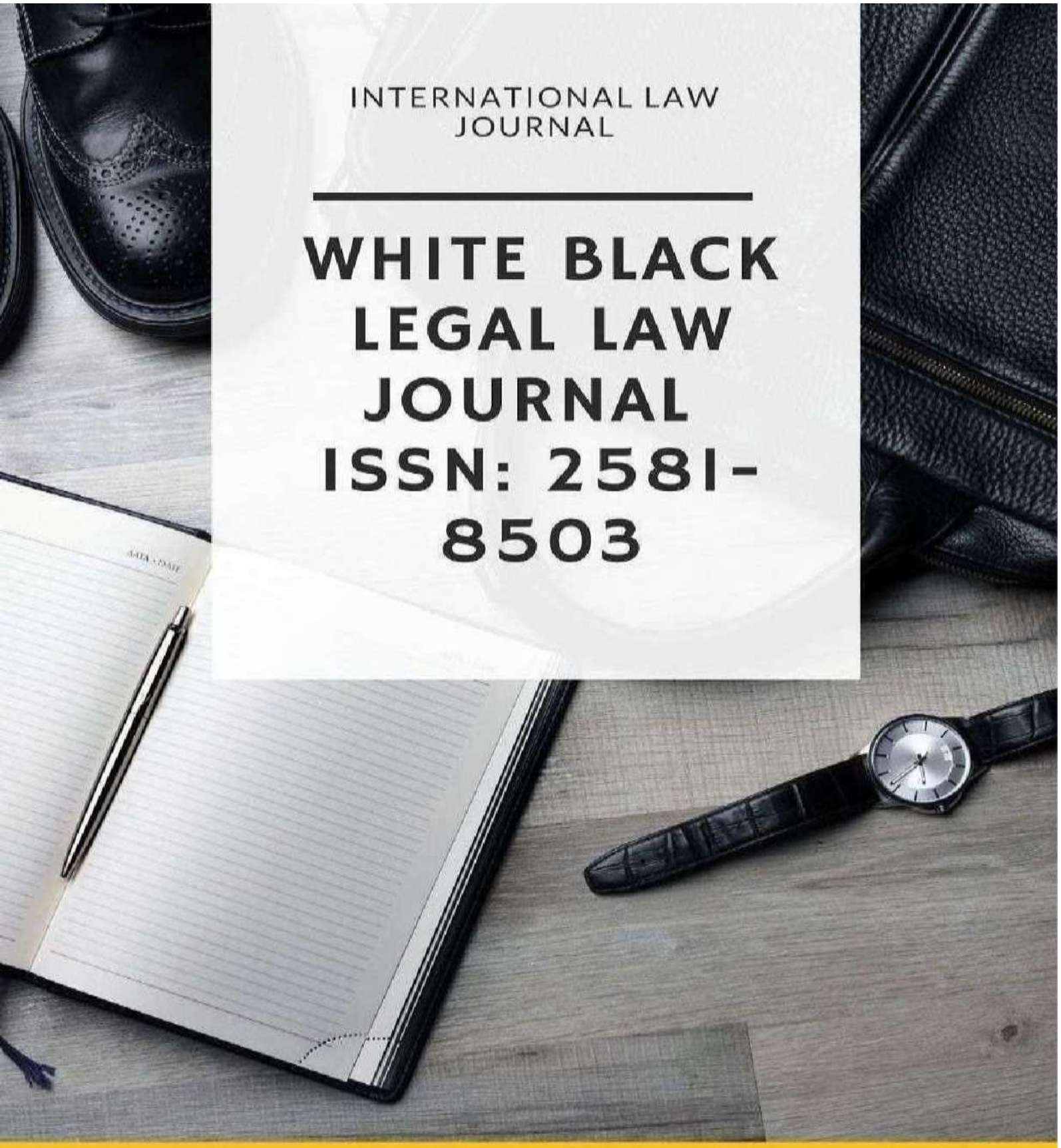

INTERNATIONAL LAW JOURNAL

# WHITE BLACK LEGAL LAW JOURNAL

ISSN: 2581-8503

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# THE INDUSTRIAL REVOLUTION OF CODE: ASSESSING LIABILITY FOR DAMAGES CAUSED BY AUTONOMOUS AI IN THE WORKPLACE.

