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An Examination of the Opportunities and Challenges of Conversational Artificial Intelligence in Small and Medium Enterprises

W.F. Ridho
National Development University "Veteran" of East Java, Surabaya, Indonesia

ABSTRACT

This study **aims** to examine the potential benefits and challenges associated with conversational artificial intelligence (CAI) implementation within small and medium enterprises (SMEs). The study employs a comprehensive literature review and thematic analysis as the primary data collection and interpretation **methods**. CAI technologies are examined, including chatbots, virtual assistants, and automated response systems. These technologies offer SMEs opportunities to automate customer service operations, gain valuable customer insights, and enhance operational efficiency. However, their integration also presents technical difficulties, financial constraints, data privacy and security concerns, and inherent CAI limitations. The study **results** provide a nuanced understanding of CAI's role in SMEs, offering insights into practical applications, potential benefits, and hurdles. The **findings** highlight SMEs' need to strategically approach AI implementation, balancing the potential benefits and associated challenges. The **key conclusion** drawn from this study is that the strategic and well-planned adoption of CAI can significantly benefit SMEs. However, it should be viewed as an augmentation of existing operations rather than a complete replacement. This study also identifies the need for future research, particularly empirical studies examining the implementation of CAI in SMEs and exploring its long-term impacts and ethical implications.

Keywords: artificial intelligence (AI); conversational AI (CAI); small and medium enterprises; SME; digital business; digital transformation; AI implementation; literature review

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ОРИГИНАЛЬНАЯ СТАТЬЯ

Исследование возможностей использования и проблем разговорного искусственного интеллекта на малых и средних предприятиях

В.Ф. Ридхо
Национальный университет развития «Ветеран» Восточной Явы, Сурабая, Индонезия

АННОТАЦИЯ

Целью данного исследования является изучение потенциальных преимуществ и проблем, связанных с внедрением разговорного искусственного интеллекта (РИИ) на малых и средних предприятиях (МСП). В качестве основных **методов** получения и интерпретации данных в исследовании используются комплексный обзор литературы и тематический анализ. Рассматриваются технологии РИИ, включая чат-боты, виртуальные помощники и системы автоматического ответа. Эти технологии предоставляют МСП возможности автоматизировать операции по обслуживанию клиентов, получать ценную информацию о клиентах и повышать операционную эффективность. Однако их интеграция также сопряжена с техническими

трудностями, финансовыми ограничениями, проблемами конфиденциальности и безопасности данных, а также с присущими РИИ ограничениями. **Результаты** исследования представляют подробное описание роли РИИ в МСП, возможностей практического применения, показывают потенциальные преимущества и препятствия использования РИИ. Результаты исследования подчеркивают необходимость стратегического подхода МСП к внедрению РИИ с учетом потенциальных преимуществ и сопутствующих проблем. **Основной вывод,** сделанный на основе данного исследования, заключается в том, что стратегическое и хорошо спланированное внедрение РИИ может принести значительную пользу МСП. Однако РИИ следует рассматривать как дополнение к существующим операциям, а не как их полную замену. Данное исследование также определяет необходимость проведения будущих научных работ, особенно эмпирических исследований, посвященных внедрению систем РИИ в МСП и изучению их долгосрочного влияния и этических последствий для организаций.

Ключевые слова: искусственный интеллект (ИИ); разговорный ИИ (РИИ); малые и средние предприятия; МСП; цифровой бизнес; цифровая трансформация; внедрение ИИ; обзор литературы

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1. Introduction

The continuous advancement of artificial intelligence (AI) technology, particularly conversational AI (CAI), has significantly transformed various aspects of our lives and industries. The role of AI in the modern economy has grown exponentially over the past decade, driven by advancements in computing power, data availability, and machine learning algorithms. As a result, AI systems, including CAI, have become increasingly adept at performing a wide range of tasks, such as natural language processing and decision-making support [1]. The integration of this technology across various sectors has offered large corporations a competitive edge and now holds the potential to revolutionise the operational dynamics of small and medium-sized enterprises (SMEs), creating avenues for growth and innovation despite distinct challenges. The global conversational AI market, valued at USD 6.18 billion in 2021, is expected to exhibit a compound annual growth rate (CAGR) of 23.6% between 2022 and 2030, highlighting this technology's increasing adoption and potential [2].

