**International Journal of Service Science, Management, Engineering, and Technology**
Volume 13 • Issue 1

# The Patentability of AI Invention:
## The Case of the Kingdom of Saudi Arabia Law

Reem Almarzoqi, Independent Researcher, Saudi Arabia
Mohamad Albakjaji, Prince Sultan University, Saudi Arabia*

### ABSTRACT

Artificial intelligence has gained momentum in the recent past due to technological advancements. As a result, it has elicited an endless debate particularly in light of intellectual property laws. Artificial intelligence is currently considered an emerging issue. This make it as a challenging issue for existing legal frameworks that are unable to govern and regulate it in a proper and effective way. KSA has put more effort and resources in streamlining the legal aspects to govern AI and related innovations. The current research aims to explore some of the potential difficulties encountered in patentability of AI inventions. It also aims to determine the legal challenges the researcher expect to emerge with the development of AI technology. The findings of this study indicate that KSA still finds a huge gap in terms of laws that govern AI-generated innovations. This study is significant in the sense that it has pointed out some of the challenges experienced in enacting effective intellectual property laws to govern AI innovations.

### KEYWORDS

Artificial Intelligence, Intellectual Property, Law, Patent

### 1. INTRODUCTION

Artificial intelligence (AI) is defined as the possibility of interpreting human intelligence so that a computer can easily imitate it and conduct functions, from the easiest to the most complicated ones. Artificial Intelligence's purposes involve comprehension, logic, and interpretation. In the last few years, the growth of global patents has significantly increased due to technological advancement and this has pushed the inventors to seek greater protection of their inventions (Trappey et al., 2020).

Artificial Intelligence has a rich history as described by Bienvenido et al. (2021) and it is interesting to see how it has changed the world. For starters, limited memory devices like automated cars merge the environment and determine based on stored information. They note indications, speed, path, and control of traffic. Automobiles and lanes. Artificial Intelligence technology's advantages are diverse and may really have the potential to revolutionize many areas of life, including within the IP sector, but the advent of AI technology also raises a range of problems within the IP industry that are likely to have to be addressed in the near future.

This paper provides a piece of background information on how these two domains have evolved over time. Furthermore, this paper explores the relationship between AI and Patent and their application in new inventions. This research discusses one of the contemporary challenging issues. It is the issue of governing Artificial Intelligence by the current patent legal system. Recently AI had an importance

DOI: 10.4018/IJSSMET.307111 *Corresponding Author

This article published as an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0/) which permits unrestricted use, distribution, and production in any medium, provided the author of the original work and original publication source are properly credited.

and evaluative role in our society where Artificial intelligence can make a rapid change and create new innovations in a way that is accelerating with technological advancements. Development acceleration is a significant attribute of the new technology including AI which makes national laws unable to keep up to date with technological developments. As the new technology is not well regulated, this makes it as a source of concerns to the users (Feltus, 2019; Tripathy & Mishra, 2017).

The current legal definitions of creativity and innovation do not take into consideration non-human innovation. AI will certainly have an impact on the traditional concepts of intellectual property. An example of this is that AI machines have no doubt the ability to build subject matter which can be protected by IP. It is also foreseeable that an advanced AI system could be responsible for creating new inventions or medicines that could attract patent protection. However, the legal challenge that is inherited to AI activity is the ownership that enables the owner of IP work to register his/her work and to sue the third party for unfair use of the IP matter, and the right of the owner if AI has an access to the work and use it without his permission.

Artificial intelligence (AI) and intellectual property (IP) are fundamentally different in how they can be monetized. Although AI companies could become increasingly relevant in today's IP-based economies, it is still unclear whether or not these firms can properly take advantage of their proprietary technology. A lot of issues have been raised regarding artificial intelligence, especially whether AI innovations should be patented. AI itself cannot own anything as of now, it doesn't consider to be as a self-determining entity. Yet, sure enough, more artificial intelligence will be developed. The problem is where current intellectual property laws is not up to the task and must be significantly revamped to keep up with evolving technologies. Based on the continuous roles and development of AI, the current legal systems are still unable to keep updated with the AI development. In the AI context, the legal protection has not yet updated with the latest the technological innovations where the current legal system cannot cope with the technological development (Albakjaji et al, 2020).

The current research aim is to explore the ways by which KSA Patent laws govern the issue AI and innovations. This topic has been scarcely discussed in the previous literature. Moreover, the current study will also analytically discuss the way forward for improving the laws that govern and regulate the AI issues. Thus, the study will be trying to answer the following research question:

To which extent is the AI invention patentable in the Saudi law?

This study is important one as it provides the current situation of IP in Saudi Arabia and identifies possible paths for further development. Further studies are needed to better understand how other countries deal with these issues. The issue of AI inventions and their patentability is a global problem and therefore requires attention by many organizations around the world. With so many areas of legal technology evolving rapidly, such studies will become increasingly valuable as knowledge about IP continues to grow. This study can be used by Saudi IP Law makers to examine current problems and determine possible solutions for a future where AI has greater presence in our daily lives. There is no doubt that artificial intelligence will change our society in many ways and there is need to take time to prepare for its implementation.

The importance of our study is to investigate different phases regarding this issue nationally. Hence, considering all latest development steps Saudi Arabia had implemented such as NEOM City, Sophia the robot that had lately given a Saudi citizenship and the Saudi Vision 2030.

The research is considered as the first work that studies the AI issue from a legal side, so it will be as a unique work in the field of legal studies on KSA legal framework. So, this will help readers understand the legal dilemma in AI governance. And also, will let innovators and AI business owners to know the future protection of their work and to help them interact under clear regulations.

Regarding the research methodology, this study will look at publications on the KSA context to explain the effectiveness of the Patent Saudi norms in governing the AI issue. Moreover, to allow a closer look at the phenomenon and to produce a more detailed representative picture of the actual situation, the researcher has used primary and secondary data. The researchers will use the law texts to explore the legal framework that govern the patent in KSA. To have an in-depth sight on the issue

of patent and AI, the researchers has used secondary data as well. The main sources used for the secondary data collection are both professional and academic. The professional sources included multilateral organizations, business related, and government websites such as WIPO, World Trade Organization, European Union, Federal Trade Commission, and Financial Times and so on. Academic sources include the use of academic books, scholarly articles, conference symposiums and legal texts. Moreover, law and business reports will be used as well. Hence, this study was designed to investigate the effectiveness of the current IP legal systems in KSA.

As for the contribution of this study, to the best researchers' knowledge, many studies have shed light on AI in different contexts, however no study spots light on the patent and AI especially in the Saudi context. In the next section, the researchers will comb and review the related literature and studies. Other sections will present theory of paten, the patentability in KSA, the challenges of patentability in the era of Artificial Intelligence, the need for appropriate policies to address patent challenges, AI-Driven Innovation in Achieving Vision 2030. The final section will cover the research findings, and conclusion.

## 2. LITERATURE REVIEW

Artificial Intelligence has become popular in the recent past, with AI startups emerging and announcing amazing breakthroughs every now and then. There are still major problems to be solved with AI, which need the deep understanding of mathematics and statistical methods to solve (Celik, 2020). One of the major concerns that scholars have raised is the patentability of AI inventions. Currently, there are no precedents on how AI can be patented. Scholars believe that AI should be given intellectual property rights as much as possible, but what will happen if it gets too sophisticated?

Legal issues have emerged because of how complex AI systems can be. How can intelligent system be controlled? How can ethical principles be provided during application in such a system? What happens if AI creates or evolves beyond human comprehension? These are some of the concerns that scholars are raising in their works (Schuster, 2018). McLaughlin (2019) argue that intellectual property rights should be provided to artificial intelligence and how can they be safeguarded against misuse? Can it be developed so that it doesn't abuse its capacity and instead uses it for good? Is there a law for this or should there be? The emergence of autonomous machines such as driverless cars or drone aircraft have led to even more legal questions about who owns what and who controls them (McLaughlin, 2020). Zhang et al. (2021) noted that they raise new legal questions about whether these technologies should be covered by law at all. If lawyers are to be asked, they will tell you that laws on patents for algorithms aren't applicable because these systems are non-human entities. Thus, if a machine learns something from its environment, it cannot be patented because it isn't patentable.