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Indian industries are transforming in to industry 4.0 along with artificial intelligence and robotics. Industry 4.0 is the fourth revolution of the digital world. The development of technology: artificial intelligence and robot come under industry 4.0 as the applications such as IOT (Internet of Things), automation, and cloud computing and big data also evolved in this period. Robot and artificial intelligence are two different fields but in industry 4.0 they are evolving together with strength and power.[1] As stated by the report of PWC in the year 2017, that India is depended on three major adherent that are the government bodies, private sector and revolution and research in artificial intelligence. ML (machine learning) is also very helping technology for promoting own concert through the deriving data.[2] Timely certain suggestions and steps need to be taken from these three major adherents (specially the researchers and the developers) for the impact on the employment, challenges in implementation, and the evolution be eco-friendly in nature. In India there are several entrepreneurship and initiatives in the fields of artificial intelligence, robotics and machine learning. The Government of India and Ministry of Commerce and Industry objectives is to connect AI with the trade and industry alteration and modification.[3] Kamakoti, he is the associate dean at Industrial Consultancy and Sponsored Research (ICSR) in IIT Madras and he is also member of National Security Advisory Board, Government of India. Kamakoti in 2018

[1] Ghosh, S. (2022, August 29). Top 6 industries being touched and transformed by AI. telegraphindia.com. https://www.telegraphindia.com/edugraph/career/top-6-industries-being-touched-and-transformed-by-ai/cid/1883262

[2] Kaushik, N. (2021, June 4). 5 Indian industries using Artificial Intelligence for innovative solutions. TechGig. https://content.techgig.com/technology/5-indian-industries-using-artificial-intelligence-for-innovative-solutions/articleshow/83236715.cms

[3] Manasa.G. (2022). Top 10 Indian Companies taking Robotics to Next Level. Analytics Insight. https://www.analyticsinsight.net/top-10-indian-companies-taking-robotics-to-next-level/

bring up the relevancy of artificial intelligence and its influence in the industry revolution.[4] The industries that will be connected with artificial intelligence and AI robotics are education, defence, financial service, manufacturing of goods, agriculture, and so on. Also, Kamakoti has provides the government with the impact on economy after the combining of AI, robotics and industry.[5] 2018, financial statements also show the investment of Indian Government in the AI and robotic research in Industry 4.0. Therefore, all these strategies are long term plans and promoting of research and funding the programs which is much needed. The government is also carrying out operation on the scheme for promoting technology revolution on AI development i.e. Technology Incubation and Development of Entrepreneurs (TIDE).[6] Government has also made developers free and open for the companies to share and support Make in India and Digital India.[7] Large percentages of researchers, entrepreneurs and developers have already invested in these mechanism and innovation. Economy's large revenue is coming from the agriculture sector nearly 18% of total gross domestic product (GDP). As India is earning large amount through agriculture sector, hence technologies in this sector will lead to more growth.[8] Manufacture sector also contributes around 25% as recorded in the year 2022 by India Brand Equity Foundation (IBEF), 2018. Concluding to AI it will be having beneficial result when combined with the defence, education, transport, machines, etc.

## APPLICABILITY OF ARTIFICIAL INTELLIGENCE AND ROBOTICS IN DIFFERENT INDUSTRIES

1. Agriculture- agriculture and other confederated such as fisheries and forestry statement around 13% GDP (Gross Domestic Product) in year 2013 and approx. 50% of employment.[9] There are some challenges in this field they are soil degradation, law technology practices, capital for the farmers, fertilizer and misuse of fertilizers.[10] Thus

[4] Ibid 54
[5] Pandit, S. (2022, April 13). Indian factories are rapidly adopting robots, AI and IoT. The Times of India. https://timesofindia.indiatimes.com/business/startups/trend-tracking/indian-factories-are-rapidly-adopting-robots-ai-and-iot/articleshow/90814173.cms
[6] Roy, A. (2023, April 6). Best Robotics & AI Stocks In India 2023 - Complete List of Stocks. Trade Brains. https://tradebrains.in/best-robotics-ai-stocks-in-india/
[7] Takyar, A. (2023, April 27). AI Use Cases & Applications Across Major industries. LeewayHertz - Software Development Company. https://www.leewayhertz.com/ai-use-cases-and-applications/
[8] Top Artificial Intelligence Companies in India. (2023, February 15). Deccan Herald. https://www.deccanherald.com/brandspot/pr-spot/top-artificial-intelligence-companies-in-india-1189155.html
[9] Artificial Intelligence in Indian Agriculture. (2022, June 17). Invest India. https://www.investindia.gov.in/team-india-blogs/artificial-intelligence-indian-agriculture#:~:text=Agriculture%20is%20one%20of%20the,and%20reduce%20food%20production%20costs.
[10] Robotics in Agriculture - INSIGHTSIAS. (2021, September 10).

artificial intelligence along with the mechanism of robotics can fix these challenges in smarter ways of consumption, production, distribution and storage. The autonomous machine such as AI robot with its intelligence and application can fix the crop health and spread of disease, health of farm animals like cattle's, improving quality of land and much more.[11] Besides the artificial intelligence, robots with AI can manage proper packaging and storing of goods with less wastage.