However, the impact of AI on SMEs has been less pronounced, with many smaller organisations needing help to keep pace with the rapid developments in AI technology [3]. This is due, in part, to the high costs associated with AI implementation, as well as the specialised knowledge and resources required to develop and maintain AI systems [4]. Moreover, SMEs often need more scale and resources to effectively leverage AI for competitive advantage, as they typically operate on smaller budgets and with fewer personnel than their larger counterparts [5]. The potential advantages and challenges of CAI technology for business advancement remain to be explored. This research attempts to answer critical questions about the potential benefits for SMEs when implementing CAI technologies and the challenges SMEs might face when incorporating CAI into their operational structures.

This research focuses on the application of conversational AI (CAI) within the operations of SMEs, emphasising potential challenges and risks. It aims to enrich the existing literature by offering a comprehensive examination of CAI's effects on SMEs, a subject that has yet to be thoroughly investigated. Moreover, it extends its contribution by delivering actionable insights and implications that can assist SMEs in successfully integrating conversational AI into their businesses. For instance, SME owners can leverage these insights to enhance their understanding of CAI implementation, promoting business growth [10]. Simultaneously, these findings can serve as a resource for government entities, guiding the development of policies to improve the SME sector and mitigating any negative impacts stemming from AI technology [11].

2. Literature review

2.1. Conversational artificial intelligence (CAI)

CAI refers to using artificial intelligence technology to enable natural language interactions between machines and humans through natural language interfaces [12]. Initially emerging as text-based interfaces, CAI has since expanded to incorporate other forms of communication, including voice

and image interactions. Examples of this evolution include text-based general conversational AI such as ChatGPT and customer service chatbots. Voice-activated assistants, such as Siri or Google Assistant, represent another facet of this development. Furthermore, image-based conversational tools such as visualGPT exemplify the broadening scope of CAI, demonstrating its capacity to interact through various mediums. In this context, CAI serves as an interface for AI technologies. It comes in multiple forms, such as chatbots, virtual assistants and automated response systems, and needs to be further defined in the context of CAI. Chatbots are AI software designed to interact with humans using natural language. These interactions can occur on various platforms, such as websites, social messaging platforms, and via text or voice [13, 14]. An automated response system refers to a system that utilises automation to generate responses or perform tasks without human intervention. It can be part of a more extensive automation system or operate independently [15, 16]. In the context of CAI, it refers to an umbrella term for chatbots and virtual assistants designed to interact with users and provide information or assistance without human intervention [17, 18].

Conversational AI has seen considerable evolution since its inception. The origins of conversational AI can be traced back to the 1960s with ELIZA, a simple rule-based system developed at the Massachusetts Institute of Technology (MIT) that mimicked a psychotherapist [19]. PARRY followed this in the 1970s, which simulated a person with paranoid schizophrenia, marking an early attempt to model human conversation more realistically [19]. The 1990s saw the advent of more sophisticated systems, such as Artificial Linguistic Internet Computer Entity (ALICE), which used heuristic pattern matching to hold conversations and won the Loebner Prize. In the 2000s, with the advent of the internet and improvements in computational power and data availability, conversational AI began to include machine learning and natural language processing capabilities. The current era of conversational AI, characterised by deep understanding and neural networks, started in the 2010s. This has led to the development of advanced systems [20], such as OpenAI's GPT-3.5 and Google's Meena. Today's CAI, powered by generative AI capabilities, can generate human-like text and understand the context using Natural Language Programming (NLP). This makes them increasingly versatile tools for content generation, customer service, personal assistance, and more [21, 22].

CAI has become increasingly important in business due to the emergence of big data and advancements in computing power [23]. CAI can potentially transform various aspects of business, including digital marketing, customer service, and commerce [24]. Organisations can better understand their customers and deliver personalised digital messages [23]. CAI can also drive business model innovation by developing new and innovative business models [25]. It has been widely used in industries such as tourism and hospitality, where conversational agents empowered by AI are becoming more common [26]. The application of conversational AI can significantly impact the customer experience and reduce service costs [27]. Overall, conversational AI has the potential to enhance business performance, improve customer engagement, and enable informed decision-making [28, 29].

