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INTELLECTUAL PROPERTY A ROADWAY TOWARDS THE PARADIGM OF BIG DATA AND RPA IN HEALTHCARE DURING COVID-19

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Abstract

The massive outbreak of the Novel Corona Virus brought the world to its knees. It also exposed the existing inequalities of income, age, race, sex, geographical location, etc., which led to the disproportionate impact of the pandemic on the vulnerable sections of the global society. This dismal picture of the healthcare system has much to do with inadequate and indiscriminate access to medicines, Covid testing kits, vaccines, and other facilities. As we all know, in the technological arena, where every possible task is carried out through AI technology Big Data and Robotic Process Automation (RPA) are the slashing innovations in healthcare. Big Data helps store a large amount of data, including patient records, payment details, and other sensitive information that requires secure protection under Information Technology (Reasonable Security Practices and Procedures and Sensitive Personal Data or Information) Rules 2011. RPA helps in auditing patient records; thus, the issue that the authors would like to introduce will be apparent to all the readers. The authors' primary focus is on the utilization of RPA & Big Data in healthcare, and a related issue arises with the access to medicines and privacy in the light of Intellectual Property under the Indian Patents Act 1970. We all know that IPR protects technological innovations like RPA and Big Data. In this article impact of IPR will be discussed thoroughly with the access to medicines and vaccines.

Keywords: Big Data, Robotics, Process Automation, Intellectual Property Rights, Healthcare, AI, Covid-19, Technology.

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1. Introduction

Big data refers to massive amounts of information which could be used to do exceptional actions.[1] It has captivated the attention of several individuals for a couple of years due to the tremendous growth that it possesses. Government and non-governmental entities collect, retain, and evaluate data to improve their goods. Significant information assets in the healthcare business include patient information, patient health records, medical examination findings, and internet of things devices. Medical science also generates big meaningful data for public healthcare. It must be appropriately managed and evaluated to get relevant information from this data.

However, finding big data to find a method eventually resembles finding a needle in an exceeding haystack. Various difficulties are attached to every stage of massive processing, which will overcome by adopting augmented technology systems for large data analysis. Consequently, to attain applicable solutions to reinforce public health, tending professionals should be equipped with the required infrastructure to systematically form and analyze big data. Big data management, analysis, and economic interpretation might alter the sport by bridging the gap to new methods for up-to-date healthcare. Together with the healthcare industry, different companies are operating arduously to turn this potential into higher services and monetary benefits. Many of these are contingent on ongoing technological advancements and indicate the growing trend toward personalized medicine. With the rise of technology in every field particularly healthcare, Robotic Process Automation (RPA) has been utilized to sort out the improvement of knowledge in medical care deliveries.

Earlier, a patient suffered a lot from the non-availability of doctor's appointments until the billing of the medicines and check-ups. RPA Technology is one of the sophisticated growing technologies that can implement better facilities daily to serve more patients and improve patient outcomes without incurring high costs. Alternatively, causing undue strain on workers. With the revolution of healthcare in innovative healthcare technology in the 5th generation, RPA can virtually automate any repetitive and manual task critical to healthcare operations and processing. It may inspire

[1] Studylib.Net, "3D Data Management: Controlling Data Volume, Velocity, and Variety", *available at*: https://studylib.net/doc/8647594/3d-data-management--controlling-data-volume--velocity--an (last visited June 01, 2022).

a new character by using intelligent technologies that gather essential information from various domains, including partnership networks, electronic health records, finance systems, payer portal systems, and finance technologies. As the authors have already thrown some light on how RPA generally works, the authors would light on Big Data

During Covid 19, when it threatened the world due to the deadly Coronavirus, healthcare management and health information systems were significant. Artificial Intelligence (AI) helps RPA to reduce the time-consuming factor in the health care billing process. By Digitalization, integration, and effective use of big data healthcare organization from a single network of medical practitioners to a large group of the accountable network which has significant benefits in R&D of the pharmaceutical industries, public health etc. Given the amount of research directly affecting the medical field, writers currently shed information on the creation of slashing treatments. Intellectual Property (IP) law has become an essential presence in the scene. While protecting is a necessary element of biotech and clinical research, increasing the incentives for development and production, other IP areas are also crucial in the strategy of the majority of healthcare-related firms. Here, we look at the connections between medical services and care and how those connections will develop in the future.

The main aim of performing this analytical research is to identify the gaps in understanding the utilization of RPA and Big Data as a tool for helping the researchers in healthcare during the pandemic and identifying the newest form of technology that researchers are prominently using, scientists worldwide. It would help the readers to understand the current emerging trends of the utilization of RPA & Big Data in healthcare sectors as of now in Covid 19. In addition, the authors will contemplate the pros and cons of the current emerging technology, which has significant inception. Secondly, the chapter will deal with the recent Intellectual Property Rights (IPR) protection and its management scope in all forms.

2. Overview of Big Data in Healthcare System

Information has been the cornerstone of the more incredible organization and new advancements. The more data we have, the more we can arrange ourselves to offer the most outstanding results. That is why data collecting is such a vital element of every company. We can use this data to estimate the latest situation under specific parameters

and upcoming projections. As we became increasingly aware of this, we began to generate and collect information about virtually everything by makingtechnological breakthroughs in this regard.

Today, we are overwhelmed with information from all aspects of our lives, encompassing social activities, research, work, healthcare, etc. Sometimes senses could compare our present situation to a considerable amount of data. Advanced technologies have enabled us to create a growing amount of data, which has grown unmanageable with current technologies. As a result, the term "big data" was invented to describe massive amounts of data.[2]

2.1. Concept and Definition

Big data refers to massive volumes of data that cannot be administered by standard software or a virtual platform. It has a large amount of usage preservation, processing, and analytical power. The term "Big" refers to a vast amount of data. Nowadays, from research to academics, Big Data is useful for many reasons that cannot manage standard software or virtual platforms. As a result, Artificial logarithms and the merging of innovative equations are becoming needful to obtain a large quantity of data.

2.1.1. Healthcare as a significant source

Healthcare is a multifaceted concept that seeks to prevent, diagnose, and cure specific diseases or impairments. The essential components of a healthcare system include healthcare providers (physicians or nurses), health facilities (clinics, hospitals for providing medications and other diagnosis or treatment technology), and banking institutions to support the first two. Health professionals include dentists, doctors, midwives, nurses, psychologists, physiotherapists, etc. Given the seriousness of a situation, many levels of healthcare are required.[3]

With the development of computer systems and their potential, the Digitalization of all clinical evaluations and medical records in healthcare systems has become a familiar and widely accepted practice. According to various scientists,

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[2] J. Gubbi, R. Buyya, *et.al*., "Internet of Things (IoT): A Vision, Architectural Elements, and Future Directions", 29(7) *Future Generation Computer Systems* (2013), *available at*: https://dl.acm.org/doi/10.1016/j.future.2013.01.010 (last on visited January 04, 2022).

[3] S. J. Reiser, "The Clinical Record in Medicine. Part 1: Learning from Cases", 114 *Ann Intern Med*. 902–907 (1991).

electronic health records (EHR)[4] is referred to as "electronic health records for patients which encompass information relevant to patient details which are there in an electronic system. It captures, transmits, receives, stores, retrieves, links, and manipulates multimedia data to provide healthcare and health-related services."[5]

2.1.2. Evolution of robotic process automation in utilization smart health care

When we talk about the term "health care",[6] the first thing that comes into the reader's mind is the USSR declaration for healthcare. The term "healthcare" is defined as the efforts given by medical practitioners to maintain the physical/ emotional and mental growth of well-being. Earlier, the techniques were not well equipped for the treatment, whereas, in the 21st century, medical technologies and treatment procedures are well advanced. Thus, the concept of smart healthcare comes into the picture. According to Blue Stream, smart healthcare means services rendered to the patient through wearable devices and with the help of advanced medical techniques or diagnostic tools.