The agriculture plays a critical and essential role in India like in economy, employment and most importantly people eat food that is grown with hard work. Though agriculture sector being so pivotal, it faces many challenges such as climate change, demand of food (as India is the most populated country) and restricted resources. To overcome these challenges artificial intelligence and robotics will be able to help out with the solution and be part of modern Indian agriculture. The agriculture sector traditional depends on human work or labour. However, advent of the technologies will come up with new probabilities for better sustainability, productivity and efficiency.

Applications of the technology in the agriculture sector- Product monitoring and pesticides detection- AI algorithms with the drone can capture the high resoluteness of the field, and alert early detection of the nutrient deficiency and pest. Farmers at initial stage can manage the crop production and enhance the productivity. Autonomous Farming- the AI robots can perform many tasks such as weeding, seeding, watering and harvesting. This will help in speedy work, labour wages, cost efficient and accuracy of the work. Supply of Goods- the intelligence will analyse the market demand geographically. This will be beneficial in storage, marketing and transport. Increase Productivity- the artificial intelligence and robotics enable to the farmer to make data driven resolution; it benefits in production cost and improves farming. Economic Growth- the innovation will lead to economic growth by fostering technology development, more profit in earning and employment opportunities (such as managing the AI and robot, keeping check on the working and much more). Challenges in the sector- to adopt the technology there are several challenges such as high cost in building the infrastructure, people need high knowledge to make AI and robots work, privacy and security is the major concern. The future of artificial intelligence and robotics in the agriculture sector: for the development, there is need of government support such as government policies, fund, guidance on how to use, encouraging farmers, knowledge through experts and technicians. By

INSIGHTSIAS. https://www.insightsonindia.com/science-technology/robotics/robotics-in-agriculture/

[11] Admin. (2021, January 18). Different Types of Agricultural Robots & Their Importance. Blog - TractorJunction. https://www.tractorjunction.com/blog/different-types-of-agricultural-robots/

the adoption, India can pave modern agriculture, socio- economic development that will be immense development of 21st century.

2. Education- smart learning applications are developed since long back time and some of them are in use. But with the applications of artificial intelligence there will be advance in education system such as natural language and much more.[12] AI combined with education can help in answering the queries, narrative answering and most importantly time will not be wasted in searching or analyzing the concept. It is also good for teachers as it decreases the burden of attending every student individually and teachers can learn too from the system and clarify students on topic.[13] Presently Chat GPT, Casper AI, Chatsonic, etc. are playing important role in this field. The Indian entrepreneurs are working on the system of education to make it more interesting and easier.[14] Feedback and suggestion given by the students, researcher will be helpful in developing the applications. Robotics can help in generating screening like metaverse that will help students explore more and understand well. It is said that education is the key to a better world but relevant education is what is needed in this world of information and to tackle privacy issues. Artificial intelligence and robotics are two different technologies which are also emerging in the education sector and are going to be immersive development. In a country like India education system faces various challenges such as limited resources, level of accessibility, large population and lack of quality infrastructure. Artificial intelligence and robotics can also cause certain challenges, while implementation in education system. First infrastructure and the resources it is one of the primary challenges as many institutes in India, lack in software, hardware, internet connectivity, to support these technologies. Also, for the infrastructure, large investment is required. Second issue that arises is the equity and inclusion. It is one of the critical concerns in adopting robotics and AI in education system as the technology is limited to geographical areas. The opportunities are tough to provide in rural areas and marginalized communities. Third is the ethical consideration means the implication of artificial intelligence and robotics in education needs to be careful. The concern regarding the fairness and biasness in algorithm decisions making as artificial

[12] Veda. (2022). Robot Teachers in India: Unleashing the Untold Stories. Analytics Insight. https://www.analyticsinsight.net/robot-teachers-in-india-unleashing-the-untold-stories/

[13] Nataraj, P. (2022). How schools in India are integrating AI in their curriculum. Analytics India Magazine. https://analyticsindiamag.com/integrating-ai-curriculum-cbse-international-schools-humanoid-robots/

[14] Ians. (2019, September 1). Robots turn teachers in Bengaluru school, thanks to AI | Mint. Mint. https://www.livemint.com/technology/tech-news/robots-turn-teachers-in-bengaluru-school-thanks-to-ai-1567336339210.html

intelligence and robotics can be on societal basis. In traditional ways, teachers or the professors, while teaching take care that students are not biased while explaining the subject. It is essential to develop software and feed the task in AI and robotics that is neutral. Lastly, there is need of teachers and students to interact in a physical mood as they learn more in interactive sessions. This can be a disadvantage while AI and robotics in education sector. Artificial intelligence and robotics application are likely to have significant impact on education system. The potential of the technology has attracted interest among government, public and academic. The smart intelligence with the potential will be making academics to higher education (HE). The HE will change the education system, the way of learning, role of researchers and teachers, and Work of institutions. The higher education will be wide and deep. The involvement of human agency in AI system and robots will empower the access to learning data; it may also change the role of staff and teaching traditions.

