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Unleashing the Potentials of Artificial Intelligence for Micro, Small, and Medium Enterprises: A Systematic Literature Review

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Abstract
Artificial intelligence has undergone rapid evolution, reaching a level of sophistication where it is now considered a personal assistant, aiding humans in their daily tasks. The potential of artificial intelligence can be observed in almost every sector of life including the business sector. Limited resources and skill capabilities especially for micro, small, and medium enterprises tend to hinder progress. However, given the current advanced level of artificial intelligence, it has emerged as an innovative and cost-effective solution to support business actors. This research systematically examines and discusses the potential of utilizing artificial intelligence in the business sector from credible and scientific sources. A systematic literature review methodology is used for this study. The review encompasses Scopus-indexed journals published between 2019 and 2023, with additional open-access publications. Based on the research findings, 106 studies were found, however, after the screening process the number of studies is reduced to 13 articles. Customer churn management emerged as the most prominent utilization of artificial intelligence. On the other hand, from a technological perspective, optimization technique emerged as the most frequently addressed topic in the examined studies.
Keywords: *artificial intelligence, msme, systematic literature review*

Abstrak
Kecerdasan buatan saat ini telah berkembang pesat, bahkan kecanggihannya dapat dianggap sebagai asisten pribadi manusia dalam menunjang pekerjaan sehari-hari. Potensi kecerdasan buatan dapat dilihat hampir di seluruh sektor kehidupan, salah satunya adalah sektor bisnis. Minimnya sumber daya serta kemampuan keterampilan bagi skala usaha mikro, kecil, dan menengah cenderung menjadi penghambat, namun kecanggihan kecerdasan buatan saat ini telah menjadi solusi inovatif sebagai asisten para pelaku usaha dengan beban yang rendah. Penelitian ini bertujuan untuk mengulas dan membahas potensi pemanfaatan kecerdasan buatan pada sektor bisnis secara sistematik melalui sumber pustaka yang bersifat kredibel dan ilmiah. Adapun metode dan pendekatan yang digunakan dalam penelitian ini yaitu berjenis *Systematic Literature Review*. Penelitian diperoleh melalui sumber pustaka Scopus dengan kriteria utama yaitu karya tulis berjenis artikel jurnal, terpublikasi dalam rentang tahun 2019 hingga 2023, dan jenis publikasi bersifat terbuka. Berdasarkan hasil penelusuran diperoleh 106 penelitian, namun setelah melalui proses penyaringan maka jumlah penelitian yang diambil dan dibahas yaitu sejumlah 13. Prediksi customer churn menjadi implementasi yang paling dominan dibandingkan dengan tujuan lainnya, sedangkan dari sisi teknologi yaitu teknik optimalisasi merupakan yang paling banyak diangkat dalam penelitian.
Keywords: kecerdasan buatan, umkm, *systematic literature review*

INTRODUCTION

The advancement of Artificial Intelligence (AI) technology has evolved rapidly, with transformers as the latest state-of-the-art technology that has a noticeable impact on human life [1]. AI has become a ubiquitous personal assistant to support humans in their daily tasks and activities. It is predicted that the presence of AI might replace human jobs in the future. However, an opposite paradigm known as "Intelligence Automation (IA)" has emerged, it is argued that the presence of AI is likely to serve as the collaborator to enhance human capabilities even further [2]. Unlike humans, AI performs various tasks effectively since it is available at any time without experiencing fatigue. Therefore, this can provide significant advantages, particularly in the business sector, as it can lead to cost and resource savings [3]. The potential possessed by AI can be further leveraged by micro, small, and medium enterprises (MSMEs) to run their businesses. Recent study has shown that adopting AI can influence business performance to have positive impacts [4], [5]. It is also further reinforced, as discussed in another study, through the optimization of distribution routes to streamline distribution costs in MSMEs [6]. Currently, MSMEs have faced several

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challenges that have affected their profitability and sustainability, such as a lack of internal human resources with financial management capabilities [7]. Apart from that, the post-pandemic recovery period necessitated specific strategies that tend to be intensive and digital for MSMEs, which are a crucial sector [8].

There is a limited amount of prior research that has addressed AI innovation in MSMEs. AI and IoT technology on a larger scale with specifically focusing on small and medium enterprises (SMEs) have been discussed previously [9], However, this study only examines technologies that are already being utilized by various SMEs, without exploring other potential impactful technologies that have yet to be adopted. The potential benefits of AI for various sub-sectors of SMEs are also explored in the second study, yet the data is obtained from a business management perspective [10]. Thus, the researcher identifies a research gap that needs to be addressed, which involves investigating the potential of AI innovation for the sustainability of the MSME sector. In addition, previous study has also concluded that the adoption of AI technology in Indonesia is relatively low compared to other countries in the Asia-Pacific region [11]. Interestingly, there is an opportunity to leverage AI technology to assist and drive MSMEs in Indonesia, particularly in West Java, considering there are approximately 6.2 million MSMEs established in the province as of 2021, which have great potential to stimulate the local economy [12].