Currently, due to the rapid increase of Corona Virus or, in short, Covid-19, traditional health care is unable to accommodate everyone's needs. Moreover, the concept of Telemedicine, Robotic Process Automation, and its utilization in smart healthcare came to the forefront.

The concept of "Telemedicine" has been considered a natural evolution of smart health care. The term "Telemedicine" was coined in the 1970s. The Greek word "tele" means "distance" and "mederi" means "heal".[7]

Medical science is getting advanced day–by–day with the latest technique that utilizes digital operations, e-services, and Artificial Intelligence; however, its application is not recognized, and the healthcare industry must still evolve. Efficiency and accuracy have risen to the top of the priority list for healthcare organizations, especially in the light of the current pandemic situation, and having a secure, scalable, and resilient digital

4 Po-Yen Wu, Chih-Wen Cheng, *et.al*., "Omic and Electronic Health Record Big Data Analytics for Precision Medicine", 64 *IEEE Trans Biomed Eng*. 263–273 (2017).

5 M. Reisman, "EHRs: The Challenge of Making Electronic Data Usable and Interoperable", 42 *P T*. 572–575 (2017).

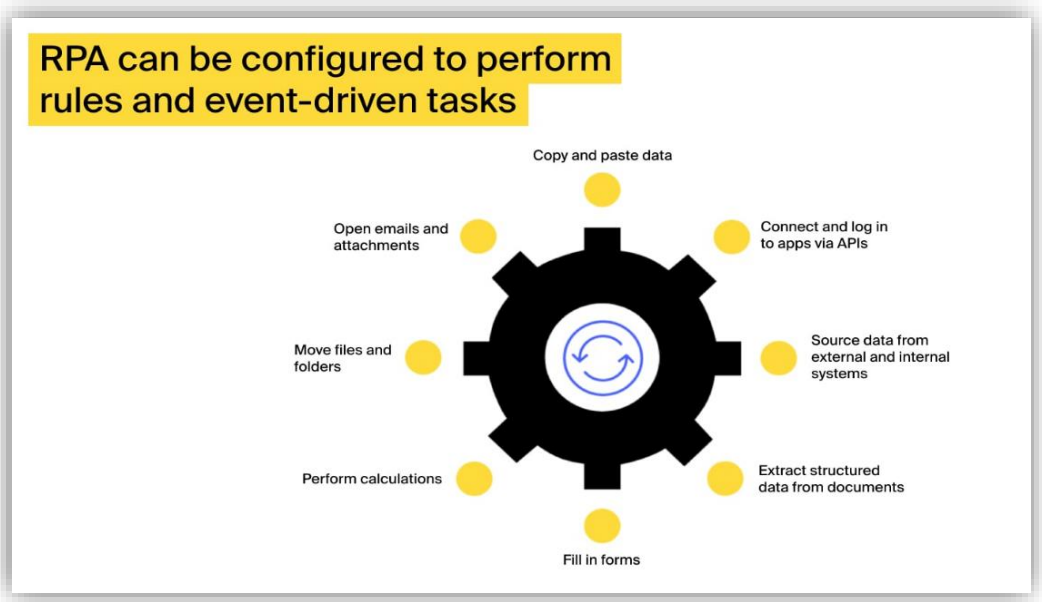
6 G. Sageena, M. Sharma, *et.al*., "Evolution of Smart Healthcare: Telemedicine During COVID-19 Pandemic", 102(6) *Journal of The Institution of Engineers India (Series B)* 1319–1324 (2021), *available at*: https://doi.org/10.1007/s40031-021-00568-8 (last visited on August 06, 2022).

7 E. M. Strehle and N. Shabde, "One hundred years of Telemedicine: Does this new technology have a place in paediatrics?", *available at*: https://doi.org/10.1136/adc.2006.099622 (last visited on August 06, 2022).

workforce has become a requirement. Robotic Process Automation (RPA) can be highly beneficial in this situation. RPA enables businesses to work smarter by automating repetitive, time-consuming manual operations. It allows more efficient use of human resources by putting people in high-value-added jobs and increasing customer satisfaction and interaction. When we say some presentation or any form of technology is a 'smart' representation, it reflects how the whole system has been summarized adequately. So, in the healthcare industry, smart healthcare refers to the proper management of hospital systems in one platform via virtual mode. When the deadly Corona Virus or Covid-19 threatened the world in 2020, RPA was already being used to speed up operations in healthcare, assisting organizations and professionals in dealing with the chaos caused by Covid-19.[8]

Figure 1.1, below is the diagrammatic representation of RPA in smart healthcare. When the patient gets registered, they can pay the bills of the reports online. The leading cause of these issues is employees' reliance on manual labour in the documentation and digitally transferring written records. Maintaining those digital records which needed to be updated manually required even more time from personnel, diminishing face-to-face interaction with patients. Therefore, RPA comes in handy, which signifies handling massive amounts of data. Simultaneously, storing vast amounts of files and information, monitoring the operation of a healthcare unit's back-office and front-office support, and other similar tasks that appear tedious to ordinary humans. Moreover, technology changes society and fuels the network connecting industries, creating enormous changes with the new generation of technology.

[8] S. Sarker, L. Jamal, *et.al.*, "Robotics and Artificial Intelligence in Healthcare during COVID-19 Pandemic: A Systematic Review", 146(103902) *Rob and Autonomous System* (2021), *available at*: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8493645/ (last visited on August 06, 2022).



(1.1.)

Fig.: 1.1. Diagrammatic Representation of RPA in Smart Healthcare

Image Source: *https://itrexgroup.com/blog/rpa-in-healthcare/# (last visited on August 06, 2022)*

2.1.3. Robotic Process Automation

Robotic Process Automation is often known to us as RPA.[9] It is a kind of technology where specific software bots are utilized to get a result. As it is a software-based bot, it automatically operates the business procedure by knowing the existing procedures and practices. In general, it minimizes the human workforce in an online mode and performs all kinds of repetitive work. Thus, it reduces the human workforce in an online mode. In today's 21st century, in the arena of business, competition becomes much harder; therefore, all of the competitors wanted to move a step ahead for future perspective. Henceforth the utilization of RPA becomes a boon in increasing the business's profits & also increases the efficiency of the business houses. Modernized technology helps the human workforce develop skills and knowledge in a particular domain. According to researchers, in the next few decades, the utilization of RPA will be more significant as it has already gained a lot of recognition worldwide.

[9] *Ibid*.

