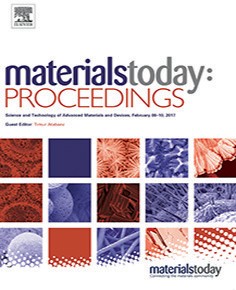
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Usage and adoption of artificial intelligence in SMEs

Anuj Kumar [a](#_bookmark0),[⇑](#_bookmark2), Anjali Kalse [b](#_bookmark1)

a *Research Scholar (GL-2789), Aligarh Muslim University, Apeejay School of Management, Dwarka, Delhi (Assistant Professor), India*

b *Director, Bharati Vidyapeeth’s Institute of Management Studies and Research, Navi Mumbai, Mumbai University, India*

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The usage of artificial intelligence has been increased in the last 15–20 years. The corporates and govern- ments are also concerned about their business administration, production, and logistics due to covid-19 crises. The usage of artificial intelligence can help in business development from small-medium enter- prises to big shot organisations. The main purpose of this paper is to explore the usage of artificial intel- ligence to develop business activities in SMEs and the factors responsible for the adoption of artificial intelligence. Systematic literature review technique has been adopted. The main findings are that artifi- cial intelligence can be used for maintaining social distance, performing business activities from a safe place, enhance customer deliverance, generate business for organizations, and give a competitive edge at the same time during the coronavirus pandemic. It was noticed that artificial was already in use by the big organizations like Google, Facebook, bumble, Netflix, Amazon, etc., but now small organizations could also harness this resource to boost their production and operation activities to compete and grow in the current scenario. The researchers have identified ten factors responsible for the adoption of artificial intelligence in SMEs, which can be further tested at the primary level by future researchers.

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1. Introduction

Covid-19, which was declared a pandemic by the world health organization and has forced the whole world to lockdown, has dev- astated the global production and business practices since it is a contagious virus and requires social distance for protection against it, till the vaccine for the same is discovered. It has become impos- sible for small and medium organizations to cope up with their business operations and competitors worldwide; although all busi- ness units are dependent on the human workforce for an operation, still it’s possible to carry out business activities at greater efficien- cies using artificial intelligence and technologies. The aim of this research paper is to encourage the use of artificial intelligence for small-medium enterprises so that they can compete, produce, and match the standards of business operations practiced world- wide by the big shot organizations like Google, Facebook, Amazon, Alibaba, etc. In this paper, the authors will research the usage of artificial intelligence to promote business activities and deal with challenges induced by the covid-19 pandemic for SME’s and big

⇑ Corresponding author.

*E-mail address:* [anujsmooth@gmail.com](mailto:anujsmooth@gmail.com) (A. Kumar).

organizations. In this paper, the researchers will try to find out the feasible solution of SMEs problems in the form of artificial intelligence adoption.[Fig.](#_bookmark3) [1.Table 1.](#_bookmark4)

* 1. *Objectives*

The major objectives of this research paper are mentioned below:

To explore the usage of artificial intelligence in SMEs

●

To explore the adoption factors for adoption of artificial intelli- gence in SMEs

●

1. Usage of artificial intelligence

Artificial intelligence popularly abbreviated as AI has set certain standards when it comes to productivity, utility, and accuracy. The old-age computers and robots were completely dependent upon humans when it came to intelligence because they lacked problem-solving capabilities, adaptability, and knowledge man- agement. Computers were bounded to certain performance and were helpless in uncertain circumstance, but current generation

