THE MODERNIZATION OF MSME: INVESTIGATING THE IMPACT AND IMPLEMENTATION OF ARTIFICIAL INTELLIGENCE IN THE MICRO, SMALL, AND MEDIUM ENTERPRISES (MSME) SECTOR: MANUFACTURING BUSINESS

Akshita Choudhary, BCom LLB, Gujarat National Law University

ABSTRACT

Micro, Small, and Medium Enterprises (MSMEs) constitute a fundamental pillar of the global economy, contributing significantly to employment, particularly in India where they rank as the second-largest employer after the agricultural sector. The proliferation of Artificial Intelligence (AI) has garnered substantial attention across diverse industries. Initially perceived as a facilitator of automation, AI has since unveiled extensive potential for innovation and design. Moreover, in the era of Industry 4.0, AI has emerged as a critical enabler, transforming various industry sectors. Artificial Intelligence (AI) and Machine Learning (ML) have become focal points in the discourse surrounding Industry 4.0. The dynamic evolution of these techniques, both in academic and practical domains, promises manifold advantages for production systems, including bolstering resilience and facilitating sustainable growth.

Even amidst resource constraints, Micro, Small, and Medium Enterprises (MSMEs) are increasingly recognizing AI as a catalyst for propelling their growth trajectory. This paper undertakes an in-depth analysis of the extent of AI adoption within the MSME sector, with a specific emphasis on the manufacturing context. Furthermore, it examines the pivotal role played by government interventions in facilitating AI adoption among MSMEs. The study also offers valuable insights into the impact of AI on the performance of MSMEs, shedding light on its transformative potential within this vital economic segment.

Keywords: Micro, Small, and Medium Enterprises, Artificial Intelligence, Government interventions, Automation, Catalyst for growth

INTRODUCTION

The world has been astonished by India's rapid growth of MSME's over the past few years. The Micro, Small, and Medium-Sized Enterprises (MSMEs) industry in India has emerged as a thriving and dynamic industry for the economy. It is acknowledged as serving as a catalyst for growth and development. When compared to large industries, MSMEs play a critical role in generating significant amounts of employment at low capital costs, establishing industries in economically depressed regions, reducing regional disparities, and ensuring a justifiable distribution of the nation's income and wealth.

"The acronym "MSME" stands for the Micro, Medium and small enterprises. It alludes to businesses whose day-to-day operations are more compact. The classification of these micro, small and medium enterprises are based on their revenue generation."

In the past, MSMEs were divided into the manufacturing and services sectors.

"The investment in manufacturing units was to be less than Rs. 25 lakh for micro enterprises, more than Rs. 25 lakh but less than Rs. 1 crore for small enterprises, and less than Rs. 5 crore but not more than Rs. 10 crore for medium enterprises."

"The investment in the service sector was limited to 10 lakh rupees. For small businesses, the investment was to be more than 10 lakhs but not more than 2 crore, while for medium businesses, the investment was to be more than 2 crores but not more than 5 crore Rupees".

However, "A revision to the MSME definition was announced in the Atmanirbhar Bharat package on May 13, 2020, 14 years after the MSME Development Act was established in 2006. As per this announcement, the definition of Micro manufacturing and services units was increased to Rs. 1 Crore of investment and Rs. 5 Crore of turnover. The small unit's investment and turnover caps have been raised to Rs. 10 crore and Rs. 50 crore, respectively. Similar to this, the medium unit's investment and turnover limits were raised to Rs. 20 crore. On June 1, 2020, the Indian government decided to further increase the MSME Definition. The new investment requirements for medium-sized businesses are Rs. 50 crore and Rs. 250 crore of turnover".

As per the "Annual Report Financial year 2022-23 of Ministry of Micro, Small and Medium enterprises, The Manufacturing sector holds the 31% of the Estimated MSME's

by the nature of the Activity."