On the other hand, if a closer look is given to software patents, which usually deal with code and mathematical calculations, then this kind of technology may fall under patent law. For example, Tripathi & Ghatak (2018) suggests that code used in robotics could be covered by copyright law because software is based on formulas and procedures that were invented by humans. This may mean that when robots perform specific actions in order to perform tasks, these actions could be considered inventions and thus may be protected by copyright law. Another issue raised by the recent proliferation of robots is whether there should be worries about laws regulating their employment and safety. As time goes by, robots will start taking over jobs previously held by employees and this will further raise ethical concerns. There is still a huge gap in understanding the patentability of AI inventions. However, most decisions about patentability have been based on information collected through routine prior art searches and non-literary methods such as comparing particular embodiments to a previously filed application or discussing abstract principles. Because patents do not convey legal knowledge about specific cases, the jurisprudence that develops will largely depend on what other people have said and done. Even so, legal decision-makers may use patents as important tools for screening out too much irrelevant information. Patent law should encourage an environment where scientists can

bring their ideas to the market without being concerned about what they cannot patent. This will allow technological innovation to flourish, creating opportunities for new jobs and more technology that will make the world a better place. A few academic articles suggest that there is no meaningful body of law yet, but some opinions, often solicited by large companies or universities, can give useful insight. Numerous publications on the intellectual property and patentability of AI inventions share similarities with each other. According to Kelly et al (2017) IP law concerns the various rights that protect creative endeavor and innovation. Importantly Patent rights also protects the application of ideas and information that are of commercial value. It does not directly address any notion of utility or appropriateness of ideas or information. However, this might be included under broader terms such as intangible asset protection or consumer protection. Schuster (2018) examined published US patent applications for computer implemented machine learning techniques from 2008 to 2015. Their research indicates that there are around 3500 machine learning related patents issued annually in the US. The more popular types of machine learning technologies include: Neural Networks, Deep Learning, Big Data Analytics, Regression Analysis, Association Rule Mining and Multi-Dimensional Discriminant Analysis. The legal dilemma surrounding patentability of AI inventions is likely to continue for years to come. For those working in this field, these studies provide useful insights into current policy debates and future challenges. Future researchers might compare different industries to determine whether similar trends occur across all sectors of business. Perhaps most importantly, future studies could attempt to identify if certain technical decisions regarding software tools are actually "inventions" in the legal sense of the term. If such questions are raised in academia, this might trigger a debate over how AI inventions should be treated under patent law. In any case, there is likely to be much more discussion around AI and its application in the coming years. As technology evolves, lawyers will have to continually re-evaluate their advice on what constitutes an invention and whether something can be patented. Schneider (2017) defined the artificial intelligence (AI) concept as an area of computer science that emphasizes the creation of intelligent machines that work and react like humans where it is designed to learn, plan, recognize speech and solve problems.

Regarding the legal issues, Buyers (2018) mentioned the legal challenge that AI presents to current legal system where the current legal systems are unable to provide an effective AI governance.

In his book, Buyers (2018) provides a comprehensive idea on causation, intellectual property ownership, confidentiality and data protection problems. Thus, the researcher will use academic books and articles such as this reference to develop a clear legal theory of technologies and how AI create issues and risks.

In the same sense, Hoffmann (2020) focus on the legal challenges and restrictions that face the AI regulation. They introduce a comprehensive view on the laws that currently shape or restrict the design or use of AI, and develops policy recommendations for those areas in which regulation is most urgently needed which can contribute in providing good ideas on this issue. On another hand, as KSA is a member state in WIPO, so it is wise to discuss the role of WIPO in regulating AI issue. WIPO (2019) shed the light on discussing analysis that offers new evidence-based perspectives on governance issues and how it includes reports in a new series from WIPO tracking and the development of technologies through the analysis of data on innovation activities.

In addition to the analysis of data on patents and scientific publications, and its importance in distinguishing their differences and innovation trends.

The previous literature only focused on discussing the role of IP laws and regulations in governing AI issue generally. So, the current research will focus on studying this issue locally by analytically discussing this issue in Saudi Arabia, and its implication nationally speaking.

## 3. THEORY OF PATENT

A patent is a set of exploitation rights for a certain invention, product or technology that is granted by a State to exclusively commercially exploit said invention for a limited period of time. It is an

industrial property right. The patent holder has a set of exclusive rights to use and exploit a new product invented by himself.

The patent owner shall have the right to prevent other natural or legal persons from industrially or commercially exploiting the invention while the patent is in force (Abbas, et al, 2014). Therefore, obtaining the patent confers a temporary exploitation monopoly on the owner. However, it must be taken into account that this exclusive right of exploitation is limited only to the territory or territories where the patent has been registered.

Patent has some important characteristics. To better understand what patents are, a number of basic characteristics must be considered: In the first place, patents are characterized by preventing the plagiarism of inventions and hindering competition in the market (Alstadsæter, et al, 2018). Patents, as a general rule, have a duration of 20 years from the filing date of the application. In addition, it is necessary to pay annual fees to keep it in force.

In the event that the owner decides not to exploit his own patent, he may decide to sell it or assign his rights to another person or company. The exclusive rights provided by patents are only valid in the country or region where they were granted. Patent holders, in exchange for obtaining exclusive use, are obliged to disclose and make the invention accessible to the public. This is done through the registration of the invention in the Patent Registry.

The possible technical objects of a patent can be mechanical devices and articles of manufacture, processes or methods of manufacture, production or synthesis in addition to chemical compositions and compounds and organisms and genetic or microorganism sequences.

Patents are important assets for a company, this means that they are the goods, rights and other resources economically controlled by a company, resulting from events from which it is expected to obtain results or economic returns in the future, since intellectual property can be one of the most valuable components of many products.

To register a patent, there are specific requirements that have been put in place. One of the most important requirements is novelty. The invention being patented must be new and has never been invented elsewhere (Schmookler & Schmookler, 2013). Another important requirement is inventive level. A product is considered to have inventive level if for a person normally versed in the corresponding technical matter, it is not obvious nor would it have been derived in an obvious way from the state of the art (Bradley et al, 2015).

In addition, industrial application is another requirement. A product is susceptible to industrial application when its object can, in principle, be produced in any type of industry. The last one is technical advantage (Tripathi, 2014). This means that the new claimable form must produce a utility that contributes to the function that is intended for a benefit, advantage or technical effect that did not exist before.

A patent can also be described as an industrial property title which gives the company owning it a right of exploitation, but above all a right to prohibit any other entity from exploiting this same patent. A patent is the exclusive title of ownership of an invention, granted to a person or a company.

For many years, patent registration have been instrumental in protecting ideas. The patent protects the invention from the reproduction and exploitation of the invention without the consent of its author (or of his beneficiaries). To exploit a new process or object, it is essential that the patent be accompanied by a right of exploitation (Abbas et al, 2014). Patents make it possible to support innovative companies, by protecting their advances, even if the validity of a patent is in fact limited in time.

Another area of importance today is the international validity of the patent. In principle, the patent is recognized only in the national territory where it was filed. To protect your invention internationally, one is a position to register it directly from the institute in charge of intellectual property in the country where the invention is to be patented, with the European Patent Office (EPO), which guarantees the protection of the invention in its 38 member countries, or with the World Intellectual Property Organization (WIPO), which has 151 member states.

Of course, the financial cost increases with the number of countries in which you want your invention to be protected. In some countries in Europe such as France, it is the person filing the patent who will benefit from its use. In other words, it will not be the inventor who will benefit if he does not file the patent himself.

## 4. THE PATENTABILITY IN KSA

To better answer the research question, and understand the relationship between the AI, and patent, the researchers will deeply discuss the patentability in KSA by analyzing the legal framework of inventors, invention and the legal requirements of patent. This will give the reader a full image on the patentability of AI in KSA.

### 4.1 The Inventor

The inventor is the one who developed the invention. In Saudi Arabia, team of experts have drafted guidelines that should be followed when patenting "AI-Generated inventions." These are inventions developed autonomously through artificial intelligence (AI). The guidelines provide AI as the inventor and the owner of AI as the applicant for the patent. Since 1980s, there have been a heated debate concerning AI-generated inventions and copyright laws (WIPO, 2021). It is important to note that United States was the first county to provide patents to Artificial Intelligence generated inventions (Deardorff, 211).