RESEARCH METHODOLOGY

2.1. Research Objectives and Questions

This research aims to review and classify various types of artificial intelligence (AI) technologies from previous studies that have the potential to be utilized by MSMEs. Furthermore, in formulating the research questions, the PICOC framework [13] is used as a reference. However, only the population and intervention elements were used as a basis for formulating the research questions in this study, resulting in the following two questions:

A. **RQ1** : What is the distribution of research studies across each business functional area? (Question derived from Population)
B. **RQ2** : What algorithms, technologies, or frameworks are used in the obtained research studies? (Question derived from Intervention)

2.2. Research Design and Steps

This study uses Systematic Literature Review (SLR) approach, which involves collecting, evaluating, integrating, and findings from various research studies based on research questions or topics [14]. The research process consists of three major stages: planning, conducting, and reporting, as depicted in **Figure 1**, which each stage comprising further comprehensive steps [15]. This study adjusts the initial stages, resulting in the following stages:

A. **Planning**, this stage begins with identifying the research background and problem to obtain novelty in the study. It is followed by protocol validation, including formulating research questions, determining research objectives, search criteria, and search procedures.
B. **Conducting**, this stage involves executing the planned literature search. The results are then filtered based on predetermined criteria, including research quality and relevance assessments. Data extraction is performed to extract information such as study identity, insights, and statistics. Lastly, the analysis process involves extracting meaningful information from the processed findings.
C. **Reporting**, this stage presents the research findings through data visualization, statistics, and diagrams. The obtained results are then discussed in detail by the formulated research questions.

2.3 Research Finding Criteria

Several search criteria are established in this study to obtain relevant and credible research. These criteria have played a crucial role in determining the research selected during the selection process. The established criteria are as follows:

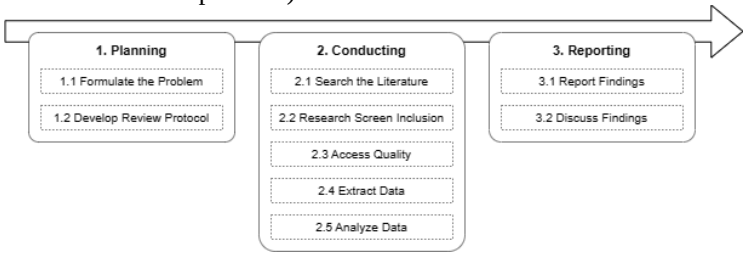

Figure 1. Stages of *Systematic Literature Review*

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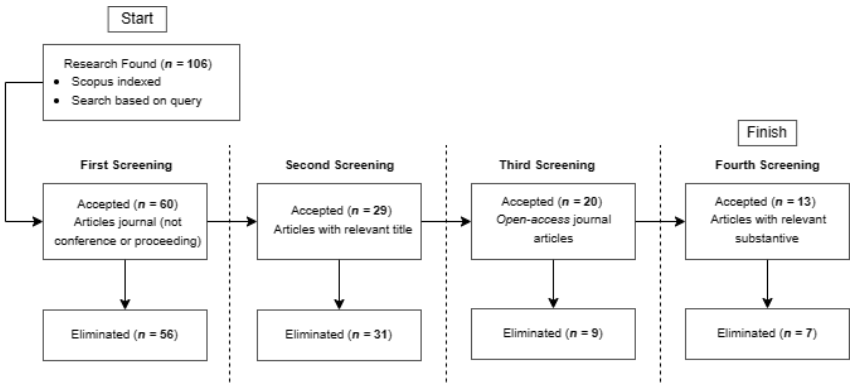

Figure 2. Results of the Screening Process

A. **Research period**, to ensure that the research is aligned with current trends and remains relevant, the study is limited to five years prior to the study, from 2019 to 2023.
B. **Type of research publication**, the research focuses on scientific articles published in journals that are openly accessible (open access) or publicly available on the internet.
C. **Research source**, to ensure the credibility of the research, the selected articles are those indexed in Scopus, a reputable database for scholarly literature.
D. **Research keywords**, the determination of search keywords refers to the Enterprise Resource Planning (ERP) module, specifically the "Sales & Distribution" and "Financial & Accounting" modules [16]. These modules are crucial for micro or small-scale businesses. The integration of these modules can be classified according to the following **Table 1**.