2.1.4. Overview of Robotic Process Automation in Healthcare Sectors

In terms of revenue and employment for large-scale workers, Healthcare Centres are one of the prominent sources.[10] It consists of medical equipment, Clinical trials, Mediclaim, medical instruments. Although it is healthcare 5.0 generation, yet certain challenging tasks are still there like appointment schedule of patients in accordance to the doctor, managing all the internal and external sources through Clinical applications, Mediclaim, etc. It is becoming complex as manual labourers cannot handle all the tasks single-handed; therefore, in this regard, RPA has been introduced in Healthcare Centres to increase the efficiency of the employees/staff in the various administrative department.[11] It also reduces the chances of errors caused by employees/staff due to lack of complex procedures like enrolment of patient details, appointment schedule of patients, Mediclaim, documentation, preparation of invoices. Further, RPA also sorts out the problem about the viability of drugs into the market for safety precautionary measures.[12]

2.2. Benefits of RPA in Healthcare Sectors

2.2.1. Capability to make better use of Data[13]

Being digital has its own set of advantages. They are using RPA in conjunction with Optical Character Recognition (OCR) aids in digitizing all paperwork, indexing it, and storing it for future reference. RPA assists in processing health claims, medical diagnosis reports, and updating the same set of information parallel to various healthcare enterprise systems, eliminating swivel chair operations. The initial digitized data is now available for slicing, dicing, and re-purposing in more creative and efficient ways to provide innovative healthcare.

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10 Grandview Research, *Report on Robotic Process Automation Market Size, Share & Trends Analysis Report by Type, By Service, By Application, By Deployment, By Organization, By Region, and Segment Forecasts, 2022 – 2030*, *available at*: https://www.grandviewresearch.com/industry-analysis/robotic-process-automation-rpa-market (last visited on August 06, 2022)

11 "Robotic Process for Automation Healthcare", *available at*: https://www.kofax.com/-/media/Files/Solution-Overview/EN/so_robotic-process-automation-for-healthcare_en.ashx (last visited on August 06, 2022).

12 A. Ethan, "Robotic Process Automation (RPA) in Healthcare", *available at*: https://medium.com/@lizheng.t94/robotic-process-automation-rpa-in-healthcare-5a27a0f8b6c2 (last visited on August 06, 2022).

13 S. Nakrani, "The Advantages of RPA for the Healthcare Industry", *available at*: https://blog.datamatics.com/the-advantages-of-rpa-for-healthcare (last visited on August 06, 2022).

2.2.2. Enhanced Knowledge Repository

RPA slowly and securely builds an information base while processing transitional work such as health claims. It aids in defining minimum and maximum thresholds in the system for accepting and rejecting claims. These thresholds will be applied upfront in all future claim processing, reducing turnaround time.

2.2.3. Improved Customer Service

RPA assists in automating routine tasks, synchronizing all digitized information, keeping track of appointments, and organizing all records in an up-to-date manner. Employees can focus more on their core competencies and customer service due to the extra hours. It is a well-coordinated effort to keep all customer information in one place aids in providing innovative service to patients.

2.2.4. Enhanced Compliance

The healthcare industry is highly regulated. Organizations must adhere to many statutory compliance and regulations in almost every process. RPA not only aids in the generation of audit trails and automated reports, but it also aids in the fulfilment of observations involving third-party systems by posting the required data and supporting documents to them regularly *via* role-based access. It ensures high accuracy, improved performance and compliance with regulatory bodies, and improved customer service.

2.3. Benefits of Big Data in Healthcare

By digitalization, integration, and effective use of big data, healthcare organization from a single network of medical practitioners creates a large group of the accountable network which has significant benefits. It has added benefits which have been stated below:

2.3.1. R & D in Pharma Industries

Analyse the health records of patients through clinical trials for identifying the indication of the discoveries before the product has been launched in the market.

2.3.2. Public Health

Big Data helps in the analysis of deadly virus/ any element which is the cause of the outbreak of the disease and helps in getting proper medications. It helps in managing the data with the help of the response based on detection of patient health status.

2.3.3. Device Monitoring

It helps in the analysis of large volumes of fast-transmission of Data for the safety of the patient with proper care and due attention on a real-time basis.

2.4. Role of AI in RPA in Healthcare

Artificial Intelligence has great importance in health care sectors,[14] with the rapid advancement of practical techniques in smart health care. Studies show that AI has great significance in smart health care. AI has provided a software program to elucidate data compilation, including images, sounds, and text, for a proper explanation. As a result, it becomes a boon to get success. Nowadays with the latest innovative techniques of Artificial Intelligence moving forwards pertain to the improvement in health care.

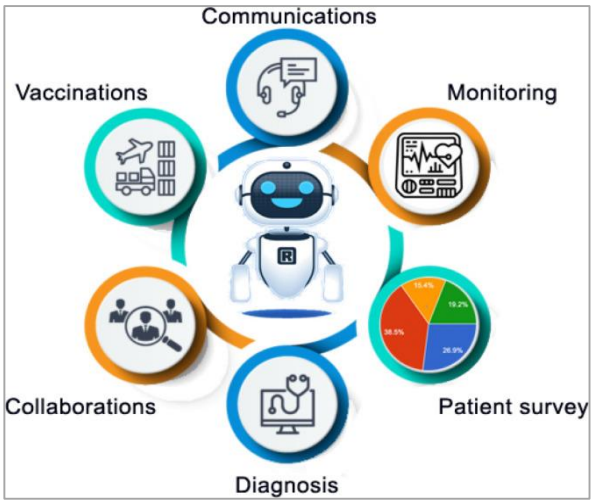
The technology fields of AI and Robotics have worked wonders in addressing the health sector's urgent needs during this pandemic. Researchers and inventors are coming up with innovative ways to address the growing issues in the healthcare industry as a result of pandemic. It has come into the picture that Covid-19 results in Speedy diagnosis[15] is emphasized to limit the outbreak and minimize virus transmission. Unfortunately, it is difficult due to a lack of medical resources and the inherent risk of infection from direct contact. It generally uses robotic technology to collect samples without having to touch them. Robots are also being utilized as a tool to allow physicians to diagnose patients, eliminating the infection risk remotely. While Artificial Intelligence applications make it easier to schedule suspicious long-suffering individuals and speed up the processing, using the least amount of people.

Early identification can aid in controlling the virus's rapid spread. It examines various AI-powered Covid-19 detection and prediction studies that have recently been

[14] M. Singh and D. Mehta, "Artificial Intelligence Systems and IP" *Lex Orbis*, *available at*: https://www.lexorbis.com/artificial-intelligence-systems-and-ip/ (last visited on August 06, 2022).

[15] A. Gorbalenya, S.C. Baker, *et.al.*, "Severe acute respiratory syndrome-related coronavirus: The Species and Its Viruses – a Statement of the Coronavirus Study Group", *available at*: https://doi.org/10.1101/2020.02.07.937862 (last visited on August 06, 2022).

published.[16] There has been a lot of analysis done to see a link between early Covid-19 indications and test results, which may help detect the disease from those minor symptoms.[17] A positive test for SARS-CoV-2 is used in the regular Covid-19 test. It is far more than just RPA. The main Significance of RPA during Covid-19 with artificial intelligence is that RPA automates the tedious, repetitive, and time-consuming operations that front-line staff typically perform, allowing for more efficient human resources.[18] During Covid-19, may leverage RPA to empower health care sectors by constructing software robots that can do the work of health professionals or medical personnel.[19] RPA boosts operational efficiency and scalability while cutting expenses rates, providing sophisticated governance services. Fig. 1.2 ,1.3 and 1.4.



(1.2.)