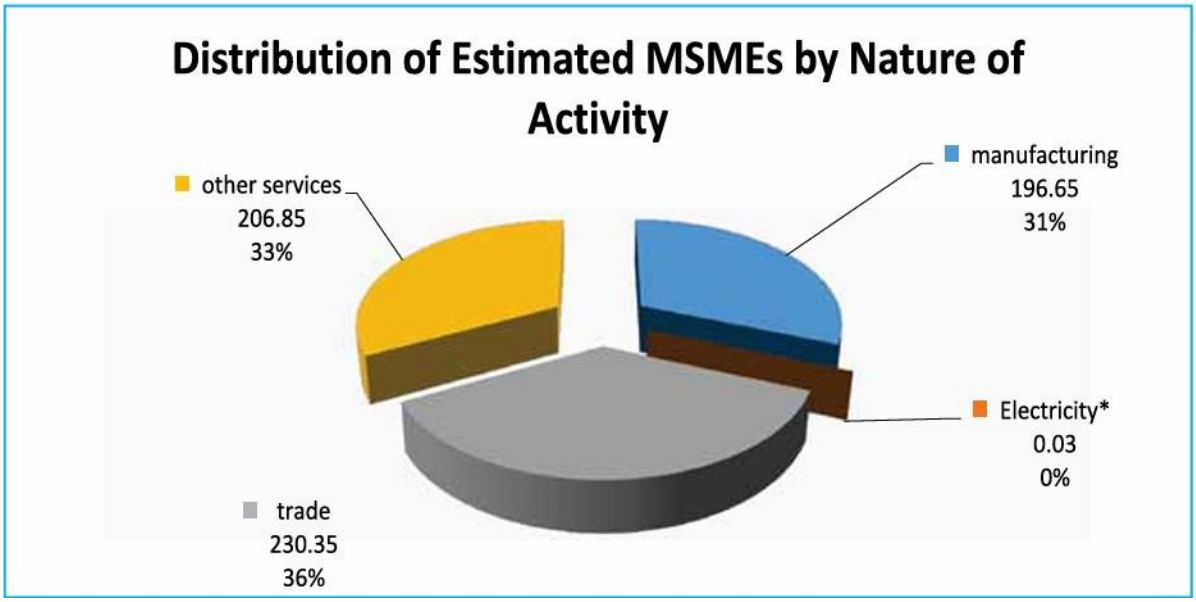

Figure 1.1: Distributions of Estimated MSMEs (Nature of Activity)

If the manufacturing companies that contributes the majority part of the MSME wants to remain competitive, they must continuously enhance their methods of operation. Due to the accelerating digitalization of society and the integration of intelligent machinery and gadgets in the manufacturing process, an enormous quantity of data is available and must be recorded, processed, and analysed.

The industrial sector has used machine learning (ML), deep learning (DL), and numerous other AI techniques for tackling an assortment of obstacles. Examples of typical use cases for AI and ML in manufacturing systems encompass demand-side management, condition monitoring, predictive maintenance, quality, production planning, production control, and supply chain management. These use cases may result in time and cost savings, improved quality, decreased waste, and the advancement of manufacturing in smart, adaptable, and environmentally friendly production environments.

Figure 1.2: Share of Udayam Registrations : Manufacturing and services as on 31 Dec 2022

APPLICATION OF AI IN THE MSME BUSINESS

In 2023, technological advancement anticipates having a profound effect on nearly every facet of your existence, from conveyance reliability and security to healthcare and food access, the process of socialization and productivity. It has rendered learning more convenient, information more accessible, and the emergence of organic worldwide networks on the internet feasible.

In the course of the past twelve months, enterprises have had to adopt advances in automation and technology for the purpose of retaining operations running while keeping consumers satiated.

In accordance with a report by PwC entitled 'Advancing Towards a More Intelligent Future: The Influence of AI in the Post-COVID Epoch', the domain of industrial products and manufacturing has witnessed the highest prevalence of AI/ML (Artificial Intelligence/Machine Learning) integration within the preceding biennium."

