



AI Adoption in Small Scale Industries: Challenges and Opportunities

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Abstract:

Artificial Intelligence (AI) is a landmark of the technological revolution in the 21st century. It has started creating an impact on various sectors of the economy including the industrial sector. It is changing the way of industrial working and small-scale industries are no exception to this.

This paper highlights the challenges and opportunities for SSI in the adoption of AI. SSIs faces numerous challenges such as high implementation costs, skill shortages, infrastructural constraints, regulatory issues, unaffordable AI solutions and a restrictive mindset which hinder their growth. Along with challenges, significant opportunities are associated with AI which would help them to become globally competitive and unlock the new path of success. The right government approach would help SSI grow and succeed in an ever-changing world.

Key Words: *Artificial Intelligence (AI), Small Scale Industries (SSI), AI Solutions, Data Analytics and Cloud Computing*

Introduction:

Small-scale industries are playing a prominent role in the economic development of the nation by generating employment opportunities, supporting local communities and fostering inclusive growth. Its role prove that small-scale industries are backbone of the economy. However, SSI faces challenges like cutthroat competition, adoption of new technology, high costs, lack of technical skills, lack of digital infrastructure etc. which make the path full of hurdles in AI adoption process. However, AI can be a game changer for small scale industries, if these challenges are converted into opportunities like enhancing productivity and operational efficiency, increasing global competitiveness, improving product quality, customer engagement, market expansion, affordable AI tools etc.

It seems that adoption of AI is a golden opportunity for SSIs to overcome the problems and empower them to become a globally competitive.

Objectives of the Paper:

- 1) To study the challenges for small scale industries in adoption of AI.
- 2) To study the opportunities created by AI for the overall growth of small-scale industries.

Methodology:

This paper is based on the secondary data such as research journals, news articles, books etc. Also, it includes researchers' observations and opinions.

Review of Literature:

This study discussed the AI applications and its benefits for SME's.

Virtual Assistant, recommendation system and machine learning are the beneficial AI applications help to improve efficiency, productivity and decision making. It also mentioned challenges such as privacy concerns and lack of specialized skills. (M. Schonberger, 2023)

This paper highlights the importance of competencies and skills for adoption of AI. The adoption process exists in those SMEs where highly qualified staff, professionally trained employees, IT professionals among themselves are all more likely to adopt AI. Furthermore, SMEs engaged in collaboration with universities and research centres, show a greater propensity to integrate AI into their operations. (Huseyn, Mammadov, Ruiz - Gandara, Africa, Gonzalez-Abril, Luis Romero, Isidoro, 2024)

This paper highlights the role of AI in empowering small-scale industries in post pandemic period. It discussed the vulnerabilities faced by SMEs during Covid pandemic. AI will be a game changer for SMEs if it is implemented properly.

Findings:

There are various challenges along with opportunities in the journey of AI adoption in small scale industries. The challenges before the small-scale industries are given below-

Challenges in AI adoption in Small-Scale Industries:

Financial Constraints:

Inadequate fund is a highlighted issue of SSIs which often restricts to allocate funds for adoption of AI. (Tyagi-Mittal, 2024) This adoption process is highly expensive. It requires heavy investment in hardware (Servers, IoT

services and other digital infrastructure) and in software (Licenses, upgradation and maintainance of the system, recruiting professionals).It may not be manageable for SSIs due to lack of funds which restricts adoption of AI in small-scale industries.

Inadequate Digital Infrastructure:

In order to implement AI effectively, a proper set up of digital infrastructure is required which is highly expensive. Along with these, it requires good connectivity which is lack in rural and semi urban areas. Moreover, small scale industries don't get easily access to advanced IT and cloud based services which discourages adoption process.

Shortage of Skilled Workforce:

Small scale industries often face the shortage of skilled workforce to operate the digital system efficiently. It requires highly professional and expertise team to deal with the development and maintainance of the AI system. However, small-scale industries are not financially capable to hire the skilled professionals separately and provide training to existing employees. (Mammadov, H., Ruiz-Gándara, A., González-Abril, L., and Romero, I. 2024).

Lack of Awareness and Knowledge:

AI helps to improve operational efficiency, streamline processes and fosters the innovation in production process. It is very cost effective but many SSIs are not aware about the benefits of AI. (Schönberger, Marius,2023). Even those who are aware, having fear and hesitation to operate the new technologies. This lack of knowledge and awareness leads to miss a golden opportunity of their development.

Poor Quality Data:

AI needs high quality and structured data to get effective outcomes but SSIs often collect data manually which is unstructured. This kind of data is not compatible and suitable for AI algorithms to generate reliable and effective digital solutions. (Kakatkar, C., Cohen, J., & Jena, P. 2020). Therefore, poor quality of data is also one of the concerns for SSIs.