Fig. 1.2. Demonstration of Software Robots that can do the work of Health Professionals or Medical Personnel

Image Source: *https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8493645/ (last visited on August 06, 2022)*

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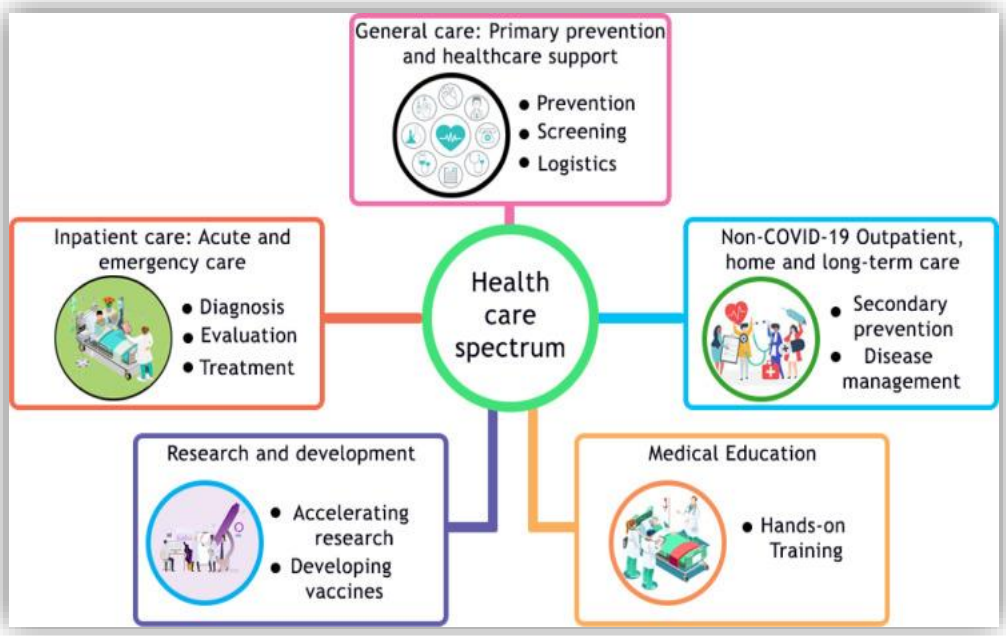
16 O.S. Albahri, A.A. Zaidan, *et.al*., "Systematic Review of Artificial Intelligence Techniques in the Detection and Classification of COVID-19 Medical Images in terms of Evaluation and Benchmarking: Taxonomy Analysis, Challenges, Future Solutions and Methodological Aspects", 13(10) *Journal of Infection and Public Health*, 1381–1396 (2020), *available at*: https://doi.org/10.1016/j.jiph.2020.06.028 (last visited on August 06, 2022).

17 H.A.S. Hashmi and H.M. Asif, "Early Detection and Assessment of Covid-19", 7 *Frontiers in Medicine* (2020), *available at*: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7296153/ (last visited on August 06, 2022).

18 Datamatics, "Robotic Process Automation (RPA) Use Cases in COVID-19 Pandemic Situations", *available at*: https://www.datamatics.com/intelligent-automation/rpa-trubot/use-cases/covid-19 (last visited on August 06, 2022).

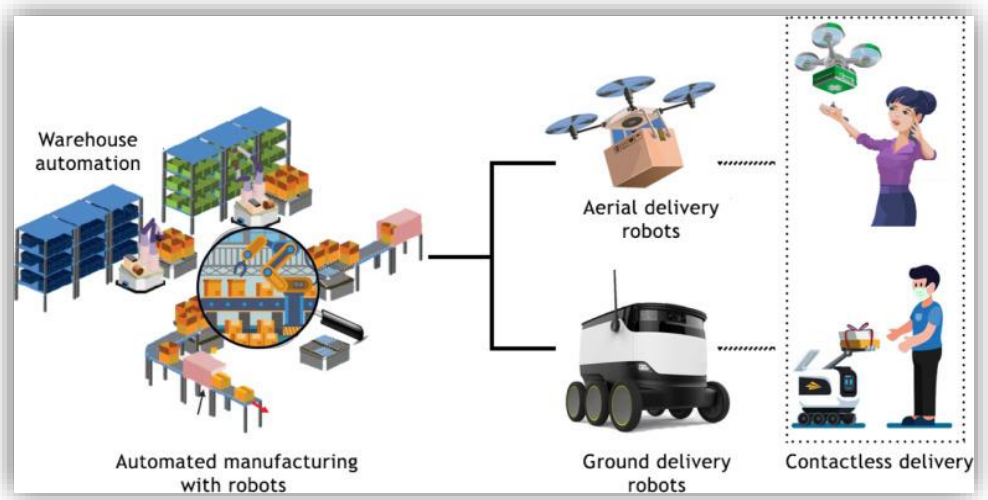
19 R. Saini, "How RPA can help Labs in COVID-19 Test Reporting Automation", *available at*: https://www.bigsteptech.com/rpa-helps-labs-in-covid19-test-reporting/ (last visited on August 06, 2022).



(1.3.)

Fig. 1.3. Division of the Healthcare Spectrum During COVID-19

Image Source: *https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8493645/ (last visited on August 07, 2022)*



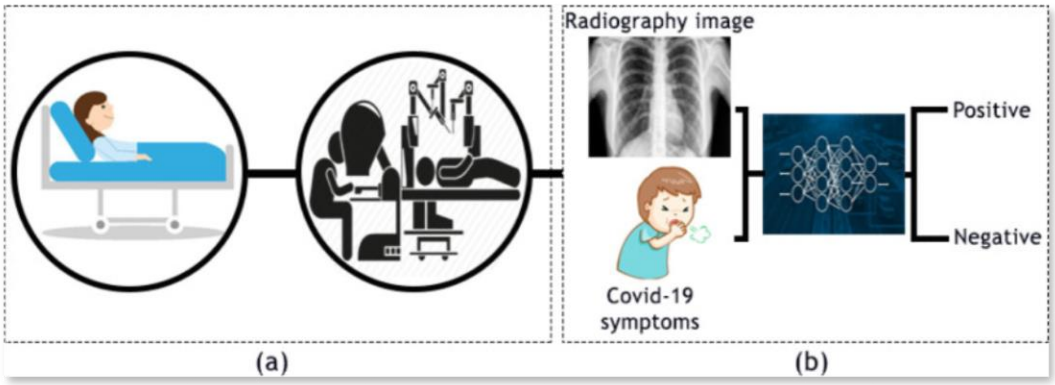
(1.4.)

Fig. 1.4. Autonomous Robots in Supply Chain and Delivery

Image Source: *https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8493645/ (last visited on August 07, 2022)*

Figures 1.3 and 1.4 demonstrate operational efficiency and scalability through RPA. AI has a lot of benefits in healthcare using RPA in solving problems in classification and the calculation of the risk of a specific event, making it an essential method for