Almost every business needed to rapidly embrace new procedures and remedies in order to cope with the pandemic's immediate difficulties. Even if this pattern existed prior to 2020, the previous year witnessed unprecedented propellant, which is projected to continue. Every business proprietor is currently aware of the perks of automated processes and advanced IT infrastructure.

AI has certainly been in prominence for over the past year. It is the development of technological devices geared towards executing tasks that typically call for human intelligence. Learning from experience, understanding natural language, reasoning, problem-solving, and adapting to new situations are a few instances of these tasks. Artificial intelligence (AI) systems are intended to imitate the cognitive functions that inhabit human minds.

AI's dominance in nearly all industries has extended to the financial sector in different incarnations such as Machine Learning, Deep Learning, Natural Language Processing, and many more.

"**Machine Learning** is the field of study that gives computers the ability to learn without being explicitly programmed" "**Deep learning** is a class of machine learning techniques that exploit many layers of non-linear information processing for supervised or unsupervised feature extraction and transformation." It is employed in finance for portfolio management, risk management, risk scoring, algorithmic trading and fraud detection.

There are other approaches as well, such as **Natural Language Processing (NLP),** which aims to make it possible for computers to comprehend, decipher, and produce human language. Typically, it is necessary for sentiment analysis, automated news synthesis, or customer service. **"Predictive analytics** encompasses a variety of statistical techniques from predictive modelling, machine learning, and data mining that analyse current and historical facts to make predictions about future or otherwise unknown events." "**Reinforcement learning** is learning what to do—how to map situations to actions—so as to maximize a numerical reward signal.

PERKS OF AI INTEGRATION AND CHALLENGES IT POSES FOR MSME

ADVANTAGES

In contemporary commerce, there is a burgeoning demand for AI-driven conversational interfaces, both pre and post-sales, offering immediate responsiveness to customer inquiries, exemplified by queries such as order tracking. This capability not only ensures customer satisfaction but also extends to B2B contexts, expediting processes like price negotiations and catalog displays, culminating in more efficient lead conversions.

Furthermore, the MSME sector in India, plagued by limited access to formal financing, stands to benefit immensely from AI and machine learning applications, particularly in the realm of unsecured loans for credit-nascent businesses. Leveraging alternative credit scoring models, such as the SOLV Score, based on diverse data points including GST and marketplace transactions, facilitates expeditious and secure lending processes, thus addressing a critical constraint on MSME growth.

Another pivotal facet lies in product refinement and customer engagement, leveraging chatbot- generated data to discern customer preferences and purchasing patterns, thereby enabling product customization and more targeted offers. Additionally, AI-driven predictive analytics emerges as a linchpin for astute marketing strategies, enabling precise customer segmentation and data-driven campaign optimization.

Moreover, the integration of AI augments working capital planning through enhanced forecasting based on real-time data, yielding sharper business decisions. Operations optimization, a critical concern for MSMEs, is facilitated through AI-driven platforms, enhancing supply chain and logistics efficiency.

AI also plays a pivotal role in market expansion by furnishing competitive analysis tools and facilitating the creation of buyer personas for advanced market research. Furthermore, AI's cognitive augmentation capabilities lend themselves to quality control and error reduction, particularly in tasks requiring intricate knowledge and discernment. Automation workflows, an imperative for resource-constrained MSME proprietors, find facilitation through AI technologies, streamlining operations and liberating time spent on routine tasks. Finally, in fortifying the digital trust ecosystem, AI-driven technologies such as blockchain and pattern recognition systems assume a crucial role in real-time fraud detection, safeguarding MSMEs from potentially catastrophic losses.

This comprehensive integration of AI in the MSME sector heralds a transformative era, amplifying efficiency, competitiveness, and resilience in the face of evolving market dynamics.

CHALLENGES

As the rapid advancement of AI technologies continues, there lies substantial potential for

significant benefits to be reaped by Micro, Small, and Medium Enterprises (MSMEs), with direct implications for India's GDP.

Through the implementation of automation, data-informed decision-making, and elevated customer experiences, AI stands poised to unlock unprecedented levels of efficiency and competitive advantage for businesses within this sector. However, amidst these promising opportunities, it is imperative to address formidable challenges and considerations.