But India being the most populated country; it is tough to teach in rural areas with the quality of education. Hence, AI and robotics can play an essential and crucial role in those rural areas. Therefore, the technology can lead to potential developments and benefits in Indian education sector, leading to improved learning and enhanced and magnify educational experience for the students. With changing dynamics and increasing competition the ways related to the same must be adopted and internet has been one of the best inventions of man-kind there must be a proper and rational use of the same to make India a digital nation.

3. Manufacturing and Supply Chain Management- the coercion in the society for industry 4.0 has led the manufacturers to convert their industries to smart applications and make digital mechanism through Internet of Things (IoT). With the applications of artificial intelligence and robotics the manufacturers have flexibility, better understanding, visualising, and operating of system in the supply chain procedure.[15] AI also helps in statistical modelling technology, auto correction processes and sales scenario. Also, reduces poor cost and quality of work and complete good.[16] with the innovation in technologies of artificial intelligence and robotics the sectors of manufacturing and supply change management have also revolutionised. These technologies have lead the managers to overcome the traditional methods, automation, complex, task, limitations

[15] DQI Bureau. (2023, March 6). Using AI and IoT-powered robotics in supply chain management. DATAQUEST. https://www.dqindia.com/using-ai-and-iot-powered-robotics-in-supply-chain-management/

[16] How Robots are Upgrading the Supply Chain Industry. (n.d.). https://www.honeywell.com/us/en/news/2022/04/how-robots-are-upgrading-the-supply-chain-industry

and has enhanced decision-making processes and analysing operations on an unprecedented scale. It is essential to understand the fundamental concept of artificial and robotics in manufacturing and supply chain management. Artificial intelligence is the development of computer system that can perform task that are equal to human intelligence, reasoning, perception and learning. Whereas robotics on the other side involves the creation, design operation of machine and programmed to specific tasks. These technologies together innovate autonomous technology. The evolution of AI and robotics in manufacturing and supply chain management was tracked back in 20th century. The applications like computerizing power, sensor, technologies and algorithms have given rise to artificial intelligence and robotics adoption in various industries. In modern world that is in today's world, AI and robotics are widely used in logistic operations, transportation, networks, manufacturing, plants, transforming traditional supply, chain processes, warehouse and redefining industry standards. The robotics process automation involves a software in which the robotic process improves efficiency, operational eligibility, reduces errors and eliminating manual interventions. The work such as order processing, data, entry, quality, control and inventory management is done through the use of AI robots automated. This free human worker and make them focus on more valuable activities. The technology is also used in industries where industrial robots play a very critical role in manufacturing, high-speed and production processes. The AI robots having advances and machine vision system can do task such as material handling, welding, packaging and assembling. The human and robot collaboration known as co-bots can work alongside with human operations which enhance productivity and also ensures safe environment of working. Another application is predictive maintenance which monitors equipment performance and predictive maintenance needs. They keep record of maintenance through which they identify patterns, potential failures and timely give alerts for the service. The applications of robotics and artificial intelligence on manufacturing sectors are more on private sectors and government. Therefore, the feature of quality control and inspection minimises the waste and rework in the plants Conclusion, the artificial intelligence and robots' technology develop the traditional process which optimise operations and performance task with consistency and precision. The significant role of quality control and inspection through smart machines are of great benefit. Therefore, this technology will give competitive edge in increasing fast and composite global marketplace.

4. Financial and Banking Services- artificial intelligence and robotics have broad diversity in the finance sector, though India is not using the technology fully in this sector. Chat bots, a feature in AI technology helps in fascinating the conversational flows, provides intelligent agents that are the robots, financial planning, efficient customer service, to detect the fraud and provide mechanism preventing from money laundering and fraud related to money.[17] Huge amount and large transactions are made every day through the channels such as ATM, credit card, online banking, Google pay and many other modes.[18] AI and robots experts inserted helps in detecting the fraud at earliest and keeps record of the transaction in sorted manner. The smart technologies will be at high need when government schemes such as cashless India and Jan Dhan will be adopted by large number of populations. Further risk like breach and fraud un banking sectors such as malpractices, low money exposure, counterparties and more will be detected by the system of smart intelligence at initial stage. Therefore, the finance sector is critically important for the economy of India. The use of artificial intelligence and robotics in the field of financial and banking services has evolved in recent years. The factors such as availability of big data, advancement in computerizing, power and improvement in algorithm has facilitated the evolution of these technologies in the banking sector. The RBI (reserve Bank of India) is the central banking institute of the country. It has also encouraged the use of AI and robotics the technology in banking sector will lead to the improve efficiency, foster innovation and enhance customer/client satisfaction. Customer service and personalisation: the smart technology powered chat, ports and virtual assistants. The customers no need to contact bank in traditional ways. These assistants can answer queries, perform routine transactions and assist any time. The NLP that is natural language processing is also feed it in the chat bots to understand and give response to the customers for their queries. Further, the smart algorithm also analyses the customer data and recommends the marketing campaigns and enhancing the overall customer experience.

