Industry 5.0 Technologies in Healthcare Sector

Dr Archana Bakshi Asst Prof in Economics Mehr Chand Mahajan DAV College for Women Sector 36, Chandigarh, archanabakshi31@gmail.com	Dr Kanwaljit Kaur Guest Faculty, Economics UILS, PU, Chandigarh kkanwaljit27@gmail.com

Abstract

Technology is transforming the process of working, learning and updating operations. Businesses are visualizing futuristic and sustainable design development rather than undergoing monotonous processes. Scientists are evolving innovative techniques to move from Industry 4.0 to Industry 5.0 to bring improvements in Artificial Intelligence (AI), robotics and digital platforms. In the Healthcare sector, Industry 5.0 technologies have revolutionized medical treatments. Healthcare 5.0 lays stress on integration of machines, humans and technology so as to provide personalized equipment for testing, diagnosis and treatment. This paper explores the application of Industry 5.0 technologies in the healthcare sector and its impact.

Keywords-Industry 5.0, Healthcare, Artificial Intelligence (AI), Telemedicine, Robotics

Introduction

Technical progress is an engine of economic growth. Industrial innovations bring spectacular increase in productivity. The process of industrialization across the world has passed through diverse phases. Steam engines marked the beginning of First Industrial revolution in 1780. The second one in 1870 brought accelerated production with generation of electricity and mechanization. Information technology was the driver of Third Industrial Evolution in 1970, which brought automation in a big way. Since 2011, Industry 4.0 focused on Artificial Intelligence (AI), Internet of Things (IOT), Big Data (BD), Virtual reality and digital platforms. 'Human touch' revolution- Industry 5.0 is underway and bringing big improvements in AI, robotics, 3D printing and digital platforms. Industry 5.0 caters to the unique need of mass personalization of products by customers. It can be said that this is a drive from mass customization to mass personalization. This transition is going to be the combination of bigdata, artificial intelligence, specialized software, machine learning and intelligent algorithm which are connected to the Internet. This blending of technology, human effort and machine learning is particularly relevant to healthcare industry where it is referred to as 'Healthcare 5.0'. Healthcare 5.0 leverages advanced technologies to transform patient care, healthcare services, technologists, and the overall patient experience, bringing significant benefits to the healthcare sector. This technological revolution would also aim to achieve the Sustainable Development Goals (SDG) as envisioned by the United

Nations, especially SDG 3, which centers on ensuring healthy lives and promoting well-being for all ages.

Industry 5.0 revolution aims to bring about enhanced efficiency through advancements in AI aided by greater interaction between machines and humans. AI is a powerful and disruptive area of computer science, with the potential to fundamentally transform production processes. The Oxford English Dictionary broadly defines artificial intelligence (AI) as "the theory and development of computer systems able to perform tasks normally requiring human intelligence". Although until recently, most of the work in the field of AI has had largely an engineering and computer-science orientation, it is now considered as a general purpose technology. It is applied transversally across sectors and most importantly the healthcare sector.

Why AI in healthcare?

Healthcare systems across the globe face substantial challenges in achieving 'Health for All', and reducing out of pocket expenditures. Ageing populations, growing burden of chronic diseases and rising costs of healthcare globally are compelling governments and healthcare workers to innovate and transform models of healthcare delivery. The convergence between healthcare and technology through use of Industry 5.0 technologies has the capability to address some of these supply-and-demand challenges. It will make manufacturing of customized and tailor-made devices feasible and commercially viable and thus reduce healthcare costs as compared to conventional methods. The medical field is drifting towards personalization

of products aiming to measure variables like blood sugar, blood pressure, platelets etc through wearable devices. AI enables access to real-time health data and thus reduces time in diagnosis and treatment as compared to conventional methods. In a short time, high accuracy in diagnosis and treatment can be achieved. Tele health, which was relatively unheard of, is now a very significant term as 'New Normal'. These developments are steering a new human centric approach in healthcare sector.