Foremost among these is the issue of data, encompassing concerns regarding its quality, quantity, and accessibility. Many companies grapple with inadequate data for feeding AI/ML solutions, necessitating the prerequisite of structuring and automating data collection prior to deploying more intricate solutions. The availability and suitability of datasets for model validation hinge on the specific application, with a notable dearth in certain domains

Additionally, transparency, security, and cybersecurity concerns are underscored as critical aspects linked to data. Another pivotal challenge lies in the scarcity of proficiency and skills related to AI/ML within the MSMEs, rendering even potentially advantageous solutions underutilized. Compounding this is the age distribution of employees, inadequate training, and a deficiency in experience.

Moreover, MSMEs contend with budgetary constraints in comparison to larger enterprises, often perceiving the cost of these solutions as prohibitively high, despite potential inaccuracies in this perception. Methodologies and tools for evaluating the cost-benefit ratio of AI/ML applications are notably deficient. The complexity of AI/ML-based solutions is identified as

another barrier, with some deeming them overly intricate for the context of MSMEs. Despite efforts to make solutions more accessible, the perception of complexity persists due to limited knowledge and resources available for such projects.

the lack of managerial involvement and a defined strategy in comprehending and adopting AI solutions proves to be a significant obstacle. Managers are urged to grasp the feasibility and advantages of AI adoption, yet a prevailing dearth of clear strategies for data collection and AI utilization is observed. Consequently, MSMEs face greater challenges than their

larger counterparts in overcoming these entry barriers, necessitating a measured and incremental approach to intelligent transformation to avert adverse repercussions.

THE ARTIFICIAL INTELLIGENCE IN USE

IIT KHARAGPUR'S DEVELOPMENT OF AI-BASED SYSTEM FOR MSME

The Micro, Small, and Medium Enterprises (MSMEs) predominantly rely on manual inspection protocols for assessing the quality of batch-produced items, involving the random selection and subsequent manual examination of a few samples. Consequently, the entire batch is either accepted or rejected, a process characterized by inefficiency and elevated production costs.

In a commendable initiative spearheaded by the Centre of Excellence in Advanced Manufacturing Technology at the Indian Institute of Technology Kharagpur, researchers are dedicated to democratizing the accessibility of Artificial Intelligence (AI) and Machine Learning (ML) applications within India's industrial sector, with a specific focus on MSMEs. This commitment has materialized in the form of a solution capable of facilitating real-time, cost-effective inspection of each item within a batch.

A portable AI-driven device has been developed for the automated evaluation of goods manufactured by the MSME sector. This groundbreaking advancement is poised to furnish MSME entrepreneurs with a more comprehensive assessment of their goods' quality, thereby mitigating losses incurred from batch rejection resulting from the identification of a limited number of defective samples during manual scrutiny.

The portable device captures images of the finalized products, transmitting the data to the AI algorithm for thorough inspection. Professors Suriya K Pal and Debashish Chakravarty, along with technical collaborator Pravanjan Nayak and intern Ayan Banerjee from Jalpaiguri Government Engineering College, have submitted a patent application for this system, with plans for its forthcoming availability to MSMEs.

This innovation holds significant promise for the MSME sector, offering the potential for widespread integration of AI technology at an industrial scale. Notably, this sector contributes substantially, accounting for 30% of the nation's Gross Domestic Product (GDP) and 50% of export earnings. In aggregate, the MSME sector provides employment

for over 10 crore individuals across the country.

A GENERAL-PURPOSE TECHNOLOGY (GPT), ARTIFICIAL INTELLIGENCE

A General-Purpose Technology (GPT) is characterized by its broad applicability, exerting a pervasive influence across diverse industries, and its capacity to catalyze the development of ancillary technologies and innovations, resulting in significant positive externalities. GPTs, exemplified by notable instances such as the steam engine, electric motor, and semiconductor, possess the potential to yield enduring and far-reaching economic effects by augmenting the economy's capacity for productivity. Their intrinsic generality and widespread utility endow them with the capacity for extensive deployment across various sectors, subject to refinement and enhancement over time. Artificial intelligence has over the time shown the characteristic of being a General-Purpose technology.