The vast majority of inventions today are the result of research carried out by different people who collaborate within the same laboratory or develop an invention on the results of previous research by colleagues or other scientists. In principle, each person who has made an inventive contribution to the development of the invention should be considered the inventor or co-inventor. There is no difference according to the importance of each person's contribution. According to Saudi Authority for Intellectual Property (SAIP), everyone involved in an invention will have an equal share in the invention, but the inventors concerned may decide otherwise in writing and recognize that they have unequal shares in the invention.

Saudi Arabia has made huge strides as far as innovation is concerned. The Kingdom has seen the significance of being competitive in a fast moving world. More efforts have been put to improve the manufacturing sector, sustainability of the environment and creating a diversified economic environment.

For instance, Saudi Aramco Company is one of the companies rich in innovation. In the last two decades, the company made a huge milestone when it patented a new technology referred to as High-Pressure Air Assist System (HPAAS), which is a smokeless flare technology. This is a sustainable approach used to simplify the complex systems in the company. The key person behind this invention was engineer Mazen M. Mashour who spent year working on this innovation. The technology was successful after several trials to confirm its viability in the company.

The inventor or his successor in title has the right to apply for a patent. In principle, this right benefits the inventor, unless he has assigned this right. For example to his employer or to the commissioner of the invention (Biagioli, 2006). If the inventor has assigned his right to the patent, he nevertheless still retains a moral right of paternity. At any time, the inventor can demand that he be recognized as the inventor and that he be mentioned on the patent. He can also oppose this mention.

Both the Belgian Intellectual Property Office and the European Patent Office consider a priori that the patent applicant is acting in a legitimate manner. In the event that a patent is applied for or obtained by an unauthorized person, the inventor or his successor may bring an action to claim the patent (claim action) within two years of the grant of the patent. It is always recommended to be assisted by a specialist in filing a patent application.

In the administrative or legal fields, one speaks of "inventor" of a treasure or any other found object, to name the one who discovered it. The Latin root invenire, in the sense of finding, at the origin of the words "inventor" and "invention", is explicit here (Deardorff, 2011).

In the field of industrial property law, the term "inventor" is also attributed to the person who is the author of a patent for an invention as well as to the person who creates a new trademark. In the field of science, the inventor is the one who describes a new "object", he is most often different from the discoverer who may not be a scientist. The inventor has the privilege of naming the "object" described. Linné described very many animal species and named them, he is the inventor of them although he did not discover them all.

### 4.2. Inventor Rights in KSA

The Kingdom of Saudi Arabia, like other developing countries, has sought to adopt the causes of economic development and growth in all fields, especially in the field of technology and technology transfer. Therefore, it has been keen on issuing regulations that are compatible with this development and to keep pace with global economic growth, including the labor and workers' system for the year 1983 and the trademark system. The Companies Law and the Copyright System With regard to the right of the inventor, the Kingdom affirmed its keenness on that with the issuance of the patent system in the year 1930, and this does not mean that the Kingdom did not care about the rights of inventors before the issuance of this system, as some Saudi regulations indicated some of the rights of inventors (WIPO, 2021).

Accordingly, the patent grants its owner a monopolistic right according to which he has the right to prevent others from manufacturing the product or using the industrial method that is the subject of the patent (Halewood, 1997). This right is not an eternal right but is limited to a specific period and in most legislations, it is twenty years starting from the date of filing the patent application and with the end of the patent protection period. They fall into the public domain, and any third-party person may use or exploit the invention without the consent of the patent owner for the expiration of the protection period (Lemley, 2012).

### 4.3. The Invention

The Kingdom of Saudi Arabia has laid down some laws that should be followed when registering or patenting an invention. The registration of intellectual property in the Kingdom of Saudi Arabia is carried out through the Saudi Authority for Intellectual Property. This is the body mandated to carry out patent registration. Saudi Authority for Intellectual Property outlines the necessary conditions are required to register the intellectual property, whether it is patent, copyright and related rights, trademarks, industrial models, planning designs for integrated administrations, or plant varieties. The steps for patent registration and other laws that should be followed are published in the website.

An invention can either be a product or a process. In addition, with advancement in technology, AI-generated inventions have been included in the list of patentable inventions. Patent protection for artificial intelligence generated inventions is necessary because it is a way of incentivizing innovation.

Here are some examples of products that can be patented:

- Objects and tools
- Devices such as production facilities and equipment
- Materials such as chemicals or textiles

On the other hand, invention in terms of processes describing specific activities include the following:

- Manufacturing processes (work or production step in the manufacture of a product)

- Control methods (operation in the use of a device or machine)
- Measurement methods

If an invention is by an employee of a company, there are certain protocols that should be followed by the employee in patenting the invention (Halewood, 1997). The law provides for a specific regime for an invention developed within a company by one of its employees. Employed inventors make 90% of patented inventions. Depending on the conditions under which the employee's invention was conceived, the rights to the invention, and therefore the choice of whether or not to file a patent, belong either to the employee or to the employer (Lemley, 2012). In the latter case, the employee will be entitled to financial compensation. This is why the employee has the obligation to declare any invention that he makes in order to inform his employer and to allow him to determine the rights he considers to hold on the invention. The objective of the declaration is to define, in the long term, who of the employee or the employer can file the patent.

In dynamic organizations, employees play a significant role in trying to find new ways or methods of manufacturing. In such a case, the invention made by employees will not benefit themselves but the company. Studies have noted that there are three categories of employee invention. The law distinguishes three categories of employee invention as follows:

- "Mission inventions"
- "Attributable non-mission inventions"
- "Non-attributable non-mission inventions"

In case of uncertainty, it is always up to the employer to prove the nature of the mission that he has entrusted to his employee. Ownership of employee inventions and financial compensation (Nordhaus, 1972). Each category of invention applies a different regime. It determines who owns the invention and the nature of the financial compensation to be granted to the employee inventor, if the invention is the responsibility of the employer.

The rules applicable to employee inventions are mandatory. Only a collective agreement or a contract can change these rules and this only in a sense more favorable to the employee. In most cases, it is advisable that the employee must immediately declare his invention to his employer. Any employee who makes an invention has the obligation to declare it to his employer. This obligation concerns all employees and all inventions, whether it is a mission or non-mission invention (Plant, 1934). The employee must declare his invention to his employer by proposing a classification, that is to say the category in which he classifies his invention. If there are several inventors, they can establish a joint declaration.

For instance, one of the judicial decisions issued by the Board of Grievances in KSA in relation with the employee's invention is the judgment issued in the Case No. 159/1/ for the year 1427 of Hijra regarding the Court's refusal to protect an invention of the employee because he did not grant the patent.

Facts are summarized as that the employee submitted a statement of claim in which he complained about the Committee's decision issued against him, as he was working as an electrical engineer for advertising and Services Company since 26/2/1985.

According to a work contract signed on 1/9/1985, the employee with his individual effort and by his own means and outside his work hours he created a convex panoramic panel related to finding technical solutions in the field of advertising design for fixed and moving lighting panels, and the employee took all the procedures required to register his invention in the Patent Office of King Abdulaziz City for Science and Technology, where he registered his invention under No. 00201032 on 5/3/2000, and although the employee reached the aforementioned inventive step during his service with the company, the invention was not the result of the implementation of a contract or commitment to raise effort and innovation, and he did not reach that invention with the capabilities or means available at

the work site, as evidenced by the fact that the company did not object to registering the invention in the name of the employee when it was submitted despite the company's knowledge of that.

In 2000, the company exploited the employee's invention commercially and manufactured many billboards, where the employee's innovative idea was widely accepted by the owners of the advertising companies, then the company earned a great number of profits from the employee's invention. The company refused to pay the employee any portion from the profits earned because of exploiting the employee's invention; then the company exerted some pressures against the employee to force him to abandon the filed patent application with King Abdulaziz City for Science and Technology, without payment of the return arising from the company's use of the invention. As a result, the employee decided not to waive the patent application, the company terminated his services in 21/9/2002, therefore the employee filed a grievance (Almakhloof, 2018)

The main issue was not paying the fees for granting the patent, if the employee complied with all the patent granting requirements, he would have the full right to protect his invention.

