Leveraging AI for small and medium-sized enterprises (SMEs): Exploring real-world applications of AI in business

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Author: Haoyu Zhang

Primary Supervisor: Muhammad Hamza, Ph.D.

Secondary Supervisor: Professor Zhihong Xu

ABSTRACT

Lappeenranta–Lahti University of Technology LUT
LUT School of Engineering Science
Software Engineering

Haoyu Zhang

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The purpose of this bachelor thesis is to find out where artificial intelligence (AI) specifically could be applicable in small and medium-sized enterprises (SMEs) when it comes to business fields such as retail, marketing, customer service, or similar crucial business operations. The current study's primary focus is to find out the possible AI applications in SMEs, the advantages, and most importantly challenges of AI adoption in SMEs by a mixed methods research approach adhering to literature review and case study. The findings of this study show the most used AI applications in SMEs include automated customer service, process automation, supply chain optimization, data analysis, and marketing optimization and automation. Besides, the research highlights one emerging application - AI-powered digital human that has the potential to revolutionize many industries. The benefits of each AI application in SMEs mentioned above were examined. The challenges such as high implementation costs and lack of technical expertise were also identified and discussed. The study concludes with recommendations for SMEs on how to successfully leverage AI technologies.

SYMBOLS AND ABBREVIATIONS

AI	Artificial Intelligence
AR	Augmented Reality
CRM	Customer Relationship Management
DL	Deep Learning
ML	Machine Learning
RPA	Robotic Process Automation
SMEs	Small and Medium-sized Enterprises
LLM	Large Language Model
AlaaS	AI-as-a-Service

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1. Introduction

In today's business environment with the rise of Artificial Intelligence (AI), small and medium-sized enterprises (SMEs) often find themselves in a challenging and sometimes even embarrassing situation, facing intense competition from larger, well-established corporations. