—would enable it to acquire certain rights and assume specific legal obligations in a manner analogous, though not identical, to the legal status of a natural person or a juristic person, while taking into account the distinctive technological nature of such systems.

The question of granting legal personality to artificial intelligence has generated considerable debate at both the doctrinal and legislative levels. Legal scholars remain divided between those who support such recognition and those who oppose it. One school of thought rejects the possibility of recognizing legal personality for artificial intelligence on the grounds that it is a non-human entity lacking legal will, moral consciousness, and the capacity necessary to bear legal responsibility independently.

Conversely, another school of thought argues that traditional legal doctrines should be reconsidered in order to accommodate the rapid development of artificial intelligence systems, particularly in the medical and surgical fields. This approach is based on the advanced characteristics exhibited by such systems, including relative autonomy in decision-making, the capacity for self-learning, and the ability to process information and interact with their surrounding environment. Accordingly, proponents of this view advocate reforming the existing legal framework so as to recognize a distinct form of legal personality for artificial intelligence, drawing by analogy upon the concept of juristic personality traditionally accorded to legal entities. Such recognition, they contend, would better reflect the practical, technological, and economic realities associated with advanced AI systems.

A third and more moderate approach proposes a compromise by recognizing virtual or electronic legal personality for artificial intelligence and surgical robots. Under this model, such personality would be limited in both scope and legal effect and would not be equivalent to either the legal personality of natural persons or that of traditional juristic persons. The principal objective of this approach is to establish a specialized legal framework capable of regulating the rights, obligations, and liabilities arising from the use of intelligent robotic systems, particularly in situations where identifying the person directly responsible for the resulting harm proves difficult or impossible.

Subsection One: The View Opposing the Recognition of Legal Personality for Surgical Robots

A significant body of legal scholarship rejects the idea of granting legal personality to surgical robots, arguing that such a proposition is no more than a legal fiction that is difficult to implement in practice, given that a surgical robot remains a technological system incapable of attaining the status of a legal person.[23] Proponents of this view rely on several legal arguments, the most important of which are discussed below.

First: Undermining the Fundamental Distinction Between Human Beings and Things

[23] Abdullah Mohammed Al-Zamil, The Legal Personality of Robots, International Journal of Law and Political Studies, Vol. 6, No. 1, 2024, p. 38.

Opponents of recognizing legal personality for surgical robots contend that such recognition would undermine the fundamental and well-established distinction between human beings and things, a distinction that constitutes one of the cornerstones of both human civilization and the legal order.[24] In their view, a robot, by its very nature, remains nothing more than an object or a technological device rather than a natural entity belonging to the category of legal persons. Consequently, it cannot legitimately be granted any form of legal personality, whether in the form of juristic personality or any other legal status.

According to this approach, the human being occupies a unique and irreplaceable position that cannot be equated with any artificial creation. Any attempt to draw a legal analogy between a natural person and a surgical robot would diminish the unique legal and moral status of human beings. A robot, regardless of its technological sophistication, remains an artificial machine designed and created by humans, whereas a human being is a unique biological entity endowed with inherent dignity and legal status. Accordingly, although surgical robots may rival human beings in performing certain specialized tasks with greater speed or precision, they can never replace human beings or succeed them as independent legal subjects. From this perspective, the human being remains the master and principal legal actor, while the robot is merely an advanced technological instrument designed to serve human purposes.[25]

Second: The Absence of Legal Necessity for Granting Legal Personality to Surgical Robots

Opponents of recognizing legal personality for surgical robots further contend that there is no legal necessity to justify conferring legal personality upon such systems. In their view, it is sufficient to classify surgical robots under their existing legal status as objects (things). Consequently, the legal rules governing objects remain adequate to regulate their legal status and use, without the need to create a new legal category or confer a separate legal personality upon them. At the present stage of technological development, surgical robots are not capable of assuming an independent legal role beyond that traditionally assigned to objects under the law[26] Moreover, surgical robots do not possess complete autonomy from human beings. Their operation remains fundamentally dependent upon human design, programming, supervision, and control. Given the current stage of artificial intelligence development, existing AI systems remain far removed from the level of Artificial Superintelligence (ASI). Rather, they operate primarily on the basis of accumulated data, algorithms, and computational models, without possessing consciousness, self-awareness, genuine understanding, or reasoning in the human

[24] Mohammed Ahmed Al-Maadawi Abdel Rabbo Mujahid, Civil Liability for Artificial Intelligence Robots: A Comparative Study, The Legal Journal, Faculty of Law, Cairo University, Vol. 9, No. 2, 2021, p. 3.

[25] Nessakh Fatima, The Legal Personality of the New Entity: The Virtual Person and the Robot, Al-Ustadh Al-Bahith Journal for Legal and Political Studies, Faculty of Law and Political Science, Mohamed Boudiaf University, Vol. 5, No. 1, 2020, p. 224

[26] Mohammed Irfan Al-Khatib, The Legal Status of the Robot (Robot): Legal Personality and Liability—A Comparative Analytical Study, Journal of the College of Law, Kuwait University, Vol. 6, No. 24, 2018, p. 111.

sense. Accordingly, artificial intelligence, in its current form, cannot be regarded as equivalent to human intelligence, nor can it justify the recognition of an independent legal personality[27].

Third: The Sufficiency of Existing Rules of Legal Liability

Supporters of this view argue that, at the present stage of artificial intelligence development, there is no practical justification for creating a new category of legal personality for surgical robots. Existing principles of civil liability are considered sufficiently flexible to address the legal consequences arising from the use of such systems, particularly by attributing liability to the person who has custody, control, operation, or use of the surgical robot.

Although a surgical robot may possess a degree of operational autonomy and the technical capability to avoid certain risks, legal responsibility for any damage resulting from its operation remains attributable to its custodian, owner, or operator, without the necessity of establishing fault on the part of the robot itself. Furthermore, the risks associated with the use of surgical robots may be effectively managed through liability insurance, requiring the owner or operator to maintain appropriate insurance coverage, thereby eliminating the need to recognize an independent legal personality for the robot.[28]

Fourth: The Risk of Allowing Manufacturers or Owners to Evade Legal Liability

Opponents further contend that granting legal personality to surgical robots could provide manufacturers, owners, or users with a means of evading legal responsibility. In practice, it is difficult to isolate the actions of an artificial intelligence system from those of its designer, programmer, manufacturer, or operator. Likewise, assessing the conduct of an intelligent system independently from the human factors that contributed to its design, programming, and operation presents significant legal challenges.

Many legal scholars also warn that recognizing legal personality for artificial intelligence may pose broader risks to humanity, particularly in light of predictions that artificial intelligence could eventually surpass human intelligence across numerous fields. While some regard such technological advancement as a significant scientific achievement, the prevailing concern is that it may undermine the status, dignity, and legal responsibility traditionally attributed to human beings.

Moreover, granting legal personality to artificial intelligence could reduce the incentives for manufacturers and developers to exercise appropriate care during the design and production process, since liability might be shifted from the human actors responsible for creating the technology to the technology itself. Such a development could ultimately result in the production of less reliable and potentially more hazardous intelligent systems.[29]

Fifth: The Difficulty of Distinguishing the Robot's Fault from Human Fault

Supporters of the opposing view further argue that recognizing legal personality for surgical robots would give rise to significant legal inconsistencies that would be difficult to resolve. One

[27] Harry Surden, Artificial Intelligence and the Law: An Overview, Journal of the Judicial Institute, Dubai, United Arab Emirates, No. 11, 2020, p. 183.

[28] Hossam El-Din Mahmoud Hassan, The Reality of Legal Personality for Artificial Intelligence, Rouh Al-Qawanin Journal, Faculty of Law, Tanta University, Vol. 35, No. 102, 2023, p. 172

[29] Rafan Lakhdar & Maouch Firouz, The Specificity of Civil Liability for Damage Caused by Artificial Intelligence Systems under Algerian Law, Tobna Journal of Scientific and Academic Studies, University of Mohamed Khider–El Oued (Si El Haouès), Vol. 6, No. 1, 2023, p. 581

of the most important of these concerns is the practical difficulty of distinguishing the fault attributable to the robot or intelligent system from that attributable to its owner, operator, programmer, or manufacturer.

From a practical perspective, evaluating the conduct of an intelligent machine independently remains problematic because its capacity for learning and autonomous operation is inherently dependent upon the individuals who own, program, supervise, or provide it with data. Likewise, distinguishing the fault of an artificial intelligence system from that of its programmer or designer is often impossible, except in situations where the damage can clearly be attributed to user negligence or to the provision of defective, inaccurate, or misleading data that causes the system to behave improperly and inflict harm upon others.[30]

In light of the foregoing, proponents of this approach conclude that surgical robots should continue to be classified as objects under the law. Accordingly, legal liability should remain with the natural or juristic persons responsible for their design, manufacture, programming, operation, or use. This solution is considered the most consistent with established principles of liability and the traditional structure of private law.

Subsection Two: The View Supporting the Recognition of Legal Personality for Surgical Robots

A considerable body of legal scholarship advocates the possibility of granting legal personality to surgical robots.[31] This view is founded on the distinction between human nature and legal personality. According to its proponents, the criterion for recognizing legal personality is not the biological nature of the entity concerned, but rather its legal capacity to acquire rights and assume obligations. Consequently, it is argued that autonomous artificial intelligence systems, including surgical robots, may be granted a form of digital or electronic legal personality, provided that they are capable of holding certain rights and bearing specific legal obligations in a manner analogous, though not identical, to that of natural or juristic persons. In support of this position, proponents advance several legal arguments, the principal of which are outlined below.

First: The Degree of Autonomy Enjoyed by Autonomous Robotic Systems

Supporters of this approach maintain that the degree of autonomy exhibited by certain autonomous robotic systems constitutes one of the strongest justifications for recognizing their legal personality. Although surgical robots are initially programmed to operate in accordance with predefined algorithms, they are frequently capable of determining how to respond to particular situations on the basis of data and circumstances that were not explicitly specified at the programming stage.

Artificial intelligence systems possess sophisticated capabilities for self-learning, data analysis, decision-making, and problem-solving, enabling them to perform certain functions without continuous human intervention. Fundamentally, these technologies automate a number of

[30] Ahmed Hassan Ali Othman, The Impact of Artificial Intelligence on Civil Law, Journal of Legal and Economic Research, Faculty of Law, Mansoura University, Vol. 11, No. 76, 2021, p. 1560.

[31] Mohammed Al-Qutb Musaad Saeed, The Role of Intellectual Property Rules in Addressing the Challenges of Artificial Intelligence: A Comparative Legal Analytical Study, Journal of Legal and Economic Research, Faculty of Law, Mansoura University, No. 75, 2021, p. 1708

cognitive processes traditionally associated with human intelligence, including decision-making, learning from previous experiences, strategic planning, information processing, and the accumulation of operational knowledge.

Accordingly, proponents argue that surgical robots possess characteristics that make them functionally comparable, from a legal perspective, to certain entities already recognized as legal persons. They are capable of making relatively autonomous decisions, learning from operational errors, interacting with their surrounding environment, and engaging with other legal actors. In the opinion of this school of thought, these characteristics justify the recognition of a special legal status for surgical robots, particularly in view of their increasingly significant role in legal and medical relationships.[32]

Secondly: The Impossibility of Considering the Surgical Robot as a Mere Object

The proponents of recognizing legal personality for intelligent surgical robots argue that the degree of autonomy exhibited by artificial intelligence systems constitutes a sufficient basis for removing such entities from the traditional legal category of objects and placing them within a new legal category that closely resembles the concept of legal persons[33]

According to this view, an intelligent surgical robot, equipped with advanced analytical and interactive capabilities, cannot be regarded as a mere object or an ordinary technical instrument. The artificial intelligence technologies embedded within such systems enable them to perform highly sophisticated functions that may, in certain respects, surpass human capabilities in terms of speed, precision, and data processing[34]Consequently, classifying an intelligent robot as nothing more than an object would undermine the very essence of artificial intelligence and deprive it of its legal significance, reducing it, from a legal perspective, to a status equivalent to legal nonexistence despite the extensive and diverse services it provides across numerous fields, particularly in the medical and surgical sectors.[3]

Thirdly: The Separation of Legal Personality from Human Status

Supporters of this approach further contend that the concept of a legal person is an abstract legal construct that should not be confused with the notion of a human being. The legal concept of a "person" is not necessarily synonymous with that of a "human," as legal personality is fundamentally distinct from human nature from both philosophical and legal perspectives[35]

Accordingly, legal personality is not exclusively reserved for natural persons. Rather, it may be conferred upon any entity whenever it is capable of performing a legally recognized function or whenever social and practical necessities justify granting it a distinct legal status. In this sense, legal personality constitutes a legal mechanism through which a particular entity is

[32] Ameera Abdul Hussein Jasim, The Legal Personality of Intelligent Robots, Journal of Sustainable Studies, Vol. 5, No. 4, 2023, p. 797.

[33] Reda Mahmoud Al-Abd, Virtual Legal Personality: Towards the Recognition of Legal Personality for Artificial Intelligence-Enabled Robots, Journal of Law and Technology, Faculty of Law, The British University in Egypt, Vol. 3, No. 2, 2023, p. 233.

[34] Taha Al-Maghribi, Criminal Protection against Errors of Artificial Intelligence Technologies (The Surgical Robot as a Model), Journal of Jurisprudential and Legal Research, Faculty of Sharia and Law, Al-Azhar University, Vol. 35, No. 43, 2023, p. 603.

[35] Mohammed Hassan Abdel Rahim, Recognizing Legal Personality for Artificial Intelligence Systems, Journal of Law and Technology, Faculty of Law, The British University in Egypt, Vol. 3, No. 2, 2023, p. 686

admitted into the legal order, enabling it to acquire legal rights, assume legal obligations, and perform legally recognized functions within the legal system[36]

The advocates of this position further argue that modern legal systems already recognize juridical persons, granting them legal personality independent from that of their founders. Such entities enjoy legal rights, assume obligations, possess separate patrimonies, incur debts, and bear legal liability, notwithstanding the fact that they lack human consciousness, natural will, or cognitive capacity.

Based on the foregoing, proponents of this view maintain that there is no legal impediment to granting artificial intelligence systems a distinct form of legal personality analogous to that enjoyed by juridical persons whenever practical and societal considerations so require, particularly where such systems become capable of producing independent or quasi-independent legal effects in their interactions with third parties[37]

Fourthly: Ensuring Legal Protection for Artificial Intelligence Systems and Individuals Harmed by Them

According to this approach, the recognition of legal personality for artificial intelligence systems is not intended solely to confer rights upon such systems; rather, it also seeks to establish a dual framework of legal protection. On the one hand, it aims to safeguard artificial intelligence systems against unlawful interference, misuse, or infringement by third parties. On the other hand, it seeks to protect individuals from the harm that may result from the operation or use of these systems.

From this perspective, recognizing the legal personality of surgical robots may facilitate the determination of liability for damages caused by such systems and enable injured parties to seek compensation from the person or entity legally responsible. Furthermore, it may mark a shift from the traditional model of liability—under which responsibility for the acts of artificial intelligence applications is generally borne by the manufacturer, the user, or the custodian—to a new model in which artificial intelligence systems themselves assume a degree of independent legal responsibility for the damage they cause to third parties.

This approach further entails granting surgical robots a separate legal patrimony, which may serve as a financial source for compensating victims for damages resulting from their errors or the manner in which they operate. Such a framework seeks to strike a balance between ensuring legal protection for intelligent systems and safeguarding the rights and interests of individuals harmed by their use[38].

Section Three: The Legislative Approach to Granting Legal Personality to Artificial Intelligence Systems

In 2017, the Committee on Legal Affairs (JURI) of the European Parliament adopted a report containing recommendations addressed to the European Commission on civil law rules

[36] Ahmed Belhaj Jarad, The Legal Personality of Artificial Intelligence: A Misleading Anticipation, Kuwait International Law School Journal, No. 2, 2023, p. 232.

[37] Iyad Mutashar Sihoud, Anticipating the Legal Impact of Artificial Intelligence Technology, 1st ed., Dar Al-Nahda Al-Arabiya, Cairo, 2021, p. 39.

[38] Mahmoud Hassan Al-Mahalli, The Basis of Civil Liability for Autonomous Artificial Intelligence: Traditional Models or a New Vision, Journal of Legal and Economic Research, Alexandria University, Vol. 2, 2021, p. 119

governing robotics. The report called for the establishment of a unified legal framework defining the concept of a "smart robot" according to its degree of autonomy and capacity for self-directed decision-making. It also addressed the issue of liability for damage caused by robots and proposed two principal models of liability. The first was strict liability, which dispenses with the requirement of proving fault, while the second was a risk management approach, under which liability is attributed to the person best positioned to foresee, prevent, and mitigate the relevant risks[39]

The report further recommended that liability should be determined in light of the robot's degree of autonomy and the extent of the instructions provided to it. It also proposed complementary measures, most notably the introduction of a mandatory insurance scheme for robot operators and the establishment of a compensation fund to cover damages not compensated by conventional insurance policies[40]The European Parliament subsequently endorsed this approach in its Resolution of 16 February 2017, which contemplated the future recognition of what was termed an "electronic legal personality" (electronic personhood) for highly autonomous intelligent robots. The Resolution also proposed the establishment of a dedicated register for such robots and the adoption of a special regime governing civil liability and compulsory insurance for damages resulting from their operation[41]