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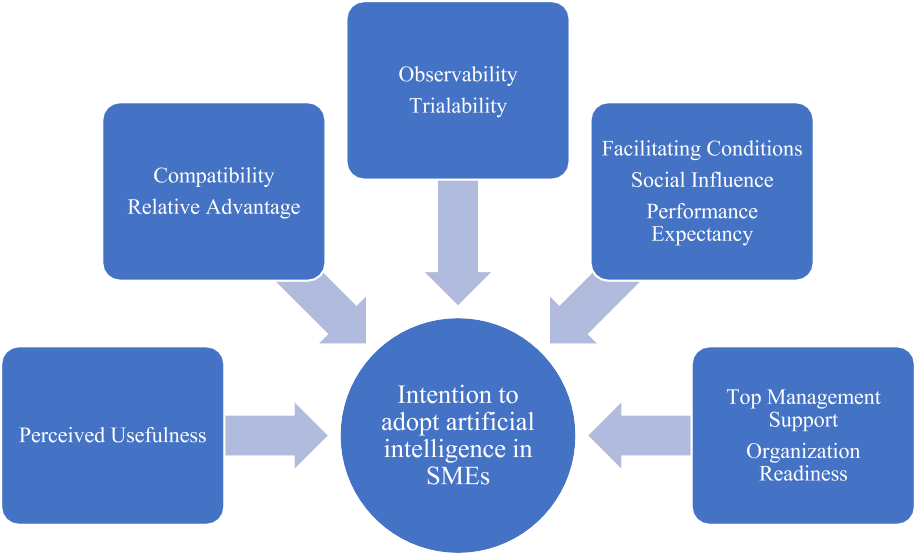


Fig. 1. Proposed Research Model for Adoption of Artificial Intelligence in SMEs.

Table 1

Literature Review on Artificial Intelligence and SMEs.

S.

No.

Author (s)

Objectives Findings

1. [[6]](#_bookmark7) Usage of artificial intelligence-based social media marketing in improving the performance of SMEs in Saudi Arabia (Primary data collected and PLS- SEM technique applied for finding the results)
2. [[7]](#_bookmark7) The aim of this study is to find out the effect of artificial intelligence on management processes, including challenges and opportunities.
3. [[8]](#_bookmark7) To explore how the implementation of artificial intelligence can help in improving the marketing processes of SMEsMajor
4. [[9]](#_bookmark7) The key objective is to look for a feasible solution to SME’s problems related to productivity, competitiveness, and product quality.

Artificial intelligence-based social media marketing helped in improving the number of customers, customer bases and overall profitability of the business.

The companies who are planning to make decisions based on artificial intelligence should primarily look for accurate investments based on data. It is necessary to have data science departments in the companies. It can help in avoiding the challenges.

Artificial intelligence is the future and most prolific solution for SMEs.It can be useful in deep learning, customer targeting, language recognition, chatbots and dynamic pricing.

Artificial intelligence-based algorithms helped in improving the productivity, quality optimization and overall development of SMEs.

1. [[10]](#_bookmark8) To find a technical solution to commercial risk assessment for SMEs Commercial risks are stopping SMEs from achieving sustainable

development goals. The artificial intelligence-based algorithms and technical solutions can help the SMEs in avoiding commercial risks and move towards sustainability.

1. [[11]](#_bookmark9) To explore various factors that contribute to AI adoption at the firm level. Based on the TOE and DOI framework, the factors responsible for AI

adoption have been explored, but their validation needs to be tested. These factors are:

* + Relative advantage
  + Complexity
  + Size of organization
  + Support from top management
  + Resources
  + Pressure from competitors
  + Pressure from government regulatory bodies

1. [[12]](#_bookmark10) To find the solution to SMEs accounting information problem, keeping the Artificial intelligence-based ALIAS system can be very useful for SMEs in concept of sustainability in mind. dealing with accounting information system and problems related to that.
2. [[13]](#_bookmark11) To work on the possible solution of operational inefficiencies of SMEs. Artificial intelligence can improve the operational inefficiencies of SMEs,

and it can also help in improving the overall processes.

1. [[14]](#_bookmark12) The aim of the study is to find out whether the furniture manufacturing SMEs in Soweto are ready to adopt artificial intelligence.

The findings of the study suggest that SMEs are not fully ready to adopt artificial intelligence because they lack the necessary resources.