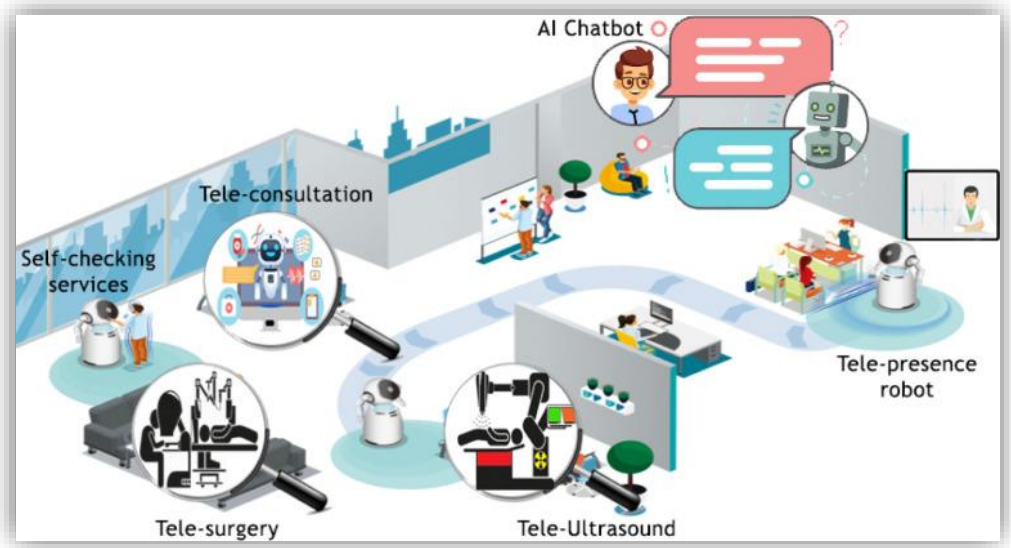
assessing and further assessing disease risk. As shown **in figure 1.5. below is the diagrammatic representation of RPA and AI in covid-19 diagnosis, and figure 1.6. shows the diagrammatic representation of RPA in Telemedicine with AI.**



(1.5)

Fig. 1.5. COVID-19 Diagnosis Using Robots and AI Based Technologies: (A) Contactless Sample Collection Using Robots (B) COVID-19 Detection Using AI

Image Source: *https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8493645/ (last visited on August 07, 2022)*



(1.6)

Fig. 1.6. Telehealth Care Services During COVID-19 Pandemic

Image Source: *https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8493645/(last visited on August 07, 2022)*

AI has various benefits in the health care sector, like in technological advancement, AI helps diagnose the patients remotely and helps provide the best treatment. AI helps in accessing the previous and present health issues through the data provided, and thus it saves the costs of the patient also. AI assures robotic surgeries

without any hassle. But every technique has both pros and cons. The main cons of this technique are privacy issues, errors that significantly impact patients. For instance, if any patient consumes any drug that AI wrongly recommends, it will lead to serious health issues.

2.5. National Standard of Utilization of RPA in Smart Healthcare during Covid-19

During Covid-19, however, one tool that will reshape the automation environment in the healthcare industry will be RPA.[20] RPA is a business process automated system that reduces interpersonal interaction by leveraging software robots or artificial intelligence (AI), often known as digital workers or software robotics. RPA uses a user interface and data capture to modify applications to interpret, interact, and prompt replies with other systems to do repeated activities. RPA robots may do tasks like editing and inserting data, shifting files, filing documents, accessing information, and so on. It helps companies reduce the tedious chores their workers complete, improves productivity and accuracy, aids in instant potential savings, enhances compliance, and boosts flexibility.

2.5.1. Role of RPA in Social Distance during COVID19[21]

RPA is a slashing technology for automating structured business procedures. It works like any other employee, interfacing with current application user interfaces and automating operations. RPA can help businesses and institutions make better use of their human resources. To avoid congestion in these times of social separation, several industries, such as healthcare, which has significant expenditures in human resources, must adopt alternative operating models, shifts, and staggered employee attendance. They indeed have an impact on working hours and workload. RPA, on the other hand, maybe trusted to do a variety of monotonous jobs, allowing the workforce to spend their human energy where it is most required. Allowing staff to automate operations with less physical

[20] S. Parikh, "RPA and COVID-19: Can automation help businesses to return to the 'new normal'?", *available at*: https://nividous.com/blogs/rpa-helps-businesses-return-to-new-normal-covid-19 (last visited August 06, 2022).

[21] A. Torgal, "Robotic Process Automation Revolutionizing Healthcare Industry during COVID-19", *available at*: https://www.ceoinsightsindia.com/industry-insider/robotic-process-automation-revolutionizing-healthcare-industry-during-covid19-nwid-3305.html (last visited August 06, 2022).

involvement helps even the most experienced personnel tackle the changing difficulties of Covid-19.

2.5.2. Automation and patient care during COVID19[22]

Healthcare organizations have historically emphasized patients by lowering costs and enhancing service quality. The market is built on human-centred services, and a tailored approach substantially influences patient experience and outcomes. Most hospitals' major issue is keeping track of information, document processing, patient information processing, billing, lengthy lines, complaint management, patient registration, reporting, and so on. Integrating and analysing this data becomes a tedious operation, where automation comes in and makes a big difference. On the other hand, hospitals have faced a substantial lack of human resources due to the epidemic. By letting medical personnel focus on patient care, RPA focused on hospital patient management systems can help hospitals expedite their digital transformation.

2.5.3. Automation in RPA for health insurance during Covid-19

RPA in healthcare is a method of streamlining procedures using automated robotic software. RPA helps reduce human labour in processing health insurance documents such as claims. Hospitals use blue Prism to reduce the workforce and skills required in Medicare operations. RPA in health insurance can work without conventional coding by integrating desktop programs like Excel, cloud-based software fields, and mainframe data into a standardized and automated process. RPA is not judgmental, but it makes things easier by automating tedious and repetitive administrative tasks and type-level paperwork. By automating these simple, repetitive tasks, your health insurance staff are free to focus on higher-level tasks that are more interesting, exciting, and important, letting the computer do what it does best: speed and precision. For example, natural language processing improves the technique of documentation. It can improve the efficiency and accuracy with which complaints are handled.

[22] T. Peterson, "12 Reasons why Automated Care is Helpful in the Healthcare Industry", *available at*: https://www.adsc.com/blog/reasons-why-automated-care-helpful-in-healthcare-industry (last visited on August 06, 2022).

2.6. National Utilization of Big Data in Smart Healthcare During Covid-19

Before the Covid-19 pandemic, China relied heavily on infectious disease case data reports for illness early warning and surveillance. In recent years, China has worked to develop the information of medical institutions and store medical data in computer network systems, effectively collecting a vast amount of medical service data. For example, the hospital information system (HIS) is a valuable medical health data source. A hospital management information system (HMIS), a laboratory information system (LIS), a medical image archive and communication system (picture archiving and communication system), radiological management systems (radiology information system), and systems for clinical decision support are the main components of HIS. The electronic medical record system (EMRS) in medical and health departments stores information on patients' names, treatment information, ailments, and test results.

Big data gives scientists, health professionals, and public health officials important information that enables them to make informed decisions in the fight against the Covid-19 virus. These data can track the infection worldwide and spark medical innovation. It can aid in forecasting the impact of Covid-19 in a specific location and the entire population. It aids in the study and development of innovative therapeutic methods. Big data may also give people potential sources and possibilities, assisting them in dealing with complex scenarios. This technology offers data for disease transmission, migration, health monitoring, and preventive system analysis.

The pandemic highlighted India's long-standing weak medical infrastructure. In a country of 1.3 billion people, about 75% of healthcare infrastructure is concentrated in urban regions, making essential services unavailable to rural communities.

Furthermore, India's overall healthcare spending (including private and governmental) is 3.6 percent of GDP, significantly lower than in other nations. It has resulted in a reduction in the infusion of value investments, a resource bottleneck, and a clogging of the healthcare system.

It is where technology can come in handy. It has the potential to close the gap between healthcare accessibility and affordability across the country. A fundamental overhaul of the healthcare industry guided by digital technology had been long overdue, and the pandemic provided an ideal opportunity to implement this shift. In the last year,

we have seen how critical technological solutions like Hospital Information Management System (HIMS) and telemedicine helped to improve the situation.