This approach suggests that the principal objective of recognizing electronic legal personality is to ensure prompt and effective compensation for individuals harmed by the actions of intelligent robots, without requiring them to prove fault or establish a defect in the robot itself or negligence on the part of the designer, manufacturer, owner, or user. Under this model, liability is attached to the robot through an insurance mechanism or a compensation fund, particularly where the robot possesses a high degree of autonomy in decision-making and self-directed operation[42]However, the European Parliament subsequently departed from this position in its Resolution of 20 October 2020, in which it implicitly acknowledged that the autonomy of artificial intelligence systems is relative rather than absolute. The Resolution concluded that granting independent legal personality to such systems is unnecessary, insofar as they remain dependent upon human intervention in their design, programming, operation, and the determination of their functions. Consequently, such human involvement continues to constitute the legal basis for holding the person responsible for developing, deploying, or modifying the system liable whenever damage occurs[43]

The same Resolution further emphasized that physical or virtual activities, devices, or processes based on artificial intelligence may directly or indirectly cause damage or loss. Nevertheless, such damage generally results from the intervention of a natural or legal person involved in the

[39] Kholoud Tu'mah Hassan, op. cit., p. 39.
[40] Reda Mahmoud Al-Abd, op. cit., p. 244
[41] Asim Mohammed Fadel Al-Dabbouli, The Legal Regime of Artificial Intelligence Robots, Dar Al-Fikr Al-Jami'i, Cairo, Egypt, 2023, p. 921.
[42] Ahmed Belhaj Jarad, op. cit., p. 236.
[43] Jihad Mahmoud Omar, The Legal Personality of Intelligent Robots between Recognition and Denial: A Legal Study, Journal of Jurisprudential and Legal Research, Al-Azhar University, Egypt, Vol. 36, No. 45, 2024, p. 896.

development, deployment, or modification of those systems[44]Accordingly, it is evident that the European Parliament's position adopted in 2020 represents a departure from its earlier approach of 2017. Whereas the 2017 Resolution envisaged the future recognition of an electronic legal personality for highly autonomous intelligent robots, the 2020 Resolution concluded that no such recognition is required. Instead, it relied on the existing framework of civil liability, particularly the rules governing liability for defective products, as the appropriate legal basis for addressing damages arising from artificial intelligence systems and intelligent robots[45].

Accordingly, the contemporary legislative trend favors refraining from recognizing legal personality for artificial intelligence systems. Rather, it focuses on modernizing the rules of civil liability—especially those governing defective products—to extend their scope to technological and digital defects. Consequently, regardless of the degree of sophistication or autonomy attained by artificial intelligence systems, they continue to be regarded as legal objects rather than legal persons, thereby undermining both the theoretical and practical justification for granting them an independent legal personality

Section Two: The Legal Consequences of Denying or Recognizing the Legal Personality of the Surgical Robot

The recognition or denial of legal personality for the surgical robot gives rise to significant legal consequences, particularly with regard to determining the legal basis of civil liability for damages resulting from its use in medical and surgical practice. Where legal personality is denied, the surgical robot is classified as a mere object or technological product and is therefore subject to the traditional rules of civil liability. Conversely, if legal personality is recognized, a number of legal issues arise concerning its legal capacity to bear obligations, the existence of an independent patrimony, and the possibility of holding it directly liable for the damage it causes.

Section One: The Legal Consequences of Denying the Legal Personality of the Surgical Robot

The denial of legal personality to the surgical robot excludes it from the category of legal persons and places it within the legal classification of objects or advanced technological devices. Consequently, damage resulting from its use is, in principle, governed by one of two legal regimes: either the rules governing liability for things or machinery, or the rules governing liability for defective products.

First: Civil Liability of the Surgical Robot as a Machine

Classifying the surgical robot as a machine or a thing entails subjecting it to the legal rules governing liability for things. The Algerian legislator has adopted this approach in Article 138 of the Algerian Civil Code, which imposes liability upon the custodian of a thing whenever that person exercises powers of use, control, and supervision over it and the thing causes damage to another. Such liability may, however, be excluded where the custodian proves that the damage resulted from a cause beyond his or her control, such as force majeure, a fortuitous event, the act of a third party, or the fault of the injured person.

[44] Jihad Mahmoud Omar, op. cit., p. 898.
[45] Kholoud Tu'mah Hassan, op. cit., p. 59

Nevertheless, the application of the theory of custody to surgical robots raises complex legal and technical difficulties. The concept of custody presupposes that the custodian exercises effective authority over the object through supervision, direction, and control. Such authority may, however, be weakened or even disappear where the surgical robot is equipped with an artificial intelligence system capable of processing data and making autonomous decisions during a surgical procedure. In such circumstances, the system may operate in a manner that is no longer subject to the physician's or operator's direct control, thereby creating uncertainty as to the identification of the legally responsible custodian.