### 4.4. Patent Requirements and the Legal Frameworks

The patentability of an invention has proven to be very complicated due to various interpretations of patent laws. Despite that these laws are almost similar across the world; some countries regularly amend these laws to suit given interpretations. In Saudi Arabia, patent laws have been amended from time to time but the baseline is that an invention must be new, be part of an inventive step and have an industrial application. For example, Sophia robot is one of the best examples to demonstrate an invention that is patentable. The innovation itself was perceived as a breakthrough in innovation to work towards attaining UN's sustainable development goals. Sophia robot was patented because it has industrial applications. The robot was mainly invented for entertainment purpose, education and research (Retto, 2011).

To be patentable, an invention must meet the following three basic conditions:

1. The invention must be new.

In other words, it should not be included in the state of the art. The state of the art is defined by all publicly accessible knowledge, for example written publications or on the Internet, but also public conferences or exhibitions, anywhere in the world before the filing of the patent application (Sheldon, 2015). Anything that you disclose about your invention is in principle also state of the art, which implies that the invention is no longer new. It is therefore imperative to keep the secret before filing.

According to Saudi laws and regulations on patents, intellectual property is well regulated as there are laws that have been grafted to guide in the registration of new inventions. According to the novelty laws, the invention cannot be patented if some public disclosures of the invention have been made. In this case, anything known to the public cannot be patented in Saudi Arabia.

2. The invention must be part of an inventive step.

It should not be obvious to a person skilled in the art. In patent law, the term "skilled person" is understood to mean a person who is familiar with the state of the art in the sector in question but who lacks a certain originality (Sichelman, 2009). A solution is consequently not inventive if the individual skilled in the art who is confronted with the technical issue underlying the invention arrives without any other at the same solution.

According to WIPO definition of inventive step, the requirements of inventive step is related to "obviousness" of the invention. Under the law, if an invention is not identical to the prior inventions, then the invention is considered new and can be patented. In addition, the law states that should not

be an improvement of the previous invention. In Saudi Arabia, for example, the determination of whether an invention is "obvious" or an improvement is one of the major challenges in patent laws.

3. The invention is capable of industrial application.

The main reason for coming up with new inventions is to improve processes in industrial setup. According to the patent laws in many countries, including Saudi Arabia, an invention may not be patented if it has no significant use in industrial scale. In this case, an invention must be able to be used, produced and reproduced industrially. According to Sichelman (2009), a machine that operates without energy input, is not patentable because it is physically impossible to achieve and use it for industrial purposes.

It has been noted that the criteria of novelty and inventive step are not examined in some contexts, for example in Switzerland. When the inventor file a patent application, however, there is an option of requesting a search to ensure that the invention meets these criteria for patentability.

Regarding the Patent registration in KSA, the patent office in the GCC adopted the clarification that if an inventor wishes to register a patent there are several stages for examining the invention before granting the patent as follow: [9]The application will be formally examined to ensure that all required documents were provided, and a decision will be made of incomplete formalities, where the Examiner will give the applicant 90 days from the date of official notification to complete all requirements; otherwise, the application will be withdrawn. In the case of Complete formalities, where The Examiner will give the applicant 90 days from the official notification date to pay the substantive examination fees, failing which the application will be withdrawn. Following a thorough examination of the application, the Examiner will make a determination of the complete or amend the application in which the applicant has 90 days from the date of the official notification to comply with any suggested amendments, or the application will be refused.

The Examiner will re-examine the application and offer the applicant an additional 90 days from the official notice date to comply with any amendments that have not yet been completed, failing which the application will be refused. After the third inspection of the application, if the requirements were not met or the patent was non-registrable, reject the application. The decision will be made public, and the applicant will have 90 days to appeal the decision to the Appeal Committee from the date of publication. If the application has been accepted, the applicant must pay the publishing and registration fees within 90 days of the official notification date to have the application published in the official gazette; otherwise, the application will be rejected. This goes in align with Judgment of the Board of grievances in case No. 11621/1 / C, for year 2017. This case, which has been filed by an inventor who has created a system operator related to trade and business against the Committee of the Appeals, at the Patent Office in the Cooperation Council for the Arab States of the Gulf (GCC).

The facts of this case are briefly represented as follows, the inventor who has refuted the resolution b\16. For \ 70 of the complaint No. 70 Patent No. (0003524) on 10.09.1437H.

Where the Patent Office declined to grant the patent and decided that the patent is not related to the operations of making or the ways of the manufacturing as it is not viable to the industrial application, the subject matter of the patent relates to a computer program to handle the practice of business and organizing commercial accounts. the application submitted for gaining the patent is not relating to the inventions so the Committee considers that the decision of granting the patent by the office was not correct, contrary with the patent regulations, and then the patent's granting should be canceled.

When the application has been reviewed, the English specification and the standard have been adopted, when this has been considered, they notice that the translation for the expression, "System Operator" that will be the "System Operation ", so the substantive examiner of the application has understood during his examination that is the operating system, i.e. He understood that that said case in one of the protection factors and being conducted automatically by the system. but after the right

check, it has been declared that this is done through a human factor who is being represented by the system operator (system operator).

One of the used protection elements is a way of practicing the commercial business, where the human being (not automatically) conducts personally the properties mentioned in the protection element, so this protection element is excluded from the terms of the granting under Article (3/1/2) of the invention patent system of the countries of the Cooperation Council for the Arab States of the Gulf (GCC), because all of the protection elements linked to the excluded independent element, they are also excluded from the granting under Article (3/1/2) of the invention patent system of the countries of the Cooperation Council for the Arab States of the Gulf (GCC) as another protection element is excluded from the granting because it relates to the practice of business system under Article 3/1/2 of the system where a human being, not automatically, who conducts the said features of the protection element, because of that, the objective searcher recommended non-considering the granting of the patent and to have retreated, and non-considering the granting decision for this patent application, which states on: Is not regarded as one of the inventions in the field of the system applying Regulations, for the following rules 3/1/2 schemes and methods of practicing the commercial business and practicing of the abstract mental activities and playing one of the games, and consequently, the office decided to decline granting the patent and seal his memo request to dismiss the case.

According to Trimble (2016), there are also some limitations in what not to patent (Trimble, 2016). For example, the following are some provisions on what cannot be patented:

- Abstract ideas that do not have concrete technical steps, inventions of ordinary processes or phenomena, scientific philosophies, for example theory of relativity and mathematical methods.
- Rules of the game and learning methods.
- The diagnostic methods and the methods of therapeutic and surgical treatment applied to human or animal bodies such as the operative treatment of a vision disorder.
- Plant species, animal strains, and biological procedures for obtaining plants or animals. On the other hand, biotechnological discoveries for instance the manufacture of human insulin from yeast cultures are patentable.
- The protection of computer programs as such is a matter of copyright. But technical inventions using software (e.g., electronic controls) are patentable.
- Inventions whose applications are contrary to public order or morality (e.g. human cloning processes) are not patentable.

## 5. THE CHALLENGES OF PATENTABILITY IN THE ERA OF ARTIFICIAL INTELLIGENCE IN THE KSA LEGAL FRAMEWORK

One of the most discussed topics in recent years is the challenges posed by artificial intelligence (AI) and intellectual property (IP) to an innovative ecosystem. To this end, analysis of the importance of patents for both researchers and investors in a new technological domain. This section highlights some of the challenges experienced patents especially in the era of artificial intelligence.

Although artificial intelligence (AI) has been present for several years in technologies that are used every day, it is not only recently that the intellectual property issues therein related are also extensively discussed. The observation is clear from the review of laws, decisions and legal texts (Celik, 2020). The principles applicable to obtaining patents whose claims cover artificial intelligence software does not differ in following the principles applied to software in general. The Patent Act as captured in MODULE 03: Inventions and Patents provides that an "invention consists of any realization, any process, any machine, fabrication or composition of materials, as well as any improvement of one of them, presenting the character of novelty and usefulness."