Table 1. Search Keywords

Sector	Keywords
Technology	*"artificial intelligence"*, "*machine learning"*, and "*deep learning*"
Business Functional	*"promotion", "sales", "accounting", "financial" , "advertising", "distribution", "cost", "profit", "budget", "customer"*, and *"market*
Addition	*"enterprise", "business", "firm", "shop"*, and *"venture*

E. **Search query**, based on the predefined keywords mentioned in point d) above, the research search was conducted using the following query:

("artificial intelligence" OR "machine learning" OR "deep learning") AND ("promotion" OR "sales" OR "accounting" OR "financial" OR "advertis" OR "distribution" OR "cost" OR "profit" OR "budget" OR "customer" OR "market") AND ("enterprise" OR "business" OR "firm" OR "shop" OR "venture")*

2.4 Selection Process

After conducting the research search process, the obtained results are subjected to three rounds of filtering. The screening process is based on predefined criteria. The number of research studies found will have decreased as the screening steps progressed, resulting in selection of research studies that passed all three screening stages for inclusion in this study. The visualization of this selection process can be seen in **Figure 2**. The details of each screening process are as follows:

A. **First screening**, this step aims to obtain scientific research papers in journals articles.
B. **Second screening**, this step involves assessing the relevance between the article titles and the investigated research topic.
C. **Third screening**, this step aims to identify open-access research studies publicly available on the internet.
D. **Fourth screening**, this step involves evaluating the relevance of the content and substance of the research studies after a thorough review. The suitable studies addressed the implementation of artificial intelligence to benefit MSMEs.

RESULT AND DISCUSSION

Based on the search conducted using the specified query, a total of 106 research studies were identified. After the first filtering round, 60 studies remained, considering that approximately 50% did not publish their findings as journal articles. Following the second screening stage to assess the relevance of the titles to the current research, 29 studies were retained. Subsequently, the third screening stage resulted in 20 studies remaining. Finally, after the fourth round of screening, a total of 13 studies were selected for inclusion. Further details of each screening stage are provided in the attached diagrams, **Figure 3** and **Figure 4**.

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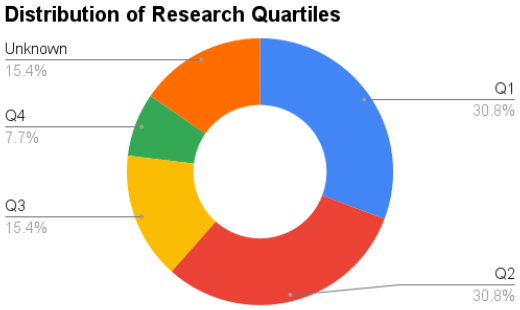

Figure 3. Distribution of Research Quartiles

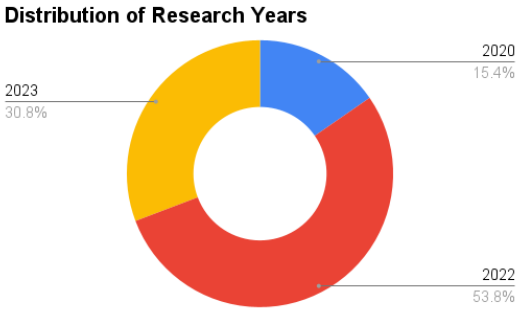

Figure 4. Distribution of Research Years

In general, the publication of research articles was observed between the years 2020 and 2023. Although the criteria included 2019, the screening results indicated no research studies conducted before 2020. Additionally, the Scopus quartile rankings of the articles varied from Q1 to Q4, with some articles unable to be identified due to the evaluation of quartiles not yet being performed by Scopus (although the studies were indexed). **Table 2** summarizes the findings and potential categories from the researcher's perspective.

In terms of publication years, two studies were found in 2020, no studies were found in 2021, and 2022 had the highest number of studies with seven, followed by four studies in 2023. Considering the quartile positions of the studies, one study was in Q4, two were in Q3, four were in Q2, four were in Q1, and two could not be identified. Regarding journal identity, Hindawi's publishers with Computational Intelligence and Neuroscience were the most frequently encountered. A comprehensive recapitulation of the journal identities is provided in **Table 3**.