The technology of artificial intelligence and robotics also helps in detecting the fraud and provide risk management through its mechanism. It is capable of identifying suspicious patterns that are related to fraudulent behaviour. AI system can also alert on predict loan

[17] Appinventiv. (2023, February 13). Key applications of artificial intelligence (AI) in banking and finance. https://appinventiv.com/blog/ai-in-banking/

[18] Banking on Artificial Intelligence (AI) - Wipro. (n.d.). https://www.wipro.com/business-process/why-banks-need-artificial-intelligence/

defaults, credit worthiness and evaluate investment risk. Further the technology also provides Robot advisory and wealth management. It is the automated investment advice and management service for the customers. The platform provides with individual risk profiles, market trends and financial goals that can be personalised according. The technology also provides in accelerating loan processing and customer on boarding in the financial sector. With the robot automation, the loan applications can be approved, assessed and validated more efficiently. It also reduces the time taken for enquiry. Therefore, the smart technology minimises the physical paperwork and time. Though data privacy and security are the major concerns regarding the use of AI and robotics in financial and banking sectors, the financial institutes must ensure the security of the robots to protect the sensitive data of the customers and breach of data. The storage, collection and process of customer data must be maintained safely. The ethical issues, data and privacy, concerns, work force displacement and regulatory compliance is required be focused on.

5. Defence and National Security- the artificial intelligence and AI robotics can be useful in the field of security and defence as well. It can be strength full for the infrastructure, power plants and the places that are endangered to attacks and risks.[19] The smart technology can be used in defence and security field by the anomalous behaviour of the technology, prediction through the sensors, the recognition through the patterns and much more technical and significant in the field. Indian government is crucially focusing on the integration of artificial intelligence and robotics in the national security and defence of India. India faces complex security issues.

The smart technology has potential to improve the operational efficiency, and has the capability and ensures the safety of the citizens. The Indian government has gathered the smart intelligence and surveillance to autonomous and unmanned aerial systems. Their AI and robotic technology advanced to augment human decision making, enable more precise, and effective reciprocation to threats. The national security application includes the border security, cyber defence, counterterrorism and disaster management. The artificial intelligence and robotics with the potential of smart thinking can assist the operations by providing predictive modelling and real-time analyses. The technology can empower security agencies through potential benefits of the AI and robotics. The enhanced operational efficiency, it can be done through data analysing of logistic management, it can reduce human errors and can

[19] Siddiqui, H. (2023, January 19). Is India prepared to use robots in tri-forces? Financial Express. https://www.financialexpress.com/business/defence-is-india-prepared-to-use-robots-in-tri-forces-2954095/

give effectiveness of operations. Improved situational awareness through satellites, facial recognition and analysing threat. The innovation provides accurate and timely information and gives swift responses on the threats. The challenges and considerations in the defence and national security include legal and ethical implications, the challenges such as privacy, potential for autonomous robots and weapons. The adoption of artificial intelligence and robotics in the field of defence and national security can also reduce the risk of human life. The soldiers who fight on the border and in the war for national security and lose their life can be replaced with autonomous robots. The AI robots are utilitarian with regard to the jobs that are risky and unsafe for human being like deep water probes, hostile territories, space exploration, detecting mines, these are the few activities.[20] The AI robot usages in this field began with Unmanned Ground Systems (UGS) and Unmanned Aerial Vehicles (UAV) where missiles and bombs are guided.

6. General Utility Services- Utilities such as power, utility companies and energy, the machine learning, smart technology i.e. AI and robotics have high potential in this field and reduces wastage, storage, predictive infrastructure, maintenance and grid operation.[21] The clients a can give their preference and cost. The smart application through its generation can customize accordingly.[22] The wealth information of cities can be recorded through police flings, large number of transportation tickets, sensors inserted on roads, cameras, malls, airports, tax information, etc. there are endless sources of improving public services. Artificial intelligence and robotics through their ability of automation have integrated in various industries in India. One of the sectors that is benefited from the application is general utility service which encompasses services like waste, disposal, transportation, energy, distribution, healthcare and water management. India is a country which is growing rapidly in population and facing various challenges in infrastructure. The adoption of the smart technology in general utility service sector can help India in many beneficial ways. India is the most populated country in the world, due to which it faces numerous challenges to provide service to