Protecting software by patent is sometimes difficult, courts having repeatedly recognized that algorithms, in relation to mathematical formulas, could not be of an invention within the meaning of

the Law. To enter the definition of "Realization", "process" or "machine", the claimed invention must not be abstract and must be more than an algorithm. The US Law has the same approach in KSA. For example, the Federal Court of Appeal in 1981 upheld a decision of Commissioner of Patents to the effect that the use of data collected during mining drilling for oil exploitation and algorithm analyzing them to obtain results useful to geologists were not patentable (Chimuka, 2019). The Commissioner of Patents initially ruled that the applicant sought to obtain a monopoly on a computer programmatic and that such programs do not constitute inventions in the meaning of the law. On appeal, the Federal Court of Appeal confirmed that what was covered by the patent claims was not the use of a computer to do calculations, but many different calculations and mathematical formulas made by the computer (Gao, 2020). She then stated some basic principles applying to software and algorithms 4: - A mathematical formula is assimilated to a simple principle scientific or an abstract theorem, which is not patentable.

In history, each major change in the modes of production of value has brought its share of transformations in the legal field; artificial intelligence is no exception. The world of patents that is strongly affected by Artificial Intelligence (AI), must adapt. The article published in December 2020 by the European Patent Office (EPO) entitled "Patents and the fourth industrial revolution", Gao highlights two phenomena. The first is the very sharp increase in the number of FBIs linked to contemporary technologies, and this on a global level. The second remark that the figures of patents are going up is linked to 4th industrial revolution. The 4th industrial revolution is more evident in most developed countries and this reflects the increasing number of patents. Gao (2020) and Jacques (2020) have raised an important question on the consequences of the development of AI on patent law. To what extent is the development of AI pushing for a reinterpretation, or even a reassessment, of patentability criteria? Many scholars, for example, Gao (2020) and Lankinen (2020) have been puzzled when it comes to patenting and Artificial intelligence. The Robert dictionary offers us the following definition: artificial intelligence defines "all the theories and techniques developing complex computer programs capable of simulating certain traits of human intelligence" on many disciplines, such as statistics, mathematics, computer language proficiency, etc. This versatility makes AI a very complex field to define and isolate from others (Ramalho, 2018).

Certain strategic sectors such as construction, transport, or even communication have already been won over by Artificial Intelligence. This list is not exhaustive, as AI is increasingly present in all areas of the economy, including those apparently foreign to new technologies such as the legal sector. For this reason, the issue of patentability of Artificial Intelligence as well as the inventions it generates is of significant importance. Indeed, it is a question of protecting the investment, which requires a clear legal framework concerning the protection of inventions in this new context. As for the patent, it has a precise legal definition, and a text governing it at European level: the European Patent Convention, drafted by the European Patent Office.

A patent can be obtained for any invention, product or process, in all technological fields. Since AI is recognized as a technological field, it appears to be patentable subject matter. It will be seen that the reality is more complex than that. As mentioned earlier in this chapter, conditions of patentability were covered. The subject of the patent can be "any invention in all fields of technology". In order for an invention to be protected, it must meet three very specific patentability criteria defined in Article 52 of the European Patent Convention and by Saudi Laws of patents, in addition to criteria of conformity with public order and good morals (Jacques, 2020). First, the invention must be novel. In other words, it should not be "included in the state of the art". This implies non-disclosure to the public before the filing date of the patent. Secondly, the invention must be capable of being the subject of industrial application. In other words, the invention must be able to be used. The possibility of being manufactured or used implies that these operations are described in sufficient detail in the application, to allow application in industry. Thirdly, the object must be inventive, i.e. it must not follow from the state of the art in a manner obvious to the person skilled in the art. The skilled person is a fictitious person, defined as having average knowledge and skills in the sector in question.

The person skilled in the art is "the man who serves as a benchmark in patent law, in order to assess the inventiveness and the sufficiency of the description of a patent". To assess compliance with the inventiveness condition, the EPO adopts a three-step reasoning: determining the state of the art, identifying the technical problem, determining whether the person skilled in the art would have actually achieved the invention (Kobakhidze, 2020). The term "effectively" means that the possibility for a person skilled in the art to obtain the

There are major changes brought about by AI in the field of patents. Recent developments in artificial intelligence challenge patent law on two levels. First, the question of the patentability of AI itself arose. Second, what about the creations generated by Artificial Intelligence? This second question has become central because this kind of innovation is multiplying. Indeed, some AI have the capacity to generate solutions to technical problems faster, and in greater numbers than humans.

There are important questions that have been raised by Ramalho (2018) and Kobakhidze (2020) about AI and patent. How to define if an invention related to artificial intelligence is patentable? Is the current KSA legal framework sufficient to define a clear and relevant legal framework with regard to artificial intelligence? Is AI a field like any other, which should face the same rules?

The qualification of invention in AI is still a major topic of discussion. The European reference text, that is the European Patent Convention, clearly sets out the exemptions from patentability. This has been captured under the law. The law provides in particular that "computer programs" cannot be subject to patent because they are not considered as inventions (Lankinen, 2020). Algorithms therefore seem, in the light of the law, excluded from the field of patents. But despite this apparently clear statement, doubts over the patentability of algorithms, for two reasons. First, the law never discusses algorithms as such, complicating its understanding when it comes to artificial intelligence. Second, can algorithms reasonably be considered "computer programs"? Defining algorithms, some of which can be very complex and inventive, as simple computer programs may seem like a bit too quick a statement.

The EPO specifies on its site that inventions involving software are not excluded from patentability if they are of a technical nature. Faced with this vagueness, the EPO publishes its "Guidelines for Examination" which offers keys to understanding the Convention. The Office specifies the spirit in which the agreement was drawn up, and thus helps to clarify certain gray areas. In recent years, the guidelines shed light on the patentability of artificial intelligence, and also evoke "machine learning". Thus, in their November 2019 version, the EPO ruled: algorithms and machine learning, keystones of artificial intelligence, are considered to be mathematical in nature. However, mathematical models are excluded from the field of patentability. In this regard, court decisions have been made in reference to these inventions. For instance, the court rules that in determination whether a claim fits into the "abstract idea" category, patent examiners must use Patent Eligibility Guidance (PEG). The definition of "abstract idea" was coined by Alice and Mayo Supreme Court cases. These cases have been used as reference in other courts globally.

Li & Koay (2020) and Celik (2020) have noted that logic would therefore want algorithms to be deprived of patents. Indeed, it is possible to circumvent this impossibility, if the mathematical method is clearly used in order to solve a precise technical problem. The EPO takes as an example a mathematical method which, when applied, makes it possible to develop a technique for cooling steel. It emerges from the previous paragraph that a prohibition in principle exists with regard to the patentability of artificial intelligences, but that it can be circumvented in certain cases. What then of the creations generated by these Artificial Intelligences?

Certain conditions had to be adapted and reinterpreted in the face of the new context. The first difficulty in the hypothesis of filing a patent relating to a creation generated by artificial intelligence is the condition of inventiveness. Today, the general knowledge of those skilled in the art includes the various automation and optimization tools, and consequently Artificial Intelligence (Li & Koay, 2020). With the use of new technologies, the place of humans in the creative process is redefined. It is sometimes reduced to determining the objective to be achieved for artificial intelligence or simply to

enter the data necessary to enable it to find a solution to a technical problem. In this context, it could be argued that the skilled person with average knowledge would necessarily arrive at the solution through the use of the technologies at his disposal. Therefore, a solution generated by artificial intelligence would be deprived of inventiveness. For example, an artificial intelligence that predicts a time when a smart factory requires maintenance has done a good work, but the artificial intelligence's output, i.e., a notification of predicted time for maintenance, is not a new invention and cannot be patented. However, to deprive a technical solution of the condition of inventiveness, the person skilled in the art must necessarily arrive at this technical solution by using the tools at his disposal. In other words, the possibility for those skilled in the art of finding the technical solution is not sufficient to deprive this solution of the condition of inventiveness (Ramalho, 2018).