Table 2. Summary Recapitulation of Research Findings

Quartile	Researcher	Findings	Category
Q1	(Suh, 2023)	Model for predicting customer churn using ensemble methods, Random Forest (RF), and Light Gradient-Boosting Machine (LightGBM) [17]	Sales
Q1	(Faritha Banu et al., 2022)	Model for predicting and managing customer churn and non-churn in the business sector using advanced selection, optimalization, and classification techniques [18]	Penjualan
Q1	(Shao & Chen, 2022)	A new novel deep learning-based method to enhance the classification accuracy of sentiment analysis on product comments [19]	Sales
Q1	(Qiu & Chen, 2022)	Model for analysing environmental costs using Back Propagation Neural Network (BPNN) optimized by the NSGA-II algorithm [20]	Financial
Q2	(Chen & Long, 2023)	Model for predicting financial risks based on a neural network with a combination of Factor Analysis (FA), Particle Swarm Optimization (PSO), and Long Short-Term Memory (LSTM) techniques [21]	Financial
Q2	(Matuszelański & Kopczewska, 2022)	Model for predicting customer churn using Extreme Gradient Boosting (XGBoost) and Logistic Regression (LR) [22]	Sales
Q2	(Agarwal, 2022)	Method for sentiment analysis and goal extraction from customer feedback using a combination of Recurrent Neural Network (RNN) and Convolutional Neural Network (CNN) [23]	Sales
Q2	(Li et al., 2022)	Implementation of Probabilistic Neural Network (PNN) for environmental cost control classification and Particle Swarm Optimization (PSO) algorithm as the decision-making system [24]	Financial
Q3	(J et al., 2023)	Customer churn prediction using a Support Vector Machine algorithm and Hybrid Recommendation Strategy to prevent churn [25]	Sales
Q3	(Zhang, 2022)	Model for predicting financial risks using an optimized structure combining Temporal Convolutional Network-Long (TCN) with Long Short-Term Memory (LSTM) [26]	Financial
Q4	(Wisesa et al., 2020)	Model for predicting sales in the B2B context using various machine learning algorithms, with Gradient Boost performing the best [27]	Sales
~	(Sánchez-Torres et al., 2022)	Clustering and efficient alternative product recommendation for budget control using Hierarchical Agglomerative Clustering (HAC) algorithm [28]	Financial
~	(Yi & Liu, 2020)	A system for providing recommendations on customer purchasing power for a product using an integration of Collaborative Filtering (CF) and Product-Product Similarity methods [29]	Sales

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Table 3. Recapitulation of Journal Research Identities

Publisher	Journal	*N*-Journal	*N*-Publisher
Hindawi	Computational Intelligence and Neuroscience	*3*	*4*
	Advances in Multimedia	*1*	
MDPI	Sustainability	*2*	*3*
	Journal of Theoretical and Applied Electronic Commerce Research	*1*	
Springer	Journal of Big Data	*1*	*2*
	Complex and Intelligent Systems	*1*	
SAGE	Global Business Review	*1*	*1*
Elsevier	Measurement: Sensors	*1*	*1*
MJEE	Majlesi Journal of Electrical Engineering	*1*	*1*
Reunir	International Journal of Interactive Multimedia and Artificial Intelligence	*1*	*1*

3.1 Distribution of Research Studies (RQ1)

This section discusses the first research question (**RQ1**), which is "How is the distribution of research studies in each business functional area?" Generally, the obtained research results can be categorized into two main types: sales and financial. However, upon further classification, at least six sub-categories can be identified, as follows:

A. Customer Churn Prediction

This sub-category has been extensively discussed in previous studies, with four studies addressing these topics [17], [18], [22], [25]. The urgency of customer churn remains relevant and continues to trend until this year, as evidenced by research published in 2023. For micro-scale businesses, especially those in the MSME sector, insights or the urgency related to customer churn tend to be overlooked. Therefore, through predictive models, business operators can respond effectively or implement strategies to minimize customer churn or customer loss.

B. Budget Control

This sub-category is the second most prevalent, with three identified studies [20], [24], [28]. Each study was conducted in the same year. Furthermore, budget control can be divided into two objectives: environmental budget control and fixed budget control (routine expenditures). Budget control is crucial for MSMEs, especially for businesses with limited capital. Through effective control systems, expenditure costs can be minimized.

C. User Review Sentiment

This sub-category is the third most prevalent, with two identified studies [19], [23]. Agarwal's study leans towards the implementation of models and identifying the purpose behind customer feedback, while Shao and Chen's research focuses more on optimizing model performance accuracy. Sentiment analysis is important to understand the intent behind digital customer reviews, especially when the number of customers is substantial, and automation is needed.

D. Financial Risk Prediction

This sub-category consists of two studies conducted in different years [21], [30]. Both studies share a common objective of developing models for predicting financial risks in businesses or companies. Financial risk assessment can assist business operators in making informed decisions regarding future business steps, particularly in maximizing high-return opportunities and minimizing risks.