Market Constraints:

Size of market is influencing factor in adoption of AI. Small scale industries often operate in a small market. Therefore, their customer base is small. (Yusuf, 2024) Due to this SSIs find difficulties to invest in new technologies as they don't have assurance about enough profit margin. However, Due to having larger customer base and market size, large scale industries can easily invest in new technologies. (et al., 2023)

Regulatory Constraints:

It is necessary for industries to fulfil certain data regulation laws, industry standards and AI specific regulations. Due to having lack of knowledge and expertise, SSIs don't have enough confidence to mitigate the legal risk and fulfil the regulatory standards. Also, due to lack of financial resources, they can not hire professionals to deal with legal standards. Moreover, cyber security issues also arise during implementation process may lead to data breaches, intellectual property theft and other types of legal risk which discourage the SSI to adopt AI. (Tyagi, 2024)

Lack of Associations and Collaborations:

Large industries usually having collaborations and partnerships with other institutions due to which they may get financial, technical and legal support

to implement new technology. However, there is a lack collaboration and partnerships in small scale industries with research institutions, start ups etc. which may not get support for technology upgradation.

Reluctant to Change:

Small scale industries are familiar and habitual with the traditional system therefore they may not ready to deal with new technology and face the disruption during transition period. Also, employees may have fear to loose their jobs due to automation. (Schönberger, Marius, 2023). This reserved and restricted mindset hindered their opportunities to grow and succeed.

Opportunities for Small-Scale Industries due to AI Adoption:**Streamline Production Process:**

AI is specifically popular to carry out repetitive tasks occurred during production process effectively and effortlessly in less time with minimum errors which help to improve the productivity without any disruptions. It helps to undertake the production process smoothly as it works 24/7. Therefore, this system is suitable for small scale industries where repetitive tasks are carried out manually. (Tyagi, 2024)

Improvement in Operational Efficiency:

AI has a potential to reduce the cost of production with minimum errors leads to optimum utilisation of resources during production process which help to achieve the target in limited period. Additionally, it enhances the productivity and operational efficiency by carrying out operations smoothly without any disruptions.

Effective Decision Making:

The success and failure of every organization depends upon the decision making. AI enhanced the decision making process. (Mammadov, H., Ruiz-Gándara, A., González-Abril, L., and Romero, I. 2024). AI powered analytics take the decision automatically according to situation such as-

- Reorders materials when stock is low.
- Send purchase order automatically.
- Prediction about market trends.
- Detecting defects in products and keep it aside.

All these above benefits make decision making process effective and effortless.

Improved Product Quality:

It is very easy to find defects in product with AI as compared to manually. AI Powered Computer Vision helps to find defects automatically and effortlessly. It keeps aside all the defected products by analysing all the quality measurements and standards which reduces the possibility of low quality product and maintain the good quality of a product.

Customer Involvement and Quality Services:

It becomes very easy to connect with the customers and provide them quality services with AI tools. (Schönberger Marius, 2023). System collects all the customer related data such as customer demand, queries and feedback effortlessly. With the help of available data, it gives idea about customer preferences, market trends, customer requirements etc. (Yusuf, 2024). AI chatbots can directly address the routine and usual queries of the customer 24/7 and solve it quickly which enhances the customer satisfaction.

Market Expansion:

The size of market of small scale industries is small . However, if they adopt AI, can reach to a large number of customers by using AI analytical tools which help them to increase the size of market. These tools analyse the customer demands, preferences, trends and gives option to customers through social media. It will really be a good opportunity to increase the customer base.

Boost Confidence and Competitiveness:

Presently, in industrial sector there is a cut throat competition. In order to retain in the competition, adoption of AI is essential. AI has a potential to improve operational efficiency, provide quality services, expand market, satisfy customer etc, which help to boost the confidence of the SSIs to face the global challenges effectively. (Mohan, K., & Pillai, P. S. 2021). AI helps to bring innovation which plays significant role to make them competitive.

Government support:

Various programmes are initiated such as 'Digital India', 'Make in India', 'MSME Act' by Indian Government to support the SSI for upgrading their technology. These programmes offer financial assistance for digital infrastructural support and training programmes to enhance skills for AI adoption. It provides favorable situation for adoption of AI.

Risk management:

AI helps to identify the risks which is difficult to detect manually. It also provides and implements strategies to mitigate the risks. For e. g.

- Detects unusual behaviour of user.

- Keeps alert if any dangerous situation occurs such as excessive heat, gas leakages etc.
- Identify suspicious financial transactions.
- Predicts delay on the basis of whether condition, traffic situations etc.

Sustainability:

AI will help the small scale industries to show the commitment towards the environmental sustainability. (Yusuf, 2024). It uses environmental friendly production strategies which reduces energy consumption and minimises wastages of resources during production process.

Conclusion:

The adoption of AI in small scale industries presents a mix of challenges and opportunities. Financial constraints, inadequate infrastructure, a shortage of skilled workforce, and regulatory barriers are significant challenges before SSI. However, the potential opportunities, such as enhanced operational efficiency, market expansion, fostering innovation, improved product quality are far greater and impactful as compared to challenges. With the right mindset, government support, strategic collaborations and partnerships, small industries can not only overcome these obstacles but also unlock new pathways to sustainable growth and competitiveness.

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