These difficulties are further compounded by the composite nature of artificial intelligence systems. Such systems are not always limited to a tangible physical object but may consist of software, algorithms, databases, and machine-learning systems. Consequently, subjecting these systems to the traditional rules governing custody may prove inadequate, since those rules were originally designed for tangible objects capable of being effectively controlled. By contrast, the risk associated with a surgical robot may arise from an intangible component, such as a defect in an algorithm, an error in data processing, or a malfunction in a software update[46].

Secondly: Civil Liability of the Surgical Robot as a Product

Product liability refers to liability arising from the lack of safety or security of a product. Under this regime, the injured party is not, as a general rule, required to prove fault on the part of the producer; rather, it is sufficient to establish the existence of a defect in the product, the occurrence of damage, and a causal link between the defect and the damage. The Algerian legislator has adopted this approach in Article 140 bis of the Algerian Civil Code, which provides that the producer shall be liable for damage resulting from a defect in the product, irrespective of whether a contractual relationship exists between the producer and the injured party.

This legal basis appears more appropriate for application to surgical robots than the theory of custody, since a surgical robot constitutes a highly sophisticated medical device combining tangible components—such as robotic arms, sensors, and control instruments—with digital components, including software, algorithms, and databases. Accordingly, where the damage results from a defect in the design, manufacture, programming, updating, or maintenance of the robot, liability may be attributed to the producer or to any of the parties involved in the robot's production, distribution, or operation.[47]

The Algerian legislator has further broadened the scope of legal protection through Law No. 09-03 on Consumer Protection and the Suppression of Fraud, which defines a product as any good or service that may be supplied either for consideration or free of charge. The law further defines goods as any tangible object capable of being transferred, and services as any activity performed other than the delivery of goods, even where such delivery is ancillary to or supportive of the service provided. It also defines an economic operator as any natural or legal person involved in the process of offering products for consumer use. This broad definition

[46] Maamar Ben Tria, Damage Caused by Robots and Artificial Intelligence Technologies: A New Challenge to the Existing Law of Civil Liability, Proceedings of the International Conference on Artificial Intelligence, Algeria, 2018, p. 135.

[47] Salam Abdel Karim, op. cit., p. 193.

makes it possible to encompass a wide range of technical and medical services associated with the operation of surgical robots within the scope of legal protection[48].

Similarly, French law regulates liability for defective products under the provisions of the French Civil Code. Article 1245 provides that a producer shall be liable for damage caused by a defect in its product, regardless of whether a contractual relationship exists between the producer and the injured party. Furthermore, Article 1245-5 defines a producer as a professional who manufactures the finished product, produces a raw material, or manufactures a component part of the product. The definition also extends to any person who presents himself or herself as the producer by affixing his or her name, trademark, or any other distinguishing sign to the product, as well as any person who imports the product into the European Union for the purpose of sale, hire, or any other form of distribution.

Nevertheless, the application of the rules governing liability for defective products to surgical robots is not without difficulty. A surgical robot cannot be regarded as a simple tangible product; rather, it constitutes a complex system integrating medical hardware, software, algorithms, and data. Consequently, the traditional definitions of a product under both Algerian and French law may not fully accommodate the digital and intangible nature of certain components of medical artificial intelligence systems.

Moreover, proving the existence of a defect in a surgical robot presents considerable practical difficulties owing to the technical complexity of artificial intelligence systems and the multiplicity of parties involved in their design, manufacture, programming, updating, maintenance, and operation. In many cases, it may be difficult for the injured party to determine whether the damage resulted from a manufacturing defect, a programming error, deficiencies in the data used by the system, a faulty software update, inadequate maintenance, or improper use of the robot by the surgeon during the surgical procedure.

In light of the foregoing, it becomes evident that, although the rules governing liability for defective products are the legal regime most closely aligned with the nature of surgical robots, they nevertheless require legislative development in order to accommodate digital, algorithmic, and software-related defects and to alleviate the burden of proof imposed upon the injured party, particularly where identifying the source of the malfunction or the responsible party proves difficult. Such development also requires the establishment of specific legal rules capable of addressing the plurality of actors involved throughout the life cycle of the surgical robot, beginning with the designer, programmer, and manufacturer, and extending to the supplier, maintenance service provider, healthcare institution, and the physician operating the robot.