The moment has come for digital health to take the lead. Healthcare is already shifting away from clinics and toward mobile phones. We have seen how physicians and patients are increasingly using teleconsultations.

3. IP and Covid-19

IP is all about invention and ideas, and IP law deals with protecting or incentivizing these advancements. The World Trade Organization defines IPR[23] as those granted to individuals for their "creations". IPR give the inventor ownership over their ideas for a certain period, allowing them to restrict others from exploiting them and negotiate payments in exchange for permission to use them. Thus, creators of new technologies have the exclusive right to use their ideas throughout the term of such protection and are allowed to charge whatever price to cover their R&D expenditures while also earning financial gains.[24] The patent holder has the sole right to his innovation, and others prohibit from undertaking research, producing, or distributing such protected items or procedures. What does IP have to do with Covid-19, one would ask? The answer is nearly everything. When it involves global healthcare or dealing with pandemics, IP, especially patents, is an essential component. Vaccines, medical equipment, software packages, tracking systems, diagnostics, and other inventions, among others, have significant IP consequences in the context of Covid-19. The development of vaccines and other medical technologies is a crucial aspect of public health preparation, so the response to a pandemic is closely related to IP.

3.1. Is Patent Law Unsuitable for a Pandemic?

Patent law is essential to a country's national innovation system since it promotes technical advancement and creativity. However, during the outbreak, there was conflicting evidence and ambiguity about IPR regarding medical technology, thus impeding the efficacy of crisis-critical product research and development. As a result,

[23] World Trade Organization, "What are Intellectual Property Rights?", *available at*: https://www.wto.org/english/tratop_e/trips_e/intel1_e.htm (last visited on August 07, 2022).

[24] P. Stevens and M. Schultz "Why Intellectual Property Rights matter for COVID-19?", *available at*: https://geneva-network.com/research/why-intellectual-property-rights-matter-for-covid-19/(last visited on August 07, 2022).

while the patent law fostered scientific innovation and creativity in peacetime, it fell well short in dealing with the emergency circumstances of the outbreak. Patent law promotes the long-term development of novel ideas by delaying their spread in the short run. When an ongoing pandemic necessitates the rapid creation and distribution of medical technology, essential medicines, or equipment, such an assumption becomes irrelevant.

3.1.1. Patent rights for COVID-19 vaccination are being waived

India and South Africa initially suggested the proposal to waive IP temporarily and patent rights for Covid-19 vaccines at the WTO in October 2020. It was co-sponsored and supported by numerous low-income nations. The United States and the European Union both rejected the plan. However, on May 5, 2021, the United States modified its position and decided to support the requested waiver, prompting mixed reactions.

3.1.2. Vaccine Patent

Vaccine patents grant vaccine developers the exclusive right to manufacture the vaccine they created. It also allows them to charge whatever price they want to pay for their R&D expenditures while generating a significant profit.

3.1.3. Why is a patent waiver necessary?

The aim of seeking a waiver[25] is to restrict pioneering vaccine firms' ability to defend their patents, allowing generic manufacturers to manufacture the vaccine without fear of being sued. It would lead to the manufacturing of vaccines in underdeveloped nations, hence promoting the immunization campaign.

3.1.4. Is a waiver a viable option?

Those who oppose the waiver of patents on the COVID-19 vaccine believe that eliminating or deferring patent enforcement will disincentivize pharmaceutical companies to invest and innovate in vaccine research and development. It also articulated that abandoning patents is not the solution for dealing with vaccine shortages because the main barrier is a lack of infrastructure in underdeveloped nations to manufacture vaccines.

[25] World Trade Organization, "Waiver from Certain Provisions of the TRIPS Agreement for the Prevention, Containment and Treatment of Covid-19", IP/C/W/669/Rev.1, (May 25, 2021), *available at*: https://docs.wto.org/dol2fe/Pages/SS/directdoc.aspx?filename=q:/IP/C/W669R1.pdf&Open=True (last visited on August 07, 2022).

Therefore, IP Management is becoming essential in order to protect the collateral assets.

4. IP Asset Management in Healthcare

The authors would like to briefly overview IP assets before proceeding to the next chapter and why they are essential to managing them. Intellectual Asset Management (IAM) is a management method that focuses on exploiting patents, trademarks, trade secrets, copyrights, know-how, and other intellectual assets to support and improve overall business performance.

IP Asset is a collection of IP creations such as trademarks, patents, copyright, and trade secrets that entrepreneurs select based on their company needs.[26] For example, a publishing business will need to handle copyright and trademark to obtain economic worth since it increases financial value in the market. By adopting the word "assets",[27] business managers and legislators understand that IP is more than just a legal right; it also provides an economic benefit to all owners. IP is part of a broader economic environment where human capital defines a productive and competent workforce or a generation of academics and scientists.

Human capital has low economic worth in the absence of IP since, by definition, it is non-owned – human ingenuity cannot be held – and has no legal standing. IP will not generate safeguarded or developed without human capital. IP has been essential for monetary progress. With Present economic knowledge, the confluence of IP rights and human resources represents a substantial financial power.

The IP created is an asset having a theoretical economic worth. This value, however, cannot be realized in practice unless the IP has employed precise, tangible, and practical ways to generate money or other economic advantages. Strategic IP asset planning and development are required preconditions for the dynamic use of IP for micro and macroeconomic development. The best innovation in the world will not generate cash

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[26] T. Lutz, "Intellectual Property and Healthcare in 2020", *available at*: https://getreferralmd.com/2019/12/intellectual-property-and-healthcare-in-2020/ (last visited on August 06, 2022).

[27] World Intellectual Property Organization, "IP Asset Development and Management: A Key Strategy for Economic Growth", *available at*: https://www.wipo.int/edocs/pubdocs/en/intproperty/896/wipo_pub_896.pdf (last visited on August 06, 2022).

if it is not successfully promoted and exploited. IP asset management is all about making the best use of your human resources.

4.1. Why IP Assets are required to be Managed?

IP refers to speculative assets legally protected and controlled by a specific firm, implying that others may not utilize them outside the company. The most significant benefit of IP is that it gives businesses a competitive advantage. Speculative assets had protected to the same extent as physical objects. The significance is - (1) Competitors will be unable to infringe your efforts, which is necessary for web-based or mobile-based businesses. (2) It adds value to the company since it includes the goods and services offered to customers. The organization may enable external parties to utilize the property, but royalty rights or other legal constraints protect this privilege. Various approaches are employed to identify, protect, and enforce IPR. Multilateral treaty frameworks and international organizational structures are examples of this. As previously said, IP is essential for the economic growth of companies. Many accounting practices in the United States and other nations put pressure on businesses to categorize all intangible assets. After all, preserving assets is essential for today's organization. Ben Bernanke, a well-known US economist who recently spoke at an economic growth conference, understood this; the value of intangible capital, in particular, has been a driving factor for many US firms.

Intangible assets, human capital, and IP have increasingly been recognized as essential aspects of global development in the financial market. Consequently, lawmakers in governments, universities, and research institutions seek to develop constructive IP policies that encourage the production, accumulation, and use of IP assets as a critical tool in monetary strategy. There are methods for producing a company's IP portfolio, and there is growing acknowledgment that current proactive policies may increase a government's productive capacity and IP asset allocation.