[20] Chowdhury, A. P. (2017). AI and robotics are revolutionizing Defence sector, Indian Army takes credence. Analytics India Magazine. https://analyticsindiamag.com/ai-robotics-revolutionizing-defence-sector-indian-army-takes-credence/

[21] Robotic Utility Mapper Reduces Costs, Improves Safety During Infrastructure Planning and Maintenance. (n.d.). Volpe National Transportation Systems Center. https://www.volpe.dot.gov/sbir-success-stories/robotic-utility-mapper

[22] StartUs Insights. (2021, November 22). Discover 5 Top Robotics Startups impacting Utility Companies. https://www.startus-insights.com/innovators-guide/discover-5-top-robotics-startups-impacting-utility-companies/

its citizens. Government has immense pressure on rapid urbanisation with limited resources. Currently in India general utility service includes management. The outdated tradition of organising the country is not essential for the population/citizens. The technology of AI and robotics can benefit the country in general utility service. Through many ways, such as efficiency of the innovation, improve decision making that will provide pattern trend and lower the risks. Automation and remote monitoring, the robotics can play a crucial role in various tasks such as water collection, maintenance, activities and infrastructure inspections. AI and robots can further help in improving the model and infrastructure of railways, telecommunication, nuclear plants, towers, power stations, etc.

7. Energy Sector-the technology can be used in energy sector in many ways. Such as making clean energy, reliable energy and affordable for several challenges counting poverty. Google is already using the AI reducing energy that is now reduced to 41% means saved several million dollars.[23] National Grid (UK) is also working with deep mind committee/ team, the same was used by Google for the opportunities. The aim of deep mind is to reduce the energy by 11% through energy supply to the nation grid. This is done through the data recorded for the prediction and learning. IBM is connecting with the team for the energy development in USA. IBM states that the energy is 30% more accurate than the solar forecasting model. Here artificial intelligence is useful for understanding the consumer behaviour. The companies are inserting smart meters for the information as at different places there are different requirement of consumptions. Artificial intelligence has the potential to learn from patterns, make informed decisions, record amount of data, the application is revolutionised in the energy sector in India. The technology also provides with the optimizing the demand forecasting and management system. Robotics is used for performing complex task, autonomously which are tough for human being to perform or risk their life. Robots are used in various areas such as in pipeline, motoring, offshore operations and maintenance of power plants. In India, the artificial intelligence robotics plays a crucial role in enhancing safety, increasing operational efficiency and reducing human risk in the energy sector. the energy generation, artificial intelligence and robotics, having advanced algorithm and deep learning techniques were very useful for

[23] Top 10 applications of AI and Robotics in Energy Sector. (2022). Energy Magazine. https://energydigital.com/top10/top-10-applications-of-AI-and-Robotics-in-Energy-Sector

thermal and hydroelectric power plants whereas robotics in solar farms and wind turbines. The technology algorithm in very less time provides detecting anomalies and facilitating effective load balancing. Though the smart technologies have numerous advantages but there are also certain challenges and limitations faced by Indian energy sectors. One of the major concerns is investment for implementation of these technologies that is the cost associated with skilled personnel, equipment and infrastructure. Also, data, privacy and security are the sensitive issue Related to cyber threats. Moreover, the technology requires regulatory framework for fair competition and ethical use. Indian government aims at increasing renewable energy and ensures universal energy access; the smart technologies can play a crucial role by helping government in suggesting, improving the reliability, managing and sustainability of energy infrastructure. The only conditions with the technology that they require efficient buildings and smart sensors to work on. The policymakers and the researchers need to make proper framework on the challenges. The adoption of the smart technologies in India in energy sector will help developing and generating the energies.

8. Assistive Technology for Physically Challenged- this challenge is still untapped in India. The AI has feature of capturing automatic capturing. AI technology has potential to make easy everyday activities for people with speech, mobility or visual and making them opt high productivity.[24] India is lacking in development as compared to many other counties, there are barriers while developing in some sectors like affordability. Though the combination of AI with other technologies like 3D, IoT, cloud can make smart prosthetics.[25] In 2022, Beijing Winter, Paralympics games robotics helped many people with disabilities. A device that just weight 3LB., cost around $400 and it can easily be made in garage with parts that are easily available. The innovation helps blind people to walk with navigation; robots cannot only help people with mobility. They can also assist disabled people with daily tasks like dressing up in the morning. Computer science and artificial intelligence laboratory, the researchers at Massachusetts Institute of Technology, have developed algorithm for motion control. The application is made for the robot to ensure early walk with physically able human. The scientist programmed it in a robot to help a person with mobility by putting the device in the