2.2. Role of CAI in business context

The role of AI in business contexts has attracted substantial attention in recent academic literature. Studies have consistently underscored the potential of AI to revolutionise various aspects of business operations, such as enhancing productivity, augmenting decision-making capabilities, and enriching customer service experiences [23, 25, 30–35]. CAI has been shown to empower decision-making processes by providing valuable insights and recommendations based on data analysis [30, 31, 36]. It has also been found to contribute to business model innovation and the transformation of industries [23, 25]. Additionally, CAI can potentially improve customer service experiences through personalised recommendations and solutions [36]. However, it is essential to consider the limitations and challenges associated with CAI, such as biases and ethical implications [33, 35]. Overall, the academic literature highlights the significant impact of AI on various aspects of business operations and emphasises the need for further research in this area.

2.3. CAI implementation case in SMEs

CAI implementation in small and medium-sized enterprises (SMEs) presents a unique set of opportunities and challenges, a topic that has recently gained prominence in scholarly litera-

ture. Due to their size and flexibility, SMEs can often adopt new technologies faster than larger enterprises, allowing them to stay competitive and innovative [37]. AI has been identified as a significant driver of operational efficiency in SMEs. A study by Von Garrel and Jahn [38] demonstrated how AI could streamline operations in SMEs by automating repetitive tasks and providing predictive insights, thereby freeing up human resources for more strategic tasks. CAI has also been shown to enhance decision-making in SMEs by providing data-driven insights and recommendations [39]. In summary, while the literature on CAI implementation in SMEs is still emerging, existing studies underscore its potential benefits and the need for strategic approaches to overcome associated challenges.

3. Method

This study uses a literature review and thematic analysis as the primary research method. The method relies on a comprehensive review of secondary data sourced predominantly from academic journals, industry reports, and articles available on the Internet [40]. The aim of this study is to obtain a broad and deep understanding of the use, benefits, and challenges of implementing CAI in SMEs. The data collection process involves the use of specific search terms related to our research questions, such as "Conversational AI", "SMEs", "AI adoption", "challenges", and "benefits", among others. Databases such as Google Scholar, IEEE Xplore, and ScienceDirect will be used to source peer-reviewed articles. Journals chosen as review sources were assessed based on their relevance to the research question, with the author's judgement based on their title and abstract. After that, it will be analysed further for content. While websites such as Medium, Towards Data Science, and Forbes will provide insights from an industry perspective. Information regarding CAI implementation in large companies was also collected to provide a broader context of the potential application of CAI to SMEs' business functions.

Data analysis will include coding and categorising the collected information according to our research questions and theoretical framework. Coding refers to assigning labels to data that represent themes or categories such as "benefit", "challenges", "implementation", and "limitation". Categorising refers to grouping based on coded data. A thematic analysis will identify recurring patterns and themes across the literature [41]. The synthesised results will then be interpreted in line with our theoretical basis, providing a comprehensive view of the implications of CAI technology for SMEs. This secondary research methodology enables us to consolidate and analyse various perspectives and findings. However, it is essential to be aware of the potential for bias and critically evaluate the sources' quality and relevance.

4. Results and discussion

4.1. Implementation and benefit of CAI in SMEs

Deploying conversational AI technology has benefited SMEs across diverse sectors [42]. This transformative technology has been instrumental in reshaping the operational landscape of these businesses, offering a wide array of advantages beyond mere cost savings. CAI has emerged as a crucial enabler for SMEs to access knowledge and capabilities once reserved for large corporations with substantial resources.

One of the most compelling features of CAI is its ability to generate content dynamically by utilising generative AI. This capability, powered by state-of-the-art machine learning models, has opened up many opportunities for SMEs. The most powerful feature supported by generative AI technology, is that CAI could create content from scratch, such as marketing materials and strategy [43, 44], generate insightful reports [45] and write business emails. This allows SMEs to manage various functions with little to no costs, matching the capabilities of their larger counterparts. The outcomes from such generative AI models closely resemble content produced by humans, as they are trained using a vast array of data. These models can be tailored to carry out particular tasks, such as creating slides following a specific style, composing marketing campaigns targeted at a particular demographic, providing commentary for online gaming, and generating high-resolution images [46]. CAI can be leveraged for tasks that require programming, as it can generate code based on user prompts. This allows users with minimal programming skills to execute tasks that traditionally require significant coding knowledge, such as creating digital materials such as websites or applications. For budget-conscious SMEs, this could be a game-changer. CAI aids users

by suggesting code, resolving programming-related queries, and guiding problem-solving processes [47]. Its natural language processing capabilities enable it to comprehend and produce code, making it a valuable resource for users [48]. Additionally, CAI can assist with code documentation, create code snippets, and explain programming concepts [49]. With the advent of CAI, these expenses can be significantly mitigated.