Review of Literature

Industry 5.0 is engaged in building complex and hyperconnected digital networks. While doing so, it has not compromised long term safety and sustainability of an innovation ecosystem. It is self-confident to bind extreme automation and Big Data with safety, innovative technology policy, and responsible implementation science, which is enabled by 3D symmetry in innovation ecosystem design. Researchers expressed the possible solutions generated by Industry 5.0 technologies to problems raised during the coronavirus pandemic situation. They explained how personalized treatment procedures could be beneficial for the health experts. Human brains can intertwine with robots to increase productivity levels and yet cause no labour displacement. Besides, the research work comprehensively highlighted the elements, methods and concerns of Industry 5.0. Leveraging human creativity with intelligent machines could lead to efficient and customized products. They explained various concepts used in Industry 5.0 and identified potential applications across diverse sectors of the economy. Fifth Industrial revolution (Society 5.0) would prove to be the final bridge between humans and machines. Robotics and AI technologies can be

employed in healthcare sector and specially to control the spread of Covid-19.

Research Objectives

1. To explore the scope of application of Industry 5.0 technologies in Healthcare Sector.
2. To examine the effects of Industry 5.0 technologies on healthcare

Research Methodology

The present paper has a descriptive research design. Secondary sources of information were used to accomplish the objectives.

Application of Industry 5.0 in healthcare sector

Industry 5.0 has excellent potential for provision of healthy and improved quality of life though patient –centric approach. By employing AI technologies like machine learning, natural language processing, deep learning in healthcare, the data-processing and predictive capabilities of health experts can be upgraded. They will be able to manage their resources in a better manner and take a more hands-on approach to various facets of healthcare. Doctors will be facilitated to take quicker decisions regarding diagnosis. Hospital administrators can maintain health records faster and patients can receive more timely and personalized treatments. It is capable to find links between new links between genetic codes, powering surgery-assisting robots, automating administrative tasks, personalizing treatment options and much more. Hence Industry 5.0 simplifies the tasks of doctors, nurses and health administrators by reducing time, resource use and thereby the cost of supplying healthcare services.

In contemporary times technology giants like IBM, Apple, Microsoft and Amazon are progressively investing in AI technologies for the healthcare sector. From identifying new cancer treatments to improving patient experiences, AI in healthcare promises to be a game changer. According to Statista the artificial intelligence (AI) healthcare market, valued at $11 billion in 2021, is projected to be worth $187 billion in 2030. That massive increase means we will likely continue to see considerable changes in how medical providers, hospitals, pharmaceutical and biotechnology companies, and others in the healthcare industry operate.

Stages of Healthcare evolution

Healthcare 1.0: In this system, patients receive personal care from doctors, nurses or other related professionals.

Healthcare 2.0: In this phase, electronic health records were maintained for the information received from patients. Digital technologies were also used for this purpose.

Healthcare 3.0: In this stage, the emphasis was on educating the patients through various health campaigns and awareness programs regarding prevention of diseases.

Healthcare 4.0: In this stage, use of AI, IoT and big data were started for patient care and health outcomes. Emphasis also started on factors like social and environment factors of health determination.

Healthcare 5.0: This stage has focus on patient and personalized care of patients with the use of new technologies.

Types of AI Technologies in Healthcare

- **Machine Learning**: Machine learning is one of the most shared examples of artificial intelligence and healthcare working together.

It is a statistical system for fitting models to data and to 'learn' by training models with data. It is a broad technique in which procedures of IA can quickly process large quantities of clinical citations, identify patterns and make predictions about medical results with higher precision than the earlier methods. It is helping in the investigating patient records and medical imaging to learning new remedies. The data science is helping healthcare experts to improve their treatments and reduce costs. The most widespread utilization of traditional machine learning is accuracy in medicine.

- **Natural Language Processing (NLP):** It helps in the language processing, a very useful method to understand the complexities of problems.
- **Predictive Analytics:** This technology allows providers to spot correlations in healthcare data to spot sicknesses.
- **Speech Recognition: It** could help healthcare workers for more effective communication with patients. This would really help patients.

Application of Industry 5.0 in healthcare 5.0

Industry 5.0 can create a virtual avalanche for healthcare by serving in the subsequent points.

1. **Point of Care Testing-** Medical tests can be done with the help of lab-on-a-chip technologies, biosensors, microfluidic, bioanalytical platforms near the patient site. It is much appreciated by patients as it is conveniently done.
2. **Customized Medical Equipment** – Cobots, corobots or collaborative

robots help to produce customized goods and services**.** New technologies can aid in the manufacturing of smart medical parts, implants, bio models, scaffolds, prosthetics and instruments.

3. **Drug discovery** - This new wave of cognitive computing applications and infrastructure, collectively known as Industry 5.0, will transform pharmaceutical industry leading to innovations in drug therapies. Industry 5.0 can take facts from big data to make balanced innovations.
4. **Surgery** – Robots are designed to work with and alongside technicians, rather than replace them. Marked improvements in vision and sensor technology have made it possible to program the cobot to stop working if a person is too close. Also, cobots are much lighter and smaller — some the size of a desk lamp. They're significantly less expensive, easily programmable and quick to set up. Cobots translate surgeon hand actions into smaller, more accurate movements, allowing for less invasive procedures. Accuray's CyberKnife system delivers radiation therapy to cancerous tumors that utilize a pre-programmed treatment plan and can correct for movement in real time. Total knee arthroplasty (TKA) utilizing a cobot system to reduce axis malalignment. Bone cuts are 5 times more precise with the system. In Canada and the USA, cobots are used in Robotic Assisted Surgery, mounted with cameras to help doctors identify tumors to remove.
5. **Patient centric monitoring**- AI permitted technologies help track the body response with better performance. It makes feasible health care linked accurate information which can be shared numerically. All machines are linked to the Internet for collection and sharing of the

necessary data of the patient. It is an smart uprising for process optimization, quality upgrading, and cost and waste lessening. Vital statistics such as oxygen levels, Blood pressure, sugar levels of patients can be monitored at home with the help of Personalized Equipment like Intelligent devices like smart watches, sensors which are wearable too.

6. **Diagnosis** Automation in labs help to reduce time, money and reagents. There is potential to use AI in reading medical images, X-rays and scans, diagnosing medical problems and creating treatment plans.
7. **Health data analytics** – Technologies help in management of electronic medical record Health care, or healthcare, is the improvement of health via the prevention, diagnosis, treatment, amelioration or cure of disease, illness, injury, and other physical and mental impairments in people. Real-time health information on human body variables can be collected.

   This data can be placed to individual medical records, helping data mi ning for both individual patients and groups so that health professionals deliver Health care punctually. All machines are linked to the Internet so that necessary data can be collected and shared with the patients.

Effects of Industry 5.0 technologies on Healthcare Industry

AI can play a groundbreaking role in global public health care systems by transforming the processes of diagnosis, treatment and monitoring.

a) **Epidemic Control System** Digital technologies can share location or status of patient and thus aid the health authorities during epidemics.

Remote Monitoring and Telehealth reduce the spread of contagious infections.

b) **Data Management System** - The intricacy and rise of data in healthcare means that artificial intelligence (AI) will progressively be applied in this field. AI in healthcare is expected to play a major role in redefining the way we process healthcare data. Healthcare sector has a broad landscape of big data related to patients, doctors, nurses, OPD entries, IPD admissions, AI helps in the creation of digital knowledge network which

further provides proper medical information and vital patient record. Machine Learning procedures are capable of communicating health data to respective health professionals.

c) **Better customer Support-** Industry 5.0 enables provision of patient services 24/7 through the use of digital technologies. This technology has the potential to improve patient outcomes by providing personalized treatment options in an efficient manner.

d) **Gross Value Added:** Gross Value added of healthcare industry can increase as production of customized products and services will have higher value.

e) **Promote medical tourism**: It will help in promoting medical tourism as medical services are digitally advanced and up to date. Personalized Treatment Plans now become cost effective

f) **Promote human capital formation:** The most significant role will be promotion of human capital formation through vocational training in robotics, AI and data science. It will further help in the development of the economy.

g) **Sustainable solutions**: The Industry 5.0 technologies will ensure minimal generation of waste. It will lead to sustainable solutions, the need of the day.

h) **Economical solutions:** Industry 5.0 technologies in healthcare will help in the reduction of production cost. It will lead to the best and optimal solutions**.**

Challenge in the Implementation of Industry 5.0

Challenges are everywhere and Industry 5.0 is not an exception. Rather, here the challenges are more as data privacy is involved.

- **Data Privacy and Security:**

  Data privacy and security are the main concerns in its implementation. These technologies pose new privacy and data security risks to patients. We need strong security policies for its effective implementation. We need explicit guidelines and rules for the collection of patient data. It must be according to the ethical and legal standards.