[24] Romeo, J. (2022, March 6). Robotics Promises to Help People With Disabilities. Robotics 24/7. https://www.robotics247.com/article/robotics_promises_help_people_disabilities

[25] RoboticsBiz. (2020). Top 5 assistive robots for people with disabilities. RoboticsBiz. https://roboticsbiz.com/top-5-assistive-robots-for-people-with-disabilities/

pocket in north-eastern university the bio engineering graduate students have designed a robotic hand which produces sign language. Samantha Johnson, a student name the device 'TATUM' i.e. Tactile ASL Translational User Mechanism. There for new smart technologies can also change human life who are disabled. The AI robotics has potential to advance prosthetic limbs and exoskeletons. The smart algorithm technology and the sensors can interpret the human brain and muscles that are unable to do natural moments. Wheelchair and mobility devices, the artificial intelligence and robotic with autonomous navigation and route planning can be beneficial for people who need it. These facilities enable the user to navigate the environment more safely and easily. Assistive robots, the technology with smart algorithms that is artificial intelligence, enables the robots to assist the disabled person with various task, such as opening door, providing companionship and fetching objects. The AI robotics, can assist physically challenged person with controlled applications, such as lights and other devices in their surroundings. Therefore, the technology is very beneficial to provide service to physically challenge. The technology also holds immense potential, which two people having disabilities and other challenges.

9. Public Health and Safety- Healthcare system is India is already under coercion, the reason is largest population, number of hospitals, facilities in medical sector, finance in medical and professionals. At some places people still don't have medical service or are out of budget when it comes to medical expenses.[26] Therefore, AI and robots are very much required in this field, as they with autonomous capability can give treatment and at low cost (IANS, 2017- Improved Outcomes and at Lower Expenses). Start-ups in India are working on the high need of AI in health sector. Smart technologies are also useful like iPhone watch that analyses the heart beat and call for emergency treatment by itself giving information to the authority. Remote area information for diagnosis, enabling tracking, monitoring health, connectivity with specialist is the concerns. The latest development in the field is of AI robots that by the assistance of human doctor can now do operation under guidance.[27] Other feature of AI is the early detection of the illness like detecting cancer at early/ initial stage. Key features how

[26] International workplace.com. (n.d.). Robots in the workplace: an emerging risk to health and safety? International Workplace. https://www.internationalworkplace.com/about-us/news-and-insight/robots-workplace-emerging-risk-health-and-safety

[27] Sarker, S., Jamal, L., Ahmed, S. K., & Irtisam, N. (2021). Robotics and artificial intelligence in healthcare during COVID-19 pandemic: A systematic review. Robotics and Autonomous Systems, 146, 103902. https://doi.org/10.1016/j.robot.2021.103902

artificial intelligence and robotics through their applications are making impact on public health and service. Firstly, disease, detection and diagnosis. The smart sensors can analyse the medical data of the patient, lab results and imaginary scans. Through these, the technology can assist and diagnose the disease. Also, the AI and robotic has has potential to identify the unnoticed disease at early stage. The artificial intelligence revolution is also beneficial in pharmaceutical industry by analysing chemical, genomic and clinical data for new drug, new design, not use and predict drug efficacy. The AI robots are also capable of giving treatment in the remote areas where doctors cannot reach. The AI robots can also perform tasks like simple collection, disinfection, medication, delivery, and also reduces the workload on healthcare workers. There is also minimum risk of human errors. Robots are now also capable of performing surgeries through the command of the doctors. The innovation can also treat the mental health support. Through the AI virtual assistant and chatbots. Through their assistance, they can provide emotional support and even detect the sign of distress. Also, they were easily available anytime and anywhere. Therefore, AI and robotics are beneficial in development in public health sector. Hence the technology will be very helpful in this sector.

10. Marketing and Customer Care- AI is making inroads in lives of users through its services like customer service bots, digital assistants, suggestions in e- commerce.[28] Also it provides designing in production feature, deep learning. Management, storage, productivity and much more. Also, there are robots that help in shops/ stores. These robots will be every useful in big shopping companies like Amazon.[29] Also AI robots keep record of the products, like the manufacturing, total number of items, expiring, etc. The payment becomes easier as the cards are already inserted, the payment is itself done. In this sector, artificial intelligence places a crucial role. It enables business man work and makes decisions through data driving of customers. Through the smart algorithm, the technology can analyse the customer's data to identify segments, patterns and preferences. This process enables business man to work on marketing campaigns. The artificial intelligence predictive analysis on customer behaviour helps in anticipating the customer needs. It is done through analysing the purchasing pattern of