Moreover, these AI-driven systems have been pivotal in providing valuable customer insights. By analysing customer interactions, SMEs can better understand customer behaviour, preferences, and needs [55]. For instance, an online retail business can use chatbot interactions to identify common customer inquiries or complaints, helping them proactively address these issues. This data-driven approach allows SMEs to tailor their products and services more effectively, increasing sales and customer retention. According to the customer relationship management (CRM) theory, understanding and responding to customer needs is critical to building long-term customer relationships and driving business growth [56]. By leveraging CAI, SMEs can implement CRM strategies more effectively, using the insights gained from customer interactions to deliver personalised experiences and build customer loyalty. In addition, CAI has also played a significant role in internal business operations. It has enabled SMEs to automate routine tasks, allowing employees to focus on more strategic, value-adding activities. For example, a small tech company could use a CAI to automate scheduling meetings or managing project timelines, allowing their team to focus more on product development and innovation [57]. Furthermore, the scalability of CAI systems has been particularly beneficial for SMEs. As these businesses grow, the CAI systems can easily be scaled up to handle increased customer interactions without significant additional investment. For instance, as an e-commerce business expands its customer base, it can scale up its CAI capabilities to drive increased customer inquiries without hiring more customer service staff [58].

Overall, the advent of CAI has levelled the playing field, allowing SMEs to access capabilities and knowledge previously out of their reach. By effectively utilising CAI, SMEs can enhance their operations and improve their competitive position in the market.

4.2. Implementation challenge and limitations for SMEs

While CAI presents many opportunities for SMEs, it is also full of challenges. There are several considerations that SMEs must address when implementing, maintaining, and managing the externalities of AI. Certain inherent limitations of CAI have been identified, which may pose potential concerns for SMEs compared to large corporations.

4.2.1. Technical challenges

SMEs may need help integrating these AI systems with their IT infrastructure [59, 60]. This process requires a certain level of technical expertise to ensure seamless integration and operation. Furthermore, maintaining and updating these systems to keep up with advancements in AI technology can be a daunting task for SMEs that may need a dedicated IT team. SMEs could implement CAI on a smaller scale, which does not require massive integration with the IT structure. SMEs' key advantage over larger businesses is their simpler IT infrastructure. This simplicity lowers the barriers to AI implementation, especially when using licensed or outsourced services. These standalone services are known for their ease of integration and minimal learning curve for employees. They offer a straightforward way for SMEs to enhance their customer service capabilities using AI. This service also provides consultation and assistance service during implementation to help SMEs.

4.2.2. Financial constraints

Financial limitations often pose a significant challenge for SMEs. The initial financial investment required to integrate conversational AI systems can be substantial. Software acquisition, system integration, and employee training costs can present a significant financial hurdle in adopting these innovative systems [61, 62]. The price of CAI software and integration may vary depending on the complexity and performance of the CAI. The integration cost may range from $ 1000 to $ 2000 per conversational AI agent [62]. Early adoption of conversational AI will be mainly driven by large organisations with sufficient budget and technical resources. Furthermore, the ongoing financial demands for system maintenance and upgrades can strain the limited resources available to SMEs.

Financial hurdles can be eased through judicious scaling of the business. SMEs can identify crucial

business needs across their business lifecycle and prioritise AI solutions based on their return on investment. The advantages of AI should be tracked over time, with the anticipation that the profits generated from its deployment will, in time, exceed the initial and sustained costs.