Additionally, GPTs instigate the emergence of complementary technologies and inventive solutions, further propelling progress within the sphere of the GPT. Moreover, GPTs wield the power to engender transformative alterations in production methodologies, organizational structures, industries, and commercial frameworks.

However, the widespread adoption of GPTs necessitates a substantial investment of time and concerted effort. The case study of integrating electricity into the production process serves as a pertinent illustration of the gradual nature of this transition. The electrification initiative in the United States commenced in the early 1880s, yet its diffusion exhibited a measured pace, with over half of manufacturing enterprises remaining unconnected to the electricity grid even three decades later. Atkeson and Kehoe (2007) identify manufacturers' hesitance to embrace novel knowledge as the primary impetus for this protracted assimilation.

Enterprises that opted for electric motors in lieu of steam engines often merely replaced sizable steam engines with equivalently large electric generators as a singular power source. Frequently, they reverted to prior production methodologies, failing to discern a discernible augmentation in profitability. This reluctance stemmed from manufacturers' inability to surmount their inertia, characterized by an inadequate appreciation of the potential advantages of electrification, and a deficiency in assimilating the innovation

induced by the new technology. The dividends of adoption materialized at a later juncture, concurrent with the reconceptualization of production systems. Rather than relying on a large electric motor for kinetic energy transmission, a smaller electric motor was employed to power individual machines, thereby facilitating maintenance and elevating production efficiency. This novel system amplified labour productivity and streamlined the manufacturing process. Having a characteristic of General-purpose technology is like in the sense as the technology is generic, has a pervasive effect across industries and can spur the development of other technologies or innovation, with high positive externalities and the AI shows the characteristic of such technology.

AUTOMATION OF A BROADER RANGE OF TASKS

The primary business applications of Artificial Intelligence (AI) pertain to task automation, image and facial recognition, natural language processing, data analytics, and decision-making, encompassing advanced information management and predictive capabilities. This section expounds upon the advantages that businesses stand to gain from the utilization of AI-driven applications. The most substantial advantages for enterprises are anticipated to arise from AI's capacity to expand the scope of automated tasks and enhance predictive capabilities, aspects that are closely intertwined.

By discerning patterns within datasets and assimilating implicit, unstructured knowledge, emerging AI systems render feasible the automation of non-routine tasks that hitherto necessitated human intervention. This automation extends beyond manufacturing and can be applied in service provision as well (Huang and Rust, 2018). With the ability to learn from their surroundings, automated machinery could undertake a broader range of tasks that are arduous or perilous for humans, such as loading/unloading cargoes (e.g., from trucks) or precision tasks demanding acute environmental perception (e.g., precision welding).

AI-facilitated automation has the potential to liberate workers from monotonous, low value- added tasks, contingent upon the capacity to restructure their roles and elevate their skill sets. For instance, AI-integrated chatbots and voicebots are adept at executing pre-defined tasks within contact centers. While the former furnishes text-based responses, the latter emulates verbal exchanges with customers. AI-based call center solutions can furnish standardized responses to queries regarding product availability, operating hours,

and reservation cancellations. Multiple inquiries can be addressed simultaneously, obviating the need for customer wait times. In instances of intricate requests, AI tools can scrutinize interactions and redirect calls to pertinent human counterparts while supplying them with pertinent information from prior exchanges.

These emergent phases of automation, empowered by AI systems, have the potential to augment the productivity of MSMEs. This could be achieved through the reorientation of business endeavors towards higher value-added functions, mitigating human and economic costs associated with accidents or injuries, and ameliorating work environments and conditions (e.g., tasks involving unclean environments). The implementation of such systems may also assist small enterprises in surmounting administrative impediments and heightening their responsiveness at reduced expenses, such as addressing straightforward customer queries and enabling continuous customer engagement on a 24/7 basis.