"Knowledge is unlimited, and those who have supported and promoted the sharing of ideas and information have been at the heart of contemporary economic and social growth", stated former Romanian President Ion Iliescu, a member of the WIPO Policy Advisory Commission (PAC). "IP is at the centre of business strategies, as seen by its growing share of fixed assets in company value".

According to the National Knowledge and Intellectual Property Task Force, which is located in the United States, "a company's value in the knowledge era mainly defined by its capacity to turn individual and organizational knowledge into net worth in time to grab new market segments". As product cycles shorten and rivals lower the time to market, a competitive corporation's methods for developing and commercializing new ideas must be continually validated and improved. The administration of IP lies at the centre of this transition. It is a method for dealing with intangible asset growth and its influence on a company's strategic market position and shareholder value.

Trademarks, international patents, copyright allocation and utilization, trade secrets, geographical indication, domain names, registered designs, plant breeder rights, and technology are all examples of IP assets that must manage to generate value, special privileges, profits, and consumer goodwill and loyalty. An IP asset assists in the income generation of products through licensing or franchising; it also helps promote money for research and development, hence improving the end outcome. The product's value also rises, which aids in transfer pricing negotiation.

4.2. Emergencies in Public Health and Direct Government Assistance

IPR acknowledges the efforts of critical stakeholders who take enormous risks to bring innovations to the forefront by letting them reap the rewards of expending considerable resources in R&D with no guarantee of success. For example, a patent holder might prohibit others from using the protected technology without his permission, or he can allow it by incurring a fee. A patent holder has the exclusive right to his work for a set time (20 years in the USA and India). Therefore, patent rights delay innovation spread by limiting output, preventing rivals, and boosting prices. It is critical for promoting innovation and the advancement of modern technologies. However, this cost-based pricing for patents is useless in times of global emergencies, such as the current epidemic. Our current objective is to speed up the immunization process rather than slow it down.

However, this raises significant concern. Suppose patent protection is removed during a global health emergency. How can pharma companies be compelled to incur substantial R&D expenses for creating vaccines and other medical technologies while losing their exclusive rights to manufacturing and selling such technology? One of the ways to tackle this is through direct government support including public funding of

research and development to manage; IP Assets in the healthcare industry. Many companies rely on IP assets, including commercial healthcare transactions. This article provides an overview of how IP rights may be effectively secured, transferred, and kept throughout transactions. The authors' next thought is, "Who is eligible to hold IPR in healthcare?" Healthcare IP is a broad field. It also encompasses the IP of influential organizations, such as health centres performing clinical trials at universities and medical research firms for and biotechnology and pharmaceutical firms. The authors would now want to explain the notion of IPR in the healthcare industry. Patents, trademarks, copyright, and even trade secrets are all examples of IPR. A medical research board owns a method or system patent for a unique approach, whereas a pharmaceutical business has a medicinal or new drug patent. Health services and organizations can also provide trademark rights for books, rules, regulations, and processes.

5. Scope of Intellectual Property Rights in Robotic Processing Automation

As we have come across the concept of Smart health in the fifth generation of healthcare, Robotic Process Automation or RPA has a booming effect. RPA or software botnets help solve the medical field's miscellaneous works in the hospital. The primary purpose of using RPA is to solve human errors or mistakes that they usually make while enrolling the name of the patients in their databases and scheduling the appointment according to the necessity. An important question arises about the confidentiality of medical records and patient details carried out by RPA or software botnets. IPR thus came into the picture as we know that under the umbrella of IPR, we have Copyright, Trademark, Patents. Therefore, Copyright protects the data carried out by RPA or software botnets to enrol the patients' names in their databases and schedule the appointment according to the necessity and Medicare billing all are encrypted. Patents protect the novelty of RPA in innovative healthcare to protect from any infringement.[28]

Healthcare is one of the most inefficient businesses; eliminating inefficiencies would result in better healthcare delivery, beneficial to the industry and the general population. Every company has inefficiencies, but few confront the healthcare industry's issues, stringent laws around patient data, and a lack of resources to cope with them.

[28] L.J. Thayer and R.L. Emsley, "Be Competitive: Patent Planning for Robotics Companies", *available at*: https://www.finnegan.com/en/insights/articles/be-competitive-patent-planning-for-robotics companies.html (last visited on August 06, 2022).

Financial services are subject to comparable high levels of regulation, although banks have easier access to money and have historically invested more in technology. As a result, healthcare has more inefficiencies and manual procedures than nearly any other business. The capital for IT and healthcare services comes entirely from healthcare providers' earnings, so RPA enables healthcare providers to avoid expensive, long-running digital transformation implementation projects and gain quick results, allowing them to contribute to patient care significantly. Along with that, use of RPA in smart healthcare for patient scheduling, Claim Management, Regulatory Compliance, Data entry, Migration, Extraction, etc. These benefits the health care industry by reducing costs, increasing appointment turnout, eliminating human error, better patient experience, and better employee satisfaction.

In a larger sense of the technology sphere, Artificial intelligence and robotics have worked wonders in resolving the health sector's grave demands throughout the pandemic situation. Diagnostics, hazard identification, monitoring, mobile health, supply and distribution network, service automation, sterilization, faster research, and pharmaceutical development are available services. They have all benefited greatly from robotics and AI services during the pandemic.

5.1. RPA and IP Assets Management

When we talk about RPA, the first thing that comes to our mind is software bots. With the advancement of information science, RPA has gone far beyond our imagination and marked in different forms in various sectors. RPA is the science of developing software technology used to carry out repetitive works and minimize human errors intertwined with complicated business. From a healthcare perspective, RPA is used in different sectors to help people easily accomplish complex tasks, keep track of any data, schedule appointments of patients, client services, and simulate models and predictions that took years to complete. RPA helps streamline the front office support that is essential to provide better customer support. But every technique has both pros and cons. The main cons of this technique are the lack of proper investment in the initial development of RPA. As a result, IPR plays a significant role in the R&D investments of its competitors.[29]

[29] "Making Your Robotics Company a More Attractive Investment", *available at*: https://www.roboticsbusinessreview.com/unmanned/making_your_robotics_company_a_more_attractive_investment/ (last visited on August 06, 2022).

IPR law protects inventions, creative activities, and ideas, usually a large bag of intangible markets. It ensures they reach the right people and are put to proper use in saving lives. It is necessary to make patent innovations and inventions in the health sector. Therefore, it is clear that copyright and patents are needed to manage as an IP asset in RPA. Copyright helps protect the database records of every patient, and patents help protect the process of using the machines and the aesthetic aspect of the product. Since it bases on computer software, R&D of healthcare industries in valuation & economic benefit as valuation is an art that helps assess the value of the product through due diligence report. Due diligence is one of the essential aspects which is needed to be done by the team as it is helpful for the mathematical valuation of IP.

Firstly, we need to focus on the market-based value, which focuses on the valuation technique of the marketed product. Secondly, cost-based value, which focuses on the appraised value, defines the expenses of creation or replacement. Thirdly, values one of the criteria is predicated on an estimation of future financial advantages best economic benefits, which works on economic benefits for the future aspects. That helps in future earnings. So, in healthcare industries, it is one of the main aspects which talks about the ever-greening of product patents for future benefits.