The European Patent Office recalls that "the existence of a technical possibility and the absence of obstacles are only necessary conditions for the execution of the invention. They are not sufficient to make obvious to a person skilled in the art what can actually be achieved". Rather than being denied, the condition of inventiveness has been redefined. The inventive character of a solution generated by an algorithm depends directly on the inventive character of the choice of the parameters making this algorithm work. If the combination of parameters is considered to be non-obvious to those skilled in the art, then the condition of inventiveness will be fulfilled. Consequently, inventiveness is not immediately excluded for creations generated by artificial intelligences. The standards in this area have adapted to the new context, taking into account new elements to determine the inventiveness of a technical solution. In terms of KSA patent laws, inventions developed though artificial intelligence (AI) may not be patented, just as stated under European Patent Office (EPO) patentability standards. This has however raised some questions. For example, the invention of human robot- Sophia, in Saudi Arabia, who said that she has a desire to have a child someday, presumably to develop a similar AI person like her, raised some concerns whether Sophia will have patentable right for her child (CreateIP, 2021).

## 6. THE NEED FOR APPROPRIATE POLICIES TO ADDRESS PATENT CHALLENGES

The technological changes that are experienced today and the way in which information is presented, stored and transmitted, make the way in which people carry out their activities to change. This is a call for adopting new, and effective ways to govern this change (Mizuno and Odake 2017). The proliferation of the internet of things (IoT), and the new technology have poses many challenges that should be legally overcome. Although the common challenge that posed by the new technology is the use of users' data which is very crucial for today business operations (Guerbouj, et al., 2019; Meskic et al, 2021; Belkeziz and Jarir, 2020; Krimpmann and Stühmeier, 2017) other challenges have been evolved over the time such as the AI and patent regulation.

In this context, the interest of the State to protect against infringement of patents and copyright arises through the implementation of various public policies in coordination with supranational organizations. A policy framework that promotes global innovation would need the world's most inventive nations acknowledging that the present stalemate and obsolete approach to intellectual property at the international level has major flaws (Ezell, 2019). To begin with, by refusing to advocate that nations examine the global consequences of their local innovation policies, far too many countries have been permitted to engage in mercantilist practices that hinder global innovation. Second, by failing to advocate for basic concepts and policies that encourage innovation at the global level, leading nations allow critics of patents and copyrights to weaken the WIPO and World Trade Organization's increasingly outdated and inefficient intellectual property regulations. Thirdly, because of this complacency and policy challenges, Intellectual property (patents) critics have been able to articulate and frame the argument as a roadblock to development, short-term interest takes precedence, Internet property is unjust—when these arguments should be recognized for what they are: anti-innovation, anti-growth, and anti-progress.

When it comes to arguments on how to improve world economies and wellbeing, those involved in making policies must reinforce innovation policies to the same level as those enforced by trade organizations (Ezell, 2019). The notion that free trade improves global economic wellbeing is well known among policymakers, economists, and commentators (Van Gorp, 2015). However, there is no such conceptual agreement when it comes to promoting innovative policies that are critical to promoting global innovation, such as strong intellectual property rights.

Whereas a growing number of policymakers recognize the importance of innovation for socioeconomic development and higher standard of living, majority have been unable to link domestic and global strategies in the same way that other policies are evaluated from a trade viewpoint (Chawla, 2020). This new perspective for advancing global economic and trade policy would be a focus on the components that promote innovation, particularly patents. Several policymakers, particularly in developing nations, need to shift to an economic structure that prioritizes and promotes innovation policy, rather than the conventional view of intellectual property as a negotiating chip to be used in trade talks with rich countries (Lee & Pickering, 2016).

There is a need to institute strong policies to protect against infringement of patents. This conventional (zero-sum) view of intellectual property overlooks the fact that intellectual property (patents) is only one component of a larger policy framework that is required to promote innovation and productivity development (together with organizational capacity, education, facilities, and so on) (Abbott, 2019). It is strongly recommended that every country should formulate and strengthen their copyright and patent policies and enforce them accordingly. It is worth noting that policy reforms are needed in order to strengthen the protection of patents and copyright. Those involved in making intellectual property policies have challenges in determining whether policies should be adopted to provide the greatest opportunity for their employees and companies to grow. An important focus of the approach should be IP-based innovations. For this to be achieved, governments must realize that they can support their own capabilities for new technologies to develop and compete without harming the capacity of others to compete effectively and to help promote innovation globally (Agrawal, 2018).

These objectives do not exclude each other. Moreover, in relation to the traditional dichotomy still pervading international ideological opposition to intellectual property, this isn't about divisions but rather whether one reside in a state where those involved in making policies understands the benefits of protecting the copyrights and patents so as to strengthen innovation and economic growth (Hoffmann-Riem, 2020). Recognizing this, governments must alter their conventional enforcement of economic policies at global arena, especially intellectual property, since the consequence of the status quo and stagnation will only keep increasing as the difference in technological and business practices between these laws increases. This requires a different strategy. With various challenges being experienced in the field of intellectual property, there is a need for policymakers to formulate appropriate policies to address these challenges (Hoffmann-Riem, 2020).

Some scholars have called for applying the soft rules to the AI issue. They argued that the national legal frameworks are unable to govern the IP and AI. The specificity of digital networks, and AI makes it difficult and probably impossible to regulate it by these traditional legal rules (Albakjaji & Adams, 2016 a). Governments should seek a cooperation with the private, and civil actors to regulate the emerging issue of AI (Duplessis, 2007, Albakjaji & Adams, 2016 b). Private actors are better able to adopt soft rules which is considered more flexible than the traditional legal rules. As stated by Albakjaji & Adams (2016 a, P. 269):

These soft rules are characterized by the simplicity of the process of elaboration, and being practical and flexible. Furthermore, they easily adapt to the complex issues of the Internet, because they rely on the activity of actors who are actually controlling the network (technical players, academics, associations or merchants, consumer associations, and sometimes other actors, such as state actors.

## 7. AI-DRIVEN INNOVATION IN ACHIEVING VISION 2030

In the recent past, Saudi Arabia has formulated plans to fuel its economy using artificial intelligence. This is one step towards realization of Vision 2030 which was coined down in 2016. Initially before KSA conceived Vision 2030, the economy was mainly built from oil and other resources. The birth of AI dates back to between 1952-1956 and it spread widely across most parts of the world. The journey of AI in KSA began in August 30, 2019 when Saudi Data and Artificial Intelligence Authority (SDAIA) was established.

Before then, KSA was reported as the first country to grant citizenship to a robot called Sophia, which was created and is regarded as an intelligent humanoid robot. The activation of humanoid robot in 2016 in KSA was a significant milestone that opened the possibility of introducing AI as an ingredient for realization of Vision 2030. This was followed by formulation of legal frameworks by SAIP and SADAIA to regulate intellectual property and AI (Abul-Enein, 2020). The policy formulations began when a royal decree was issued in August 2019 to guide the transition of the Kingdom into a data-driven economic system by the Saudi Data and Artificial Intelligence Authority (SDAIA). It is worth noting that the greatest and most comprehensive economic reform and transformation initiative in the history of KSA is being undertaken. The broad range of changes is made possible through digitalization and artificial intelligence (AI) (Abbott, 2019).

The Kingdom's digitalization activities serve to achieve Vision 2030 in a wide variety of ways and in particularly by developing an infrastructure suitable for the twenty - first century. This is the basis for all technologies; thus, it is a major priority for KSA. According to the latest reports, Kingdom of Saudi Arabia is aiming at strengthening the digital capacities of the workers for the development, maintenance, and operation of AI solutions and technologies. The country is also aiming at embracing the Internet of Things (IoT), and blockchain so as to fulfil Vision 2030 (Jewell, 2018). This is a huge endeavor that necessitates substantial educational reforms to ensure that learners get digital competencies required for future employment. According to Jewell (2018), digitalization will have a significant impact on innovation in KSA. The digitalization process has been supported by the government as reflected in efforts put in ICT sector and adoption of AI. Innovation is a wide-ranging term which includes the manner in which people approach things. According to Chawla (2020), innovation is a way of thinking and a culture.

With regard to ICT, KSA is currently focusing on creating a culture of entrepreneurialism and technological innovations. The efforts put by the government have been reinforced by external agencies as well as private sector entities. To show the seriousness it has in embracing AI innovations, KSA is currently establishing a network of innovation laboratories, in which researchers and entrepreneurs may examine their ideas, develop and test novel business models, and provide solutions to promote Vision 2030. Kingdom of Saudi Arabia is actively encouraging prospective entrepreneurs through such innovation laboratories to explore their ideas, which also help the country to promote awareness of innovation and Patent.