PREDICTIVE ANALYTICS FOR DECISION MAKING

Artificial Intelligence (AI) systems possess the capability to engage in statistical prognostication, involving the derivation of diagnoses and analyses predicated on previously acquired information. This process involves the examination of extensive datasets and the refinement of algorithms. The application of sophisticated statistical methodologies for predictive purposes is commonly known as predictive analytics, constituting a subcategory within the domain of data analytics.

A notable distinction from conventional predictive modelling lies in AI's capacity to substantially reduce the cost associated with predictions, thereby facilitating data-informed

decision-making within the business sphere (Agrawal, Gans, & Goldfarb, 2018)[17]. This reduction in prediction costs broadens the accessibility to a diverse array of prediction methods. Micro, Small and Medium-sized Enterprises (SMEs) can leverage predictive analytics to delineate uncertainties, thereby mitigating their exposure to risks while identifying potential opportunities. AI-driven predictive tools have the capacity to automate various business projections, encompassing sales forecasts, budgeting, and inventory management, thus providing companies with the means to conduct real-time business forecasting.

For instance, AI stands to enhance the efficiency of asset maintenance and oversight. Predictive maintenance entails the ability to pinpoint when and where an asset is prone to malfunction, allowing for preemptive repairs prior to breakdown. Real-time data on asset condition is gathered through Internet of Things (IoT) sensors, which are amalgamated with historical life cycle data to assess asset status and identify deviations. In contrast to reactive maintenance, predictive maintenance yields substantial advantages by curtailing downtime and subsequently mitigating production costs or business interruptions in the event of an incident, while also averting unnecessary routine maintenance.

Augmented predictive prowess affords greater segmentation within markets and enables price differentiation. This equips MSMEs with the capacity to innovate and adapt their business processes, as they can more accurately forecast individual customer behavior, ascertain price sensitivity, and anticipate shifts in demand. Drawing on German firm-level data, Niebel et al. (2018) observed that the utilization of data analytics heightens the likelihood of a firm emerging as a product innovator and achieving market success through innovation.

1. ETHICAL AND LEGAL CONSIDERATION

The discourse traces the historical origins of ethical inquiries in AI, underscoring their recent the discussion traces the historical antecedents of ethical deliberations in the realm of Artificial Intelligence (AI), emphasizing their recent surge in prominence propelled by technological advancements. This augmented relevance of AI is attributed to the maturation of machine learning algorithms, enhanced computational capacities, and the broader accessibility of extensive datasets. These factors collectively confer the capability for potent applications, promising enhanced data utilization, streamlined processes, waste reduction, and the promotion of sustainability.

Prominent technology conglomerates, in collaboration with global policy makers, have disseminated the narrative concerning the potential of AI. However, it is acknowledged that AI introduces a spectrum of challenges encompassing technical, data-related, as well as broader social and political dimensions. Of noteworthy consideration is the recognition that AI can influence ethical norms and human rights, prompting policymakers to address these concerns concurrently with the advancement of AI.

Distinctive methodologies within AI, such as deep learning, may evoke concerns regarding their intricacy and limited interpretability, particularly in critical decision-making contexts. Furthermore, apprehensions extend to potential biases inherent in automated decision processes and the substantial data requisites for the training of AI systems, which may implicate considerations of privacy and security.

In addition to these technical concerns, broader societal apprehensions emerge from the integration of AI within socio-technical frameworks. These encompass inquiries pertaining to machine autonomy, economic consequences, and political implications. This encompasses concerns regarding the concentration of power within prominent technology entities, potentially circumventing national governance and societal norms.

2. POLICIES AND SUPPORT FOR AI ADOPTION

The adoption of digital tools for communication among Indian Micro, Small, and Medium Enterprises (MSMEs) remains limited, with only 34% reported to have integrated digital means for interactions with stakeholders, as per a survey conducted by the India SME Forum. Furthermore, a mere 7% of the surveyed 1,29,537 MSME respondents have fully embraced technologies or Software-as-a-Service solutions. Although half of the respondents acknowledge the advantages of digital tools in enhancing operational efficiency, customer engagement, and profitability, a significant 70% attribute their hesitancy towards adopting digital technologies to factors such as insufficient knowledge and guidance, high investment costs, and a dearth of skilled personnel to manage them.