Accordingly, denying legal personality to the surgical robot results in its continued classification as a legal object or product. Consequently, damage arising from its operation remains subject either to the rules governing the liability of the custodian of a thing or to the rules governing product liability for defective products. However, neither regime, in its traditional form, is sufficient to address the technological and digital specificities of intelligent

[48] Law No. 09-03 of 25 February 2009 on Consumer Protection and the Suppression of Fraud, Official Gazette of the People's Democratic Republic of Algeria, No. 15, issued on 8 March 2009.

surgical robots. This justifies the need to modernize the rules of civil liability in a manner consistent with the evolving nature of artificial intelligence and its contemporary medical applications.

Section Two: The Legal Consequences of Recognizing the Legal Personality of the Surgical Robot

Recognizing the legal personality of the surgical robot entails incorporating it into the category of legal persons, thereby granting it a legal personality independent of the natural and juridical persons involved in its design, manufacture, operation, or use. In principle, such recognition results in the attribution of an independent legal patrimony to the robot and the conferral of a limited legal capacity upon it, restricted to the purposes for which it was created. This capacity is functional and limited in nature; it does not amount to the full legal capacity enjoyed by natural persons but is determined according to the nature of the intelligent system and the scope of its intended use.

The recognition of legal personality may also entail granting the surgical robot certain non-financial legal attributes compatible with its nature, such as a legal name, a legal domicile, and a registration number, for the purpose of distinguishing it from other intelligent systems and identifying its legal status. Nationality, however, cannot be regarded as a necessary consequence of recognizing the legal personality of a robot, since nationality traditionally denotes a legal and political bond between an individual and a State. Nevertheless, reference may be made, by way of illustration, to the case of the robot Sophia, which was granted Saudi citizenship—an unprecedented event that generated extensive legal and academic debate concerning the limits of legal recognition of non-human entities equipped with artificial intelligence[49].

One of the most significant consequences of recognizing the legal personality of the surgical robot is the possibility of attributing civil liability directly to the robot itself for the damage it causes, rather than limiting liability exclusively to the designer, manufacturer, owner, or user. Such recognition, however, does not imply the complete exemption of those persons from liability. They remain legally accountable whenever the damage results from defects in design, manufacture, programming, maintenance, or operation. By contrast, where the damage results from an autonomous decision made by the intelligent system within the limits of its functional autonomy, liability may be attributed directly to the surgical robot through its independent patrimony or through a dedicated compensation fund financed in advance by manufacturers or by the entities owning or operating such systems[50].

Having examined both the arguments in favor of and against granting legal personality to surgical robots, together with the legal consequences of recognizing or denying such personality, it is submitted that recognizing a special and limited legal personality for highly autonomous intelligent surgical robots constitutes a compelling legal approach. Treating these systems merely as objects or products is no longer adequate in all circumstances, given their

[49]] Raed Ahmed Awwad Al-Haraman, The Jurisprudential and Legislative Position on Granting Legal Personality to Artificial Intelligence, Ph.D. Dissertation, Faculty of Law, Mansoura University, 2025, p. 11.
[50] Homam Al-Qousi, op. cit., p. 37.

capacity to process data, learn from experience, interact with the surgical environment, and make decisions that are not always subject to direct human supervision.

Furthermore, the traditional rules of civil liability appear insufficient to accommodate all forms of damage arising from intelligent surgical robots. Subjecting such robots to the rules governing the liability of the custodian of a thing encounters difficulties in identifying the actual custodian whenever the system operates with a degree of autonomy. Likewise, applying the rules governing liability for defective products creates significant evidentiary challenges, particularly where the source of the damage lies in an algorithmic defect, a software malfunction, or an autonomous decision generated by the artificial intelligence system itself.

Accordingly, recognizing a special legal personality for the surgical robot may constitute an intermediate legal solution, drawing by analogy upon the concept of the juridical person while taking into account the fundamental legal and technological differences between juridical persons and intelligent robots. Just as the legislator created the concept of the juridical person as an autonomous legal entity distinct from its founders, it may, where necessity so requires, establish a new legal category specifically designed for highly autonomous artificial intelligence systems. Such legal personality should remain limited to the purposes for which the system was created and should be subject to strict legal conditions and regulatory safeguards.