1. [[15]](#_bookmark12) To find a solution to SMEs’ problem of improving sales via exporting. The artificial intelligence-based methods can help the SMEs in improving

foreign market screening, and it will assist the SMEs.

computers are capable of knowledge management and learning from there experience which opens limitless door potential. According to Bernard Marr (the enterprise tech of Forbes), Alibaba, China’s top organization, plans to invest a $1 trillion in the AI industry by 2030, enabling China to overtake the United States and become the world’s leader in technology [[1]](#_bookmark5). Approximately 42% of world populations are active users of the internet, and 29% have active social media content enabling the arterial intelli-

gence to analyze a consumer’s behavior when it comes to purchas- ing patterns, satisfaction, needs, demography, and preferences. Artificial intelligence today can analyze all the activities performed by consumers online to study their behavior and computing possi- bilities through an algorithm and can manage demand–supply and perform all the backend operations

David Norris, the developer of Microsoft chess game, using AI he developed a game enabling a human to play chess with a com-

puter, noting that each step a human take is unknown to the com- puter and the AI of the game must understand each step a human takes to defeat the human, this apprehension in a computer is arti- ficial intelligence. The authors studied artificial intelligence used by other big companies like Facebook, Google, bumble, amazon, etc. and aim to provide that intelligence to small and medium enterprises so that they can perform their daily operations with accuracy, more productivity, and feasibly even under tough time like a covid-19 pandemic and worldwide lockdown [[2]](#_bookmark6). The authors aim to enable SMEs with world-class production standards and promotion activities with minimal human workforce, which would not only cut cost and increase profits but also ensure the safety of mankind by obeying rules of social distance till the vac- cine for coronavirus is discovered.

* 1. *Potential usage of artificial intelligence to deal with covid-19 by SME’s*

All the points discussed below can be used by the SME’s to enhance their production during covid-19

Example 1- QR Code QR code is a tech used today all over the world, from standalone

shops to global companies, yet SME’s are unable to utilize its true potential like big corporates as the artificial intelligence is compo- nent here which makes the difference as introducing AI with QR code system changes its scope completely [[3]](#_bookmark7). QR code is basically used for inventory management, but when combined with artificial intelligence, it can perform various activities like data recorded using QR code can be used in accounting, understanding prefer- ences of the customer, forecasting future demand, and hence increasing production efficiency [[4]](#_bookmark7), for example, the QR code scanned at movie theatres can be used to understand the preferred genre of films by the customer providing a significant quality of data to film production industry.

Example 2 Sales Prioritization (Zomato)

Sales are suffering, and artificial intelligence is the most opti- mum way out, says Thomas H. Davenport, Barry Libert, and Megan Beck; due to covid-19, there is lockdown almost worldwide, which means all the customers are surfing online to fulfil their needs from shopping food to luxury products which are giving artificial intel- ligence a greater pool of data to understand the actual preferences of the customer and suggesting the producers or retailers target such specific audience [[2]](#_bookmark6). After studying the artificial intelligence of Zomato, the author came to a conclusion that some people pre- fer to try new restaurants and cuisine where others show a signif- icant interest in specific cuisines here the artificial intelligence understand the need and preference of the customer and suggest them either food deliveries or outlets of their preference and taste here sales are prioritized towards a specific segment of audience which leads to sales promotion and advertisement cost efficiencies

Example 3 Identification, Verification and Surveillance (bank) Robert Prigge, chief executive at Jumio corporation (mobile pay-

ments and transaction-based company), explains the importance of Artificial intelligence in the online monetary sector and empha- sizes that covid-19 is pushing digital transformation to the front line. This section could work as a boon for all the SME’s, consider- ing a scenario of the bank in normal days (before covid-19) either at the entrance or exit the receptionist or the sales executive always demand every walk-in to fill a feedback form, those feed- back forms were the marketing strategies that must be left a dec- ade ago because the AI here has changed the business strategies completely[[5]](#_bookmark7) . Now during the lockdown its need for every cus- tomer to avail of bank services online, and every time a customer visits the bank website, he has no idea how he is speculated by the AI; whenever a customer arrives at the bank’s website, Not only he is identified, verified and protected by artificial intelli-

gence, but his wealth is speculated which defines his buying capac- ity, the customer’s interest in taking a loan or filling a fixed deposit is speculated, a person’s reason to take a loan and then the AI mar- kets products to the specific segment of customers according to their specific needs like interest at low rates, fixed deposits at a high rate or a plot of land on EMI’s