- **Ethical and legal Considerations**

  Protection of patient privacy and confidentiality is a crucial ethical consideration. Legal issues related to laws governing data privacy, security and informed consent must be taken into account. Data collection and data transfer must be according to the ethical and legal standards. For this, it is crucial to engage in ongoing stakeholder dialogue. The use of industry 5.0 in healthcare must be governed by clear rules and regulation and standards for data privacy must be developed beforehand.

- **Skilled workforce**

A very pertinent issue in the effective implementation is the need of skilled workforce. We need workers who are highly skilled and have required knowledge. Workers are needed to design, create and implement this new system. It implies that we have to educate and trained the current workforce so that they can successfully use the technologies which are developed by industry.

- **Cost and Infrastructure**

  Implementation of industry 5.0 requires huge amount of money also as it requires infrastructure, hardware, software as well as staff training along with routine maintenance, upgradation and replacements. There can be patients who cannot afford the additional expenses and are not interested in it.

- **Acceptance and adoption by patients**

  Some of the patients might not be interested to use these cutting-edge technologies. Perhaps they don't trust technologies like wearables or telemedicine. The success of these technologies depends on patients' acceptance. Education and awareness is needed for the successful implementation of Industry 5.0 in healthcare,

Policy Recommendations

1. **Promotion of Start-ups:** Start-ups endorsing Industry 5.0 technologies in healthcare industry can be undertaken by the Government. Seed Money can be provided by MOHFW. MOHFW is

already providing for other activities. It will enhance the entrepreneurs in the country and will reduce unemployment. Our youth is migrating to other countries. It will check migration also. It will help in the capital formation of the country.

2. **Vocational courses:** Vocational courses related to application of new technologies (AI) can be started for senior secondary students as well as graduates. These are employment oriented and it is easy to learn along with their regular studies. NEP 2020 is already in this direction. This is AI era. We must adopt it. AI courses should be part of curriculum in all streams of graduation.
3. **Orientation Programs**: In order to spread the use of new technologies, existing healthcare staff can be up skilled by special orientation programs. These programmes can be arranged in Schools. Colleges and Universities. With these programs, we can get the full benefit of new technologies.

Conclusion

Innovation has become imperative in modern medicine. Industry 4.0 had already transformed treatment processes with Machine Learning and Artificial Intelligence. With introduction of Industry 5.0 technologies, health experts may focus on specialized tasks so that routine activities can be taken care of by robots. Industry 5.0 has made mass personalization into reality- Personalized medical implants, artificial organs, body fluids, and transplants can be manufactured precisely in this revolution. Thus Industry 5.0 has the capability to revolutionize healthcare sector specifically enhancement in patient outcomes and improvement in healthcare delivery which will change the entire healthcare system.

References:

Basulo-Ribeiro, J., & Teixeira, L. (2024). The future of healthcare with Industry 5.0: Preliminary interview-based qualitative analysis. *Future Internet, 16*(1), 68. https://doi.org/10.3390/fi16010068

Bresnahan, T. F., & Trajtenberg, M. (1995). General purpose technologies "engines of growth"? *Journal of Econometrics, 65*(1), 83–108. https://doi.org/10.1016/0304-4076(94)01696-T

Haleem, A., & Javaid, M. (2019). Industry 5.0 and its expected applications in medical field. *Current Medicine Research and Practice, 9*(4), 167–169. https://doi.org/10.1016/j.cmrp.2019.07.001

Maddikunta, P. K., et al. (2022). Industry 5.0: A survey on enabling technologies and potential applications. *Journal of Industrial Information Integration, 26*, 100257. https://doi.org/10.1016/j.jii.2021.100257

Nahavandi, S. (2019). Industry 5.0—a human-centric solution. *Sustainability, 11*(16), 4371. https://doi.org/10.3390/su11164371

Özdemir, V., & Hekim, N. (2018). Birth of Industry 5.0: Making sense of big data with artificial intelligence, "The Internet of Things" and next-generation technology policy. *OMICS: A Journal of Integrative Biology, 22*(1), 65–76. https://doi.org/10.1089/omi.2017.0194

Sarfraz, Z., et al. (2021). Is COVID-19 pushing us to the fifth industrial revolution (Society 5.0)? *Pakistan Journal of Medical Sciences, 37*(3), 808–812. https://doi.org/10.12669/pjms.37.3.4525