The development of Saudi's economy in the near future lies on AI innovations. The Kingdom embraces artificial intelligence and explores various ways it can use it in innovative, accountable and ethical manner so that it can promote Vision 2030. According to the latest reports, the Kingdom has committed about $3 billion in infrastructure construction, which enables the country to become a leader in AI usage. The Kingdom is working towards improvement of people's lives using AI innovations. Such innovations are directed towards improving education, health sector and establishing smart cities. According to studies, embracing AI-driven innovations in KSA is expected to have a positive impact. According to Jewel (2018), AI and robots can enhance human lives and increase productivity. What is required only is proper implementation and usage. Digitalization and automation are not new concepts today. When digitalization actually started to take off in the 1980s, computers were believed to eliminate employment. In reality, the reverse happened; more employment opportunities were created and productivity and quality of human life considerably improved. Net impact of

digitalization is favorable, according to several research. Certainly, some regular occupations may be lost, but new ones will arise.

## 8. FINDINGS AND CONCLUSION

This study was able to explore the way by which the KSA Intellectual property laws govern AI and innovations. Just like any other country, KSA still finds a huge gap in terms of laws that governs AI generated innovations. It is worth noting that the study was able to elucidate why it is still a major challenge to patent AI generated innovations. It is remarkable to note how AI plays a significant role in our lives.

From this study, an important finding is that Artificial intelligence has tremendous potential, as well as certain advantages that could help Saudi Arabia to realize its Vision 2030. It can also be noted that AI innovations are mainly achieved through the use of algorithms. Smart machines often have algorithms to monitor, which enable the intellectual capabilities to be modified, almost perfect memory, and execute tasks relatively quickly. This study was also able to note patenting an innovation has proven to be very complicated due to various interpretations of patent laws. It is worth noting that KSA's patent laws have not sufficiently addressed the issue of AI innovation and their patentability. Despite that these laws are almost similar across the world; some countries regularly amend these laws to suit given interpretations. In Saudi Arabia, patent laws have been amended from time to time but the baseline is that an invention must be new, be part of an inventive step and have an industrial application. This new context will probably push to find a balance between the protection of investment and the protection of competition. The question of ownership seems to be one of the main questions raised by the appearance of artificial intelligence in the field of patents, in the sense that patenting a large number of inventions related to artificial intelligence can lead to, in the case of high-performance artificial intelligences, to grant patents to algorithms. This practice could go against the very principle of patents if it were to materialize, insofar as the latter are intended to be alive, to be the subject of operating contracts, and not to be in the hands of a non-human entity, incapable of exploiting a patent like a human would.

Saudi Arabia is one of the largest Intellectual property centers in the GCC region. Patents in the KSA are protected under the Patent Law (promulgated by Royal Decree No. M/27 of 29/5/1425H (July 17, 2004). The Patent Law in KSA captures patenting AI inventions. It is worth noting that the demand for Artificial Intelligence patents is growing exponentially. KSA became the first nation to patent and grant citizenship to a robot called Sophia. This robot may be considered the cutting edge of AI, but it has also pointed out the challenges and realities of patenting artificial intelligence inventions. So, based on the above discussion, Artificial intelligence has generated an endless debate regarding whether it should be considered as a patent.

Today, patent registration offices such as European Patent Office (EPO) have refined its protocols with regard to patentability of AI. Artificial intelligence is a patent because it conforms to patentability requirements- novelty, inventive step and used in industrial setup. It is important to note that inventions generated using software are not excluded from patents as long as they exhibit technical character.

## FUNDING AGENCY

The Open Access Processing fee for this article was covered in full by the authors.

## ACKNOWLEDGMENT

The authors would like to acknowledge the support of Prince Sultan University for supporting this publication. Special acknowledgement is given to the Governance and Policy Design Research Lab

(GPDRL) at Prince Sultan University (PSU) for their academic support to conduct this research and publish it in a reputable Journal.

## REFERENCES

Abbas, A., Zhang, L., & Khan, S. U. (2014). A literature review on the state-of-the-art in patent analysis. *World Patent Information*, *37*, 3–13. doi:10.1016/j.wpi.2013.12.006

Abbott, R. (2019). *The Artificial Inventor Project*. Retrieved 12 June 2021, from: https://www.wipo.int/wipo_magazine/en/2019/06/article_0002.html

Abul-Enein, H. (2020, October 22). *Introducing Saudi Arabia's National Strategy for Data and AI*. Access Partnership. https://www.accesspartnership.com/introducing-saudi-arabias-national-strategy-for-data-and-ai/

Agrawal, A., Gans, J., & Goldfarb, A. (2018). *Prediction Machines: The Simple Economics of Artificial Intelligence – April 17, 2018*. Harvard Business Review Press.

Albakjaji, M., & Adams, J. (2016a). Cyberspace: A New Threat to the Sovereignty of the State. *Management Studies*, *4*(6), 256–272.

Albakjaji, M., & Adams, J. (2016b). Cyberspace: A Vouch for Alternative Legal Mechanisms. *International Journal of Business and Cyber Security*, *1*(1), 1–10.

Albakjaji, M., & Adams, J., Almahmoud, H., & Sharafaldean Al Shishany, A. (2020). The Legal Dilemma in Governing the Privacy Right of E-Commerce Users: Evidence from the USA Context. *International Journal of Service Science, Management, Engineering, and Technology, 11*(4), 166-187.

Almakhloof, S. A. (2018). *The Intellectual Property Rights in the Saudi regulation. Dar Alejadah*. KSA.

Alstadsæter, A., Barrios, S., Nicodème, G., Skonieczna, A. M., & Vezzani, A. (2018). Patent boxes design, patents location, and local R&D. *Economic Policy*, *33*(93), 131–177. doi:10.1093/epolic/eix021

Belkeziz, R., & Jarir, Z. (2020). An Overview of the IoT Coordination Challenge. *International Journal of Service Science, Management, Engineering, and Technology*, *11*(1), 99–115. doi:10.4018/IJSSMET.2020010107

Biagioli, M. (2006). Patent republic: Representing inventions, constructing rights and authors. *Social Research*, *73*(4), 1129–1172. doi:10.1353/sor.2006.0001

Bienvenido, H. P., Barinaga, B., & Mora-Fernandez, J. (2021). A Historical Review of Immersive Storytelling Technologies: New Uses of AI, Data Science, qnd User Experience in Virtual Worlds. In *Handbook of Research on Applied Data Science and Artificial Intelligence in Business and Industry* (pp. 569–597). IGI Global. doi:10.4018/978-1-7998-6985-6.ch027

Bradley, S., Dauchy, E., & Robinson, L. (2015). Cross-country evidence on the preliminary effects of patent box regimes on patent activity and ownership. *Proceedings. Annual Conference on Taxation and Minutes of the Annual Meeting of the National Tax Association*, *108*, 1–30.

Buyers, J. (2018). *The Practical Legal Issues in the Artificial Intelligence*. Law Brief Publishing Ltd.

CelikE. (2020). *How Ip Struggles to Define AI-Generated Products and the Ownership Dilemma*. Available at SSRN 3763885. 10.2139/ssrn.3763885

Chawla, V. (2020, August 23). How Saudi Arabia Is Looking To Develop & Integrate Artificial Intelligence In Its Economy. *Analytics India Magazine*. https://analyticsindiamag.com/how-saudi-arabia-is-looking-to-develop-integrate-artificial-intelligence-in-its-economy/

Create, I. P. (2021). *AI and Patents, are we ready?* Retrieved 10 June 2021, from https://www.createip.co.nz/ai-patents/

Deardorff, A. V. (2011). Welfare effects of global patent protection. In Comparative Advantage, Growth, And The Gains From Trade And Globalization: A Festschrift in Honor of Alan V Deardorff (pp. 329–346). World Scientific. doi:10.1142/9789814340373_0028

Ezell, S., & Cory, N. (2019). *The way forward for intellectual property internationally*. Information Technology and Innovation Foundation.

Feltus, C. (2019). Deriving Information System Security and Privacy From Value Cocreation Theory: Case Study in the Financial Sector. *International Journal of Service Science, Management, Engineering, and Technology*, *10*(4), 1–25. doi:10.4018/IJSSMET.2019100101

Gao, M. (2020). Protection of Intellectual Property Rights of AI Products in the Era of Big Data. *International Conference on Applications and Techniques in Cyber Security and Intelligence*, 265–273.