5.2. Current Security Challenges through RPA in Healthcare

India's economy is expanding. Most individuals desire a health care file they can take with them wherever they go in the country. It is an urgent necessity and an idea that is rapidly expanding. Securing this data should go hand in hand with it. Security encompasses the protection of gathered data and the procedures and resources required to maintain, complete, and update it. While RPA and its "big brother" AI also are kinds of automation (where some form of automation system now undertakes a work previously performed by a human), there is significant differentiation between them. RPA is "robotic" because it is configured to execute a specific set of actions and will perform them frequently and consistently, exactly as planned.

Conversely, AI uses machine learning to adapt to results and changes in the environment. It improves when it generates less-than-ideal results or faces a situation it has not encountered before. As a result, AI is well suited to automating considerably more complicated jobs involving highly subjective judgments addressed by pattern analysis.

Unlike RPA, AI can analyse ambiguous, complex and complicated large datasets as RPA is pre-programmed. AI is being enhanced.

The following are some of the current data security problems:

5.2.1. Lacking Better Understanding

It may be a challenging issue to solve. Health care professionals who acquire patient data require some training in data security. Often a data leak happens because someone in the system clicked on a phishing email, allowing a defect in the system to exist. Owing to technological illiteracy, people are not always adequately taught to save data. If workers are not provided with fundamental instructions, it becomes challenging to arrest or, in certain situations, avert the breach. Health organizations should consider investing in this area, which is a lack of employment opportunities in the system.

Furthermore, the necessity of establishing new law to safeguard must commence with "why?" "why not?" "what and what not to?" and the consequences of these irresponsible actions.

5.2.2. Position Accessibility

Any infrastructure within the company that manages should configure patient data with role-based access. Role-based access operates on the premise that persons with restricted information accessibility will also grant limited access to data and other infrared.

5.2.3. Digital Literacy

Most health care personnel are not schooled in technology since it is not part of their daily job. However, anyone can learn how to use technology and software with minimal instruction. Digital literacy reveals the importance of internet security skills, such as choosing secure passwords, understanding and managing privacy settings, and knowing what to publish or not to share on social media, among other things. On the other hand, executives and managers must invest in technology that is easy to use. Most opt for glitzy technologies that might be difficult for most medical personnel on the ground. Whoever chooses the app should extensively evaluate the infrastructure in terms of usability, consumer access, and customer-centric considerations.

Overall, the effort and responsibility for a successful, safe, and secure system should share by the person who uses it and the executives who build the network.

5.2.4. Ethical Issues in Research and Biomedical Medicine

Like other new scientific approaches, biomedical ethical norms must be followed by AI in healthcare applications.[30] They are autonomy, advantage, non-crime, and justice. They manifest as permission, privacy, safety, voluntary involvement, independent decision-making, and so on, all of which should be considered.

In RPA, particular challenges are there, which are listed below:

Many of the jobs we undertake in healthcare are laborious and repetitive, resulting in hours upon hours of data input, with personnel frequently re-entering data that already exists and can be obtained elsewhere in the system.

It is frequently why the time lag between submitting a claim to a payer and getting reimbursement from them is so long. Healthcare workers also waste a lot of time gathering information from medical databases and clinical documentation for public health reporting. We are losing money and competitive advantage by significantly reducing the productivity of our human resources on boring jobs. RPA can solve a wide range of process difficulties in healthcare, encompassing invoicing and compliance, electronic health records, clinical documentation, banking institutions, outpatient appointments, and various internal and external customer contact areas.

5.3. Intellectual Property- Safeguarding Challenge for RPA

With AI challenging the boundaries of healthcare, there is an increasing need to safeguard decades of technology development and research. Inventions, creative works, and ideas are all protected by IP law, which forms a substantial pool of tangible markets. It is prudent to patent healthcare breakthroughs and technologies to guarantee that they reach the correct people and are put to fair use to save lives.

Robotics companies sometimes invest years of extensive (and costly) research before selling their products and achieving commercial success. The lengthy and expensive process of delivering lucrative goods underscores the importance of IPR, which

[30] G. Gopal, C. S. Crazzolara, *et.al.*, "Digital Transformation in Healthcare – Architectures of Present and Future Information *Technologies*", 57(3) *Clinical Chemistry and Laboratory Medicine* 328–335 (2019), *available at*: https://doi.org/10.1515/cclm-2018-0658 (last visited on August 07, 2022).

are required to recuperate up-front costs and ward off competitors attempting to capitalize on their rivals' R&D spending. We will now look at how acquiring and managing IPR in smart healthcare.

The ideal approach to the work of computer-related databases is to assess the compatibility between "data security" and "intellectual property regulation". The "practice, authority, and decision" parts of an individual's IPR are founded on the "practice, authority, and preference" aspects. The owner's work which involves literature, fiction, poetry, art, and film, needs protection as there's a chance of infringement. The Copyright Act makes it difficult to distinguish between data protection and security. Data protection aims to preserve people's privacy, whereas database protection is to protect the creativity and cost of gathering, validating, and displaying databases in novel ways. All partnerships follow the essential legal principles of entrance, anonymity, and confidentiality.

5.3.1. Copyright

What is an infringement in one country may not be so in another? When seeking to describe the complex cloud world in terms of copyright, the courts ought to be careful. In the cloud arena, the extent of copyright is in doubt. In this industry, the software is critical, with robots unable to function without underlying programming - robots without the software would effectively be unable to execute their intended jobs. While conventional robot functions include path-finding, control, locating, and exchanging data, some programming code tries to provide robots with the potential to generate artistic, literary, and musical creations. As a result, relying on copyright to safeguard such software is critical for the robotics sector. There is no specific liability for the copyright-protected content provided by intermediaries. Some countries encourage people and close friends and family circles to make copies of songs and movie files for private use.

5.3.2. Trademark

Trademarks are a fundamental means for AI and RPA in healthcare devices to express their identity to patients, medical professionals, and healthcare systems. Because trademarks are a unique method for customers to identify your company and its products, selecting trademarks that complement your company's current branding strategy is critical. Most likely, your organization pondered which trademarks to link with your

company, goods, and brand. Maintaining a reputable and very sound reputation as trustworthy and safe is especially vital in medical products. Patients may have to rely on the quality of your medical product to maintain their well-being, safety, and health for years to come. Thus, patients must learn to depend on it.

5.3.3. Patent

A design patent allows healthcare firms and experts to protect their AI-designed gadgets, goods, and equipment. Design patents provide the owner authority over a product's visual, aesthetic, and kinematic features. This will preserve the creator's rights in everything from the whole colour scheme of an AI-based user interface, information layout to the look and operation of a wearable activity monitor's touch notifications.

5.3.4. Trade Secrets

As few individuals have the technological know-how to reverse engineer these systems, firms usually rely on trade secrets to protect their concepts. The WIPO Copyright Treaty of 1996 makes it illegal to circumvent a technical protective measure to access copyrightable computer code.

6. Conclusion

Finally, the authors have contributed to the chapter about the role of RPA in smart healthcare with various advancements in smart healthcare management. Apart from RPA, Artificial Intelligence also meets the continuous requirements of pharmaceutical industries, therefore in the light of the Pandemic Covid-19. Now IPR has a significant effect that the authors have discussed in this paper, especially copyright. Patent and Trademark has a substantial aspect of RPA as it increases prospects for creativity and innovation. Since there is a lot of advancement in healthcare industries on RPA and Artificial Intelligence, various collateral data sets are available, termed as assets under IPR, known as IP Assets. The paper states the best ways to manage the IP Assets, which has significant inception.