4.2.3. Data privacy and security concerns

Using conversational AI systems, which often handle sensitive client information, inherently raises data privacy and security concerns. SMEs must ensure that these systems comply with data protection laws, maintain high data security standards, and protect customer information to maintain trust [63]. Deviations from these standards can lead to legal repercussions and significant damage to the company's reputation. Additionally, these systems are not impervious to cybersecurity threats; a notable example being the exploitation of these systems by malevolent entities to procure sensitive user data [64].

Addressing data privacy and security concerns is vital, particularly for CAI systems handling sensitive customer data. SMEs can consider AI services that adhere to data protection laws and invest in training their employees on data security protocols. Furthermore, integrating privacy considerations into every process — a strategy often referred to as 'privacy by design' — can help ensure robust data protection measures are in place from the outset.

4.2.4. Limitations of CAI

Despite the considerable advances in conversational AI, it's essential to recognise its potential shortcomings. Primarily, the creative capabilities of CAI can be a double-edged sword, posing challenges to the reliability and accuracy of the system. Contemporary research typically presents objective metrics on test sets. Still, it may quickly and justifiably discount any poor performance, attributing it to the system's creative language generation compared to the ground truth responses. Instead, they rely on crowd-sourced reviews as a qualitative metric for evaluating model performance [65]. Utilising the current iteration of CAI for tasks demanding high precision and consequences in information generation, such as healthcare diagnosis, legal counsel, or safety-critical systems, carries a degree of risk. As a result, the outputs from CAI should be treated as advisory and supporting data rather than absolute truths that serve as the sole basis for decision-making. Moreover, CAI should be leveraged to enhance, not replace, human interaction and critical thinking [66]. CAI also poses challenges in comprehending the subtleties and intricacies of human language. These limitations include but are not limited to reliability, semantic variations, colloquialisms, and culturally specific linguistic nuances, which pose formidable challenges to the accurate interpretation of language by AI models [67].

Table 1 illustrates the multifaceted implications of CAI across a spectrum of business operations. Although not all applications have been adopted within the SME landscape, the table delineates many potential opportunities for integrating such technologies within this sector.

While AI implementation has many challenges, its benefits greatly outweigh them. From streamlining processes to assisting in decision-making across all business functions, AI may become an indispensable business tool for gaining a competitive edge. Despite initial obstacles such as cost, technical complexity, and privacy concerns, businesses that successfully harness the power of AI can transform their operations and customer experiences. With AI, they can automate repetitive tasks, freeing up human resources for more strategic, high-value work. This increases efficiency and boosts employee satisfaction by allowing them to focus on more creative and fulfilling tasks. In decision-making, AI-powered analytics can give businesses unparalleled insights into operations, market trends, and customer behaviour. These insights allow companies to make data-driven decisions, reducing guesswork and enabling them to respond more quickly to changes in the market. Therefore, while adopting AI may present particular challenges, its strategic integration into business functions can provide significant advantages. It is crucial, however, for businesses to approach AI implementation thoughtfully and strategically, carefully considering their specific needs, resources, and potential risks and rewards.

4.3. Future research direction

While the existing literature provides valuable insights into the potential benefits and challenges of CAI for SMEs, it also highlights several areas where further research is needed. Our synthesis of the literature suggests the following critical areas for future exploration (*Table 2*).

Table 1
Practical implications of CAI across business functions

Practical implementation	Benefit	Potential challenge
	Customer service [42, 52, 53]	
Responding to customer inquiries	Reduces response times from a few minutes to a few seconds. Cutting costs up to 30%	Resistance from employees due to fears of job loss
AI for complaint resolution	Boosts customer satisfaction	The balance between AI and human support
	Sales and marketing [68–70]	
Using CAI to qualify leads	Supports lead generation	High upfront costs
Personalised marketing messages	Improves customer engagement	Managing data privacy concerns
	Human resources [71, 72]	
Automating initial interviews	Streamlines recruitment processes	Requires reorganisation of existing workflows
Answering questions about company policies	Improves new hire onboarding	Managing employee's perceptions towards AI
Scheduling interviews	Reduces administrative work	Ensuring AI reliability
	Operations and supply chain management [39, 73, 74]	
Chatbots tracking inventory levels	It makes businesses more efficient	Data privacy concerns
CAI provides real-time updates on shipment status	Enhances customer-centric operations	Coordinating AI with human decision-making
	Finance [75–78]	
CAI provides financial advice	Empowers customers with financial knowledge	Managing customer trust in AI handling financial transactions. Reliability of information

Source: Developed by the author from various sources.