E. Sales Prediction

This sub-category comprises one identified study [27]. Sales prediction is closely related to predicting product demand trends. By having predictions or estimates of future sales profitability, MSME operators can devise appropriate strategies to determine dynamic sales costs based on demand trends. This approach allows them to maximize profits.

F. Buying Interest Recommendation System

This sub-category includes one identified study [29]. Through a recommendation system, business operators can determine the level of customer attraction toward a particular product. Furthermore, this step can be integrated with promotional strategies to maximize product sales.

3.2 Technical Explanation of Research (RQ2)

This section discusses the second research question (**RQ2**), which is "What algorithms,

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technologies, or frameworks are used in the obtained research?" Generally, the algorithms and technologies used in each study vary, although there are some common technical aspects. To gain a deeper understanding of the technical aspects of each study, they are categorized into four types:

A. Machine Learning

The studies cover supervised, unsupervised, and ensemble learning. In terms of quantity, research on ensemble learning is the most dominant, including algorithms such as Random Forest, Light Gradient Boosting Machine, Fuzzy Rule-based Classifier, Extreme Gradient Boosting, and Gradient Boosting [17], [18], [22], [27]. The prevalence of ensemble usage indicates that the research aims to maximize performance through the combination of various models. Additionally, within the scope of supervised learning, established algorithms such as Support Vector Machine and Logistic Regression are revisited [22], [25]. Lastly, in the domain of unsupervised learning, the Hierarchical Agglomerative Clustering algorithm is utilized for clustering purposes [28].

B. Deep Learning

Neural network techniques and methods predominantly characterize the use of deep learning. Firstly, a Backpropagation Neural Network (BPNN), a type of Feedforward Neural Network (FFNN), is utilized, and researchers optimize its performance using genetic algorithms [20]. Another combination is the integration of Recurrent Neural Network (RNN) and Convolutional Neural Network (CNN) for sentiment analysis, representing each word as a vector [23]. An exciting study combines Temporal Convolutional Neural Network (TCNN) with a non-neural network approach, namely Long Short-Time Memory (LSTM), aiming to improve processing efficiency and memory units [30]. Lastly, Probabilistic Neural Network (PNN) is utilized due to its simplicity in the learning process, fast training, accurate classification, and strong tolerance [24].

C. Optimalization

Mathematically, optimization techniques involve the process of finding the best value of a function within constraints to achieve specific objectives [31]. Some studies combine their algorithmic basis with optimization techniques to achieve maximum performance. The most commonly used technique is Particle Swarm Optimization (PSO), found in two studies [21], [24], although both studies have different objectives for its utilization. Other swarm optimization techniques include Chaotic Salp Swarm Optimization-based Feature Selection (CSSO-FS) for feature selection, and Quantum Behaved Particle Swarm Optimization (QPSO) to enhance model performance [18]. Another technique is Non-dominated Sorting Genetic Algorithm II (NSGA-II), which inherits principles from genetic algorithms [20]. The last technique found is Factor Analysis, used to obtain common factors in an effort to identify the effects of reducing overfitting in the model [21].

D. Recommendation Systems

Only one study discusses a recommendation system that applies two techniques: Collaborative Filtering (CF) and Product-Product (P-P) similarity [29]. Furthermore, Yi and Liu explain that CF focuses on recommending products based on collaboration with other users. On the other hand, P-P similarity aims to identify the best products to recommend.

CONCLUSION

This research has shown the potential benefits of artificial intelligence (AI) for micro, small, and medium enterprises (MSMEs). These benefits can be realized through several innovative applications, such as customer churn prediction, budget control, sentiment analysis of customer reviews, financial risk prediction, sales forecasting, and personalized recommendation systems for buying interests. From a technological perspective, a wide range of techniques, including machine learning, deep learning, optimization, and recommendation systems, have been extensively utilized. However, most research has focused on enhancing and optimizing performance of the systems and their established models. As a result, MSMEs are expected to experience partial business growth by utilizing various advancements in AI.

Several recommendations have emerged based on this research. First, the selection process in this study has limited criteria. To gather more diverse research, future studies can adopt broader criteria, such as a wide range of functional business sectors including various types of research works or publications. Additionally, there is an opportunity to conduct in-depth examinations of specific functional business sectors, both from technical and operational perspectives. Second, policymakers, especially the government, can seize significant

opportunities through the adoption of these technologies. The availability of academic knowledge represents a valuable asset in maximizing the utilization of cost-effective technology. Consequently, aimed policies that promote MSMEs should prioritize minimizing burdens on business actors while actively promoting the adoption of technology.

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