This approach further requires the establishment of a special register for intelligent surgical robots, in which essential information relating to each robot would be recorded, including the identity of the manufacturer, owner, operator, intended field of use, degree of autonomy, applicable insurance arrangements, and significant software updates. Such systems should acquire legal personality only upon registration, thereby ensuring legal certainty regarding their legal status, defining the scope of their legal capacity, and linking them either to an independent patrimony or to a dedicated insurance or compensation fund intended to compensate victims of damage caused by their operation[51].

In this regard, a number of legal scholars argue that granting artificial intelligence systems a special legal status does not necessarily imply conferring upon them a complete legal personality equivalent to that of natural persons. Rather, the objective is to recognize a functional and limited legal personality designed to regulate civil liability, facilitate compensation, and fill the legal gap created by the increasing autonomy of certain intelligent systems. Accordingly, the proposed recognition should be understood as a legal mechanism for ensuring compensation and allocating liability, rather than as a means of granting robots human rights or a legal status equivalent to that enjoyed by human beings[52].

Accordingly, recognizing a limited legal personality for the surgical robot is justified by the need to achieve a dual objective of legal protection. On the one hand, it ensures more effective and expeditious compensation for injured parties. On the other hand, it prevents designers, manufacturers, or users from bearing the entirety of the legal consequences of damage in

[51] Hossam El-Din Mahmoud Hassan, op. cit., p. 135.

[52] Saddam Faisal Kukr Al-Mohammadi, Towards a Modern Approach to Recognizing the Legal Personality of Artificial Intelligence Applications, Critical Journal of Law and Political Sciences, Mouloud Mammeri University, Algeria, Vol. 18, No. 1, 2023, p. 57

situations where the harmful conduct results from the robot's genuine functional autonomy. This objective may be achieved by attributing liability to the surgical robot within the limits of its independent patrimony or its dedicated insurance fund, without prejudice to the possibility of holding the natural or juridical persons involved liable whenever their fault or negligence is established[53].

Conclusion

This study has led to the following conclusions:

-The surgical robot represents one of the most significant applications of artificial intelligence in the medical field, as it provides a high degree of precision in performing surgical procedures, reduces the incidence of human error, and enhances the quality of healthcare services.

-Although the surgical robot enjoys a certain degree of technical autonomy in performing specific tasks, it does not possess an independent legal will that would enable it to acquire legal personality or bear legal responsibility directly.

-The study has demonstrated that the traditional rules of legal liability encounter considerable difficulties in addressing damage arising from the use of surgical robots, particularly in situations involving overlapping responsibilities among the surgeon, the healthcare institution, the manufacturer, and the software developer.

-The absence of a specific legislative framework in Algerian law governing the legal status of surgical robots and regulating their use, as well as the liability arising from their operation, constitutes a significant legislative gap.

-The study further revealed that the prevailing view in comparative legal scholarship continues to reject the recognition of an independent legal personality for surgical robots, while maintaining that liability should remain attributable to the natural or juridical persons involved in their design, manufacture, operation, or use.

-The rapid development of surgical robotics necessitates a reconsideration of traditional legal rules in order to achieve an appropriate balance between encouraging medical innovation and ensuring the effective protection of patients' rights.

Recommendations

In light of the foregoing findings, the study recommends the following:

-Enacting a dedicated Algerian statute regulating the use of surgical robots, specifying the legal requirements governing their acquisition, operation, supervision, and monitoring within healthcare institutions.

-Establishing clear legal rules governing both civil and criminal liability for damage arising from the use of surgical robots, while clearly defining the respective responsibilities of the surgeon, the healthcare institution, the manufacturer, and the software developer.

-Refraining, at the present stage, from granting surgical robots an independent legal personality, owing to the absence of sufficient legal grounds justifying such recognition, while maintaining liability on the part of the persons responsible for their design, manufacture, operation, or use.

-Requiring healthcare institutions to carry out periodic maintenance and continuous software updates for surgical robots, in addition to establishing a comprehensive system for documenting all surgical procedures in which such robots are involved.

[53] Saddam Faisal Kukr Al-Mohammadi, op. cit., p. 62.

-Developing specialized education and training programs for surgeons and medical personnel on the safe and effective use of surgical robots, with a view to enhancing patient safety and minimizing both technical and human errors.
-Establishing a specialized national authority responsible for the certification and supervision of surgical robots, ensuring their compliance with applicable technical, legal, and ethical standards before they are authorized for clinical use.
-Promoting scientific research and comparative legal studies in the fields of surgical robotics and medical artificial intelligence, with the objective of developing a modern legislative framework capable of keeping pace with technological advances while safeguarding the rights and interests of all stakeholders.

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