In response to this gap, the India SME Forum, in collaboration with Intel, has announced a series of workshops across nine cities aimed at facilitating technology absorption within Indian MSMEs. The objective is to augment revenues, mitigate risks, lower operational costs, and enhance sustainable competitiveness in international markets. Vinod Kumar, President of India SME Forum, emphasized the substantial potential for digital transformation in the MSME sector, with the capacity to triple its GDP contribution and bolster employment opportunities.

Artificial Intelligence (AI) is poised to become a decisive factor in global competitiveness in the forthcoming decades, affording a strategic edge to early adopters. As articulated by Mukesh Ambani of Reliance Industries Limited (RIL) at the RAISE 2020 event, nations are

now poised to compete on the basis of digital capital. Consequently, both national governments and international organizations are initiating policies tailored towards harnessing the full potential of AI.

The United States has committed substantial resources, approximately $6 million, towards AI research and development projects in 2021, while Europe is projected to increase its AI-related spending by 33% from 2020 to 2023. India, possessing a vast reservoir of digital capital, is uniquely positioned to drive AI-driven development in a manner that is inclusive and grassroots-oriented. Dr. Arvind Krishna, CEO of IBM, expressed confidence in India's potential to lead the AI technology revolution, citing the country's extensive developer community, robust startup ecosystem, and strong scientific and engineering culture.

The Government of India has taken proactive steps in this direction, with entities like MeitY, NASSCOM, and DRDO spearheading the strategic roadmap for AI in the country. The establishment of the Centre for Artificial Intelligence and Robotics (CAIR) underscores the commitment to AI-centric research and development. Concurrently, the Digital India initiative is making significant strides towards its fulfillment.

AI applications within the Indian government presently encompass various domains, including biometric identification, facial recognition, criminal investigation, crowd and traffic management, and digital agriculture. This reflects a concerted effort to leverage AI's potential in bolstering public services and governance. The US-India AI Initiative the **Indo-US Science and Technology Forum (IUSSTF**) inaugurated its prominent venture, the US-India Artificial Intelligence Initiative, on March 18, 2021. This initiative aims to convene pivotal participants from both India and the United States with the objective of cultivating innovation in the realm of Artificial Intelligence (AI). It seeks to facilitate AI innovation through the exchange of insights and knowledge, the exploration of fresh prospects in research and development, and the promotion of bilateral cooperation between the two nations.

Further, The Ministry of Micro, Small, and Medium Enterprises (MSME) has embarked on a significant initiative, integrating advanced Information Technology tools such as Artificial Intelligence (AI) and Machine Learning (ML) to address the concerns of MSMEs. This integration has been affected within the Ministry's robust Single Window System 'Champions', inaugurated by the Prime Minister on June 1, 2020. This multi-modal

system encompasses a virtual portal along with technologically equipped physical control centers established at approximately 69 locations nationwide. In a remarkably short period, 'Champions' has emerged as a leading platform for MSMEs.

Despite the challenges posed by the Covid-19 pandemic, the Ministry of MSME has proactively seized this circumstance as an occasion for forward-looking interventions. In this trying period, the Ministry is not only extending wholehearted support to MSMEs, endeavoring to transform this crisis into an opportunity, but is also propelling them towards breaking their existing barriers, ushering in a paradigm shift, and enabling them to rise as champions[20].

Other Government initiative concerning AI

The Government has initiated numerous efforts to promote the adoption and proficiency of AI. Such as:

AI Centres of Excellence: "On March 18, 2021, Principal Scientific Adviser K. Vijay Raghavan announced the incorporation of Centers of Excellence (CoE) within the framework of the national Artificial Intelligence (AI) Mission." A pivotal component of this mission will be the establishment of a National Centre for Transformation AI, with a primary directive towards application-oriented research. Raghavan noted that while individuals readily embrace AI for tasks such as map navigation or food ordering, its widespread integration into decision-making structures, especially within governmental entities at both central and state levels, remains an area necessitating further development and implementation.