5. Conclusion

The advent of CAI has ushered in a new era of digital transformation, offering many opportunities for SMEs to enhance their operational efficiency, improve customer satisfaction, and gain a competitive edge in the market. However, the implementation of this transformative technology has its challenges. Technical difficulties, financial constraints, data privacy and security concerns, and the inherent limitations of CAI are some of the potential hurdles that SMEs may encounter in their AI journey. Therefore, SMES must adopt a strategic approach towards AI implementation, considering these potential challenges and devising effective strategies to mitigate them. Despite the challenges, the potential benefits of CAI for SMEs are immense. By automating routine tasks, providing valuable customer insights, and enhancing customer service, CAI can significantly contribute to the growth and competitiveness of SMEs. However, SMEs must understand that CAI is not a panacea for all their challenges. Instead, it should be viewed as a tool to augment their existing capabilities and help them achieve their business objectives.

Future research could focus on exploring the long-term impacts of CAI on SMEs, including its effects on employee roles and responsibilities, or-

Table 2
Future research areas

Key questions	Research gap	Type of studies needed to answer the question	Future research recommendation
How does industry influence the impact of CAI?	Need for industry-specific analyses	Comparative studies across different sectors	Researchers should focus on individual industries, identifying unique opportunities and challenges
	Only some comprehensive studies explore all facets of a specific industry	Deep dives into each sector, investigating the entire value chain	Researchers could consider the whole spectrum of industry operations to identify how AI could add value
How does the size of the SME influence the implementation and outcomes of CAI?	Lack of differentiation in studies based on the size of the SMEs	Comparative studies on small versus medium-sized enterprises.	More nuanced studies considering the size and resource availability of SMEs are required
	Inadequate exploration of the impact of resource availability on AI implementation	Correlation studies between resource availability and successful AI integration	Studies should consider the role of resources in enabling or hindering AI adoption
What are the perceptions and attitudes of employees towards CAI?	There needs to be more consideration of the employee perspective	Surveys, interviews, and ethnographic studies to gauge employee attitudes and acceptance	An in-depth exploration of the employee's perspective, including attitudes, fears, and adaptability, is needed
	Neglected exploration of strategies for improving employee acceptance	Case studies on successful employee engagement with AI	Strategies for fostering positive employee engagement with AI should be identified and evaluated
What are the best methodologies or tools for integrating CAI into existing SME operations?	Scarcity of practical guides or methodological studies	Case studies, design research, and action research focusing on the practical implementation of AI	Researchers should aim to provide experimental methodologies, frameworks, and tools for SMEs transitioning to AI
	Minimal investigation of the processes for training and educating SMEs about AI	Exploratory and evaluative studies of AI training and education programs.	Research should focus on developing and evaluating practical AI training and education for SMEs

Source: Developed by the author.

ganisational structure, and business strategy. Additionally, empirical studies examining the implementation and use of CAI in SMEs could provide valuable insights into this technology's practical challenges and benefits. Furthermore, the research could also explore the ethical implications of CAI, including issues related to data privacy, security, and the potential for AI to perpetuate and amplify socio-cultural and racial biases.

In conclusion, this research has significantly contributed to the literature on AI and SMEs. This study has provided a comprehensive analysis of the implications of conversational AI for SMEs and offered practical insights to guide their adoption and use of this technology. These contributions fill a gap in the existing literature and provide valuable information for business owners, managers, and policymakers.

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ABOUT THE AUTHOR / ИНФОРМАЦИЯ ОБ АВТОРЕ

Wahyu Fahrul Ridho — MBA, Lecturer, Department of Business Administration, National Development University "Veteran" of East Java, Surabaya, Indonesia
https://orcid.org/ 0000-0002-2447-2032
wahyu.ridho.adbis@upnjatim.ac.id
Вахью Фахрул Ридхо — MBA, преподаватель департамента делового администрирования, Национальный университет развития «Ветеран» Восточной Явы, Сурабая, Индонезия
https://orcid.org/ 0000-0002-2447-2032
wahyu.ridho.adbis@upnjatim.ac.id

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