[28] Role of AI and Robotics in Marketing. (2022, November 9). Theintactone. https://theintactone.com/2022/11/09/role-of-ai-and-robotics-in-marketing/
[29] The Role of AI in Marketing. (n.d.). Salesforce. https://www.salesforce.com/in/resources/guides/role-of-ai-in-marketing/

the customer. The device is having application of chat bots and virtual assistants can free human agents so that they can focus on more complex task that AI and robotics cannot perform. These chat bots and virtual assistants are available 24×7 in customer service, where they answer the frequent questions asked by the customers. The natural language processing, the technique is very beneficial for the management and business analyses. This helps in understanding the social media, conversations, customer sentiments and their feedbacks. Also personalised recommendations can help in customer data, preference and purchase history that enhance the abseiling opportunities and improve overall sales rates. Overall, the technology empowers the marketing, automation; sentiment analysis, and customer journey, optimisations through which data is analysed for enhance marketing and customer care services.

11. Auto mobiles – the role of robotics and artificial intelligence applications are used for designing, management, production activities and supply chain in the auto mobiles. Applications such as autonomous, driving, driver, risk, assistant and driver assistance are implemented in auto mobile industries. The industry is rapidly using smart intelligence. The artificial intelligence and machine learning in robotics have made the industry drastic.[30] The AI robots provide accurate vision for locating the requirements. Robots can also install door panels, coating, and painting, insert headlights, etc. The AI robots can assemble the machine devices, such as screws, motors, pumps, etc in the auto mobiles. The AI robots and AI mechanism, powers, driver, assistance, system in vehicles and provides improve driving experience. The technology provides with adoption of cruise control, automatic emergency brake, lane keeping assistance, detecting potential hazards and assist driver in various ways. The technology of autonomous vehicle is also provided with natural language processes which help the driver to interact and give commands. Comprehensively, the technology of artificial intelligence and robotics has potential to make the vehicle, efficient, safer and more enjoyable to use.

Therefore, artificial intelligence and robotics plays crucial roles in different sector in different ways.

[30] Rauch, S. (2023). AI in the Automotive Industry: A 2023 Outlook. Simplilearn.com. https://www.simplilearn.com/ai-in-automative-article#:~:text=Leveraging%20AI%20in%20the%20automotive,safety%20and%20comfort%20in%20cars.

## CURRENT SITUATION OF STARUPS IN INDIA

Several new start-ups with artificial intelligence, robot AI robots, machine learning, cloud, big data, fintech etc. are attracting people to do or create their own work. Also, Government of India is supporting them with the flagship of Make in India. The small start-ups are potential and giving good competition in the market. IT Sectors Company has already adopted large application of AI and robotics. The startups are spreading overall in all sectors such as education, healthcare, defence, e- commerce, banking, manufacturing, etc. Quality products in low cost are available through these start-ups which are small and medium sized enterprises (SMEs).

## STRATEGIES FOR FUTURE/ MODERN INDIA

1. Application and Infrastructure Development- just like advance countries, India is also following their trend and now AI and robotic technology which will be very helpful in development.[31] Custom built is one hands of the user. The government need to maintain infrastructure for the application of the technologies. The application of artificial intelligence requires large memory, storage and high computational power. Some systems already exist in the cloud. Several artificial development applications need public data which according to the rules not supposed to be stored or can be used outside the nation such as cloud space of amazon, Microsoft, google, etc. therefore, here comes the need of infrastructure for the storage of data and for the developers. But public data is not used for the privacy purpose that is the fundamental right of the citizens. Therefore, the particular data ne unidentified before being used. AI development and technology also need high speed data and there will be large amount of data used for the large storages. And lastly connectivity of data in the remote and rural area is also a challenge.
2. The Road Ahead- India is a developing country and is blessed with the unique opportunity. It is necessary to use the opportunity at time before it will be lost. The technology of artificial intelligence can help the Government of India in various programmes and schemes such as Make in India, Skill India and Digital India. AI can give suggestion and recommendation through its applications. Also, in the growth of

[31] Ibid 79

Policy and Regulation, Infrastructure development, research and human resources development.

3. Constructing Regulatory Framework for Security and Data Privacy- the robotics and artificial intelligence in their application stores several aspects of human life that also leads the safety of their personal data and other data.[32] The autonomous cars also ask for permission or the set up to drive. Regulations to the AI are required in the autonomous healthcare system where the patient can be advised with the treatment and medicine diagnose.[33] But at the starting it is better to observe the activities of AI mechanism for if anything goes out of tract then it can be handled. Therefore, need of regulatory framework is needed for the security of data.

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[32] Artificial Intelligence and Robotics in the Manufacturing Industry. (n.d.). Lazywill. https://www.ennomotive.com/artificial-intelligence-robotics/

[33] Schroer, A. (2022). 26 AI Robotics Companies Driving Innovation. Built In. https://builtin.com/artificial-intelligence/robotics-ai-companies