1. Literature review

The above literature and examples are showing that artificial intelligence can be very useful for SMEs in marketing, financial record keeping, accounting information systems, avoiding com- mercial risks, improving foreign market expansion, and improving production. There are some recent studies on artificial intelligence and SMEs, but only one study was focussing on the adoption fac- tors of artificial intelligence in SMEs. One can argue that the adop- tion of artificial intelligence can be avoided now, but how long can SMEs avoid it. It is high time, and COVID-19 has also taught the world that technology is the only panacea to beat such a pandemic [[16]](#_bookmark12). Without advanced technology, the survival of either big multinationals or small firms will be questionable [[17]](#_bookmark12). Adoption of technology in any form is a requirement of SMEs, and it will take organizations towards sustainability [[18]](#_bookmark12). Social media tools adop- tion is helping organizations in achieving economies of scales and market expansion by effective marketing techniques [[19,20]](#_bookmark12).

1. Adoption theories and factors

In this segment, the authors will discuss what can be the possi- ble factors behind the adoption of artificial intelligence in SMEs. There are multiple theories exist on technology adoption. The most useful cited and discussed theory is technology acceptance theory, known as the TAM model [[21]](#_bookmark12). It was derived from the reasoned action theory [[22]](#_bookmark12). The two factors in TAM theory talk about the usefulness of technology adoption and how easy it is to use the technology. This theory is taking the individual perceptive for understanding the adoption of technology. Artificial intelligence is the latest technology, and it is still in the introductory phase. The people in developed countries are getting themselves acquainted to artificial intelligence. It will take more time for indi- viduals from developing countries to acquaint with the usage of artificial intelligence. The major challenges in technology adoption in SMEs are less training and skills of the employees [[23]](#_bookmark12). They require more technical training to adapt to several technologies. Currently, in the Indian scenario, the middle-level employees and lower-level employees are not even comfortable with technology

2.0 tools like Facebook, Linked-in, Instagram, etc. Only learning can improve the adoption of technology at the individual level. It can be said that one factor of the TAM model, which talks about usefulness, can be considered for the adoption of artificial intelli- gence in Indian SMEs, but the ease of use will take time.

The second most discussed and cited theory of adoption is the theory of reasoned action [[24]](#_bookmark12). This theory originated from psy- chology, and it talks about the psychology perspective as well. It states that the behavioural intention of an individual aligns it towards certain behaviour [[25]](#_bookmark13). The components of behavioural intentions are subjective norms and attitude towards that beha- viour. The attitude towards behaviour originates from behavioural beliefs, while the subjective norms originate from normative beliefs. This theory is much more reliable in studying consumer behaviour or other types of family planning behaviour. This will again provide an individual level view and will be hard to imple- ment at the organizational level. The third most discussed and cited theory is the diffusion of innovation theory. Diffusion of inno- vation model has five stages from implementation till adoption.

The five components of diffusion of innovation theory are a relative advantage (advantage from the adoption of new technology), com- patibility (how much employees are compatible with new technol- ogy), complexity (is it complex to use new technology or not), trialability, and observability [[26]](#_bookmark14). These factors can be taken for the adoption of artificial intelligence in Indian SMEs because these factors are talking about the firm’s perspective. The case studies in the literature are justifying that organizations will get benefits and advantages by adopting artificial intelligence. The relative advan- tage of technology adoption can be seen in different aspects. Com- patibility is questionable in the Indian environment because many organizations do not have the quality infrastructure to support the adoption of artificial intelligence. It is a challenging factor too. Complexity cannot be considered as a favourable factor for adop- tion because the adoption of artificial intelligence is very challeng- ing and complex at this stage. The type of technical and financial support required is high in nature. Trialability and observability can be taken as adoption factors for studying the adoption of arti- ficial intelligence.