MCA 3.0: "In May 2021, the Ministry of Corporate Affairs (MCA) unveiled an updated iteration of its portal, denoted as MCA 21, version 3.0. This iteration is poised to harness contemporary technologies such as data analytics, Artificial Intelligence (AI), and Machine Learning (ML) to streamline the regulatory filing processes for corporate entities." The primary objective behind this initiative is to facilitate the ease of conducting business operations and enhance the monitoring of compliance. In addition to augmenting existing services and modules, MCA21 V3.0 is slated to introduce novel functionalities encompassing e-adjudication, a compliance management system, an advanced helpdesk, feedback mechanisms, user dashboards, self-reporting tools, and a restructured master

data service.

National Research Foundation: "Pursuant to the implementation of the National Education Policy (NEP) of 2020, the Government of India has instituted the National Research Foundation (NRF) as an independent entity. The NRF is mandated to bolster

research endeavors across various domains, including Artificial Intelligence (AI). Prime Minister Narendra Modi, during his address in a webinar on March 3, 2021, affirmed an allocation of fifty thousand crore rupees for this purpose. He emphasized that this allocation is intended to fortify the administrative framework of research-centric institutions and foster enhanced synergies between Research and Development (R&D), academia, and industry."

AI in Schools: "In accordance with the National Education Policy (NEP) of 2020, Artificial Intelligence (AI) is slated to be integrated into the educational curriculum of Indian schools. The National Council of Educational Research & Training (NCERT) has commenced the endeavor of formulating a revised national curriculum framework for school education, aligning with the directives of the National Education Policy 2020. This process will involve an in-depth examination of the potential inclusion of a dedicated course on artificial intelligence at the secondary education level."

These endeavors collectively contribute to augmenting the adeptness of individuals in their utilization of not only the manufacturing sector, but across diverse fields and industries. In the forthcoming years, AI exhibits discernible indications of catalyzing a fourth industrial revolution, exerting substantial influence on economic advancement in distinctive modalities.

CONCLUSION

The incorporation of Artificial Intelligence (AI) into the Micro, Small, and Medium Enterprises (MSME) sector, specifically in the realm of manufacturing, represents a notable stride towards modernization and heightened operational efficacy. the escalating incorporation of Artificial Intelligence (AI) within the Micro, Small, and Medium Enterprises (MSME) sector, particularly in manufacturing, signifies a substantial leap

forward in technological progression and operational efficacy. Nonetheless, it is imperative to recognize that this integration is still in its embryonic phase, necessitating coordinated endeavors for its efficacious execution.

A primary challenge lies in the scarcity of individuals equipped with the requisite technological acumen to adeptly deploy AI. It is imperative to acknowledge that a significant segment of the workforce may necessitate training and enhancement of skills to fully leverage the potential of this transformative technology. In this context, government intervention assumes pivotal importance in offering the essential support and resources to facilitate widespread AI assimilation.

Furthermore, the assimilation of AI introduces an array of challenges pertinent to data integrity, security, and privacy. Given the sensitive nature of data within contemporary enterprises, robust regulatory frameworks must be instituted to shield against potential breaches and vulnerabilities. Governmental oversight and regulation are imperative to ensure conscientious and ethical utilization of AI technologies.

Despite these obstacles, it is crucial to emphasize that the capacity of AI to precipitate a paradigmatic shift in various industries is substantial. Its transformative influence extends beyond the confines of the MSME sector, encompassing the potential to revolutionize economies on a more expansive scale. Hence, cultivating an environment conducive to the integration of AI, while addressing associated challenges, emerges as a critical priority for both public and private stakeholders alike. This collective endeavor towards judicious AI adoption holds the promise of heralding the advent of the Fourth Industrial Revolution, redefining the economic landscape across diverse sectors.