Guerbouj, S., Gharsellaoui, H., & Bouamama, S. (2019). A Comprehensive Survey on Privacy and Security Issues in Cloud Computing, Internet of Things and Cloud of Things. *International Journal of Service Science, Management, Engineering, and Technology*, *10*(3), 32–44. doi:10.4018/IJSSMET.2019070103

Hoffmann-Riem, W. (2020). Artificial Intelligence as a Challenge for Law and Regulation. In T. Wischmeyer & T. Rademacher (Eds.), *Regulating Artificial Intelligence*. Springer. doi:10.1007/978-3-030-32361-5_1

Halewood, M. (1997). Regulating patent holders: Local working requirements and compulsory licences at international law. *Osgoode Hall Law Journal*, *35*, 243–287.

Jacques, S. (2020). *Patenting Algorithms in an Internet of Things and Artificial Intelligence World: Pathways to Harmonizing the Patentable Subject Matters and Evaluation of the Novelty Requirement*. Japanese Institute of Intellectual Property.

Jewell, C. (2018). *Saudi Arabia embraces AI-driven innovation*. https://www.wipo.int/wipo_magazine/en/2018/05/article_0002.html

Kelly, D., Hammer, R., Hendy, J., & Denoncourt, J. (2017). *Business Law*. Routledge. doi:10.4324/9781315726205

Kobakhidze, T. (2020). *Software as Patentable Subject Matter* [LLM thesis]. Central European University.

Krimpmann, D., & Stühmeier, A. (2017). Big data and analytics: Why an IT organization requires dedicated roles to drive sustainable competitive advantage. *International Journal of Service Science, Management, Engineering, and Technology*, *8*(3), 79–92. doi:10.4018/IJSSMET.2017070105

Lankinen, A. (2020). *Patentability of Artificial Intelligence in Europe: Is Artificial Intelligence Patentable According to the European Patent Convention and is the Current Legal Framework for Patents Suitable for Patenting Artificial Intelligence?* School of Law, Psychology and Social Work, Örebro University.

Lemley, M. A. (2012). The myth of the sole inventor. *Michigan Law Review*, 709–760.

Li, N., & Koay, T. (2020, May). Artificial intelligence and inventorship: An Australian perspective. *Journal of Intellectual Property Law & Practice.*, *15*(5), 399–404. doi:10.1093/jiplp/jpaa039

McLaughlin, M. (2019). Computer-generated inventions. *Journal of the Patent and Trademark Office Society*, *101*, 224.

Meskic, Z., Albakjaji, M., Omerovic, E., & Alhussein, H. (2021). Transnational Consumer Protection in E-Commerce: Lessons Learned from the European Union and the United States. *International Journal of Service Science, Management, Engineering, and TechnologyOpen AccessVolume*, *13*(1).

Mizuno, Y., & Odake, N. (2017). A Study of Development and Formation of Personal Information Trust Service in Japan. *International Journal of Service Science, Management, Engineering, and Technology*, *8*(3), 1–22. doi:10.4018/IJSSMET.2017070107

Nordhaus, W. D. (1972). The optimum life of a patent [Reply]. *The American Economic Review*, *62*(3), 428–431.

Patent Examination Report. (2014). *No. 1. Issued in Connection with Australian Patent Application, 2013204354*.

Lee, P., & Pickering, K. (2016). The General Data Protection Regulation: A Myth-Buster. *Journal of Data Protection & Privacy*, *1*(1), 28–32.

Plant, A. (1934). The economic theory concerning patents for inventions. *Economica*, *1*(1), 30–51. doi:10.2307/2548573

RamalhoA. (2018). *Patentability of AI-Generated Inventions: Is a Reform of the Patent System Needed?* Institute of Intellectual Property, Foundation for Intellectual Property of Japan. 10.2139/ssrn.3168703

Jesus, R. (2017). *Sophia, first citizen robot of the world.* Jour. Available on: https://www.researchgate. Net

Sheldon, J. G. (2015). *How to write a patent application?* Practicing Law Institute.

Chimuka, G. (2019). Impact of artificial intelligence on patent law. Towards a new analytical framework–The Multi-Level Model. World Patent Information, 59, 101926.

Schmookler, J., & Schmookler, J. (2013). *Patents, invention, and economic change*. Harvard University Press.

Schneider, G. (2017). *Electronic Commerce* (12th ed.). Cengage.

Schuster, W. M. (2018). Artificial intelligence and patent ownership. *Washington and Lee Law Review*, *75*, 1945–2004.

Sichelman, T. (2009). Commercializing patents. *Stanford Law Review*, *62*, 341–414.

Trappey, A. J., Trappey, C. V., & Chang, A. C. (2020). Intelligent extraction of a knowledge ontology from global patents: The case of smart retailing technology mining. *International Journal on Semantic Web and Information Systems*, *16*(4), 61–80. doi:10.4018/IJSWIS.2020100104

Trappey, A. J., Trappey, C. V., Govindarajan, U. H., Chuang, A. C., & Sun, J. J. (2017). A review of essential standards and patent landscapes for the Internet of Things: A key enabler for Industry 4.0. *Advanced Engineering Informatics*, *33*, 208–229. doi:10.1016/j.aei.2016.11.007

Trimble, M. (2016). Patent working requirements: Historical and comparative perspectives. *UC Irvine L. Rev.*, *6*, 483–508.

Tripathy, B., & Mishra, J. (2017). A Generalized Framework for E-Contract. *International Journal of Service Science, Management, Engineering, and Technology*, *8*(4), 1–18. doi:10.4018/IJSSMET.2017100101

Tripathi, S., & Ghatak, C. (2018). Artificial Intelligence and Intellectual Property Law. *Christ University Law Journal*, *7*(1), 83–98. doi:10.12728/culj.12.5

Van Gorp, N., & Honnefelder, S. (2015). Challenges for competition policy in the digitalized economy. *Communications & Stratégies*, (99), 149.

WIPO. (2021). *The Artificial Inventor Project.* Retrieved 20 March 2021, from https://www.wipo.int/wipo_magazine/en/2019/06/article_0002.html

Yu, X., Zhang, R., Zhang, B., & Wang, H. (2021). Challenges of artificial intelligence to patent law and copyright law and countermeasures. In *The Future of Intellectual Property*. Edward Elgar Publishing. doi:10.4337/9781800885349.00014

## ENDNOTES

1 *See* Australian Government. Australia, IP. https://www.ipaustralia.gov.au/patents/applying-patent/standard-patent-application-process/examination-standard-patent

2 *See* https://india.aramco.com/en/magazine/elements/2020/an-invention-with-great-flare_

3 *See* Aramco Publications https://www.aramco.com/-/media/publications/books/energytotheworldvol2english.pdf_

4 Patents Justia https://patents.justia.com/inventor/mazen-m-mashhour

5 *See WIPO*: https://www.wipo.int/wipo_magazine/en/2019/06/article_0002.html

6 *See Saudi Authority for Intellectual Property the* https://www.saip.gov.sa.

7 *See* Gov.sa. (2021). *Patent Registration Requirement*. Retrieved 20 March 2021, from https://www.my.gov.sa/wps/portal/snp/servicesDirectory/servicedetails/s9098.

8 *See* WIPO. (2021). Inventive step - Standing Committee on the Law of Patents. Retrieved 18 May 2021, from https://www.wipo.int/edocs/mdocs/scp/en/scp_22/scp_22_3.pdf

9 An interview with the Head of inventors & innovation supports section at the GCC. Conducted on 11.06.2020.

10 *See* AI Policy—Saudi Arabia. (n.d.). Future of Life Institute. Retrieved August 27, 2021, from https://futureoflife.org/ai-policy-saudi-arabia/

*Reem Almarzoqi is a legal specialist at Salehiya Healthcare. She is specialist in the area of Artificial Intelligence and Law.*

*Mohamad Albakjaji is an Assistant Professor at Prince Sultan University. He is specialist at new technology and law. Dr. Albakjaji has lots of distinguished publications on this field.*