Venkatesh et al. (2003) argued about unified acceptance theory for the adoption of technology [[27]](#_bookmark15). This theory is in consideration by many researchers for studying the adoption of cloud computing in the SMEs. In this theory, four components of the user’s accep- tance and behaviour are discussed. These four components are per- formance expectancy, effort expectancy, facilitating conditions and social influence. The moderating variables of individuals- gender, age, and experience and how voluntarily they are using technology affects the four components or constructs. Facilitating conditions can be taken as the adoption factor for the adoption of artificial intelligence in SMEs. It all depends on what type of infrastructure and top management support provided by organizational heads. The adoption of artificial intelligence is not possible without top- quality infrastructural support and organizational support from top leaders in the organization. The second component effort expectancy again talked about the ease of use of technology adop- tion. It will take some time to derive ease of use in artificial intel- ligence adoption at SMEs level. The third component, performance expectancy, can be taken as a factor because it is true that the adoption of artificial intelligence will improve the overall perfor- mance. The social influence can also be taken as a factor for adop- tion. Many employers have shown their concern for the health and well-being of employees. It is mandatory to keep a physical dis- tance at the workplace. Artificial intelligence-based algorithms and techniques can improve the productivity of the organization and help in maintaining the physical distance at the workplace. The employees, customers and other stakeholders are influencing towards technology adoption. Social influence can be checked as a factor of adoption.

Tornatzky and Fleischer (1990) have proposed a TOE framework

for the adoption of technology. This framework has categorized the variables in organizational, technology and environmental cate- gories. The categorizing variables are helpful in taking the compo- nents from previous theories and fit those components in TOE theory. The components in the technology framework can be adopted from the diffusion of innovation theory. TAM theory con- structs are also useful in deriving the technology components. The organizational category includes factors such as firm size and readiness of an organization. An organization’s readiness can be taken as a factor of adoption for artificial intelligence in SMEs. The SMEs need to check themselves that how much they are pre- pared for the adoption of artificial intelligence at the firm level. In the environmental framework, the support from the govern- ment can be checked for the adoption of artificial intelligence.

Based on the above discussion, the following hypothesis can be tested:

H1: The perceived usefulness makes a positive impact on the intention to adopt artificial intelligence in SMEs

H2: The relative advantage makes a positive impact on the intention to adopt artificial intelligence in SMEs.

H3: Compatibility makes a positive impact on the intention to adopt artificial intelligence in SMEs.

H4: Trialability makes a positive impact on the intention to adopt artificial intelligence in SMEs.

H5: Observability makes a positive impact on the intention to adopt artificial intelligence in SMEs

H6: Facilitating conditions makes a positive impact on the intention to adopt artificial intelligence in SMEs

H7: Top management support makes a positive impact on the intention to adopt artificial intelligence in SMEs

H8: Performance expectancy makes a positive impact on the intention to adopt artificial intelligence in SMEs.

H9: Social influence makes a positive impact on the intention to adopt artificial intelligence in SMEs.

*H*10: Organization readiness makes a positive impact on the intention to adopt artificial intelligence in SMEs.

1. Findings and conclusion

Based on the above discussion, it can be concluded that the adoption of artificial intelligence can help SMEs in all fields. It can improve the conditions of SMEs, especially after the COVID- 19 pandemic, but the adoption is not easy. The top management must make efforts for technology adoption at the firm level.

The major findings of the paper are mentioned below.

The adoption of artificial intelligence will be beneficial for SMEs in marketing, finance, data capturing, employees’ relationship, and all the other business domains.

●

The adoption of artificial intelligence will also help in achieving sustainability because of less usage of physical resources, economies of scale in production, and transition towards technology.

●

The key factors of adoption of artificial intelligence can be derived from different adoption theories- TAM theory, TOE the- ory, UTAUT theory and DOI theory. Overall, ten factors have been identified for the adoption of artificial intelligence in SMEs.

●

CRediT authorship contribution statement

Anuj Kumar: Conceptualization, Methodology, Software, Data curation, Supervision, Writing - review & editing. Anjali Kalse: Software, Validation, Visualization, Writing - original draft.

Declaration of Competing Interest

The authors declare that they have no known competing finan- cial interests or personal relationships that could have appeared to influence the work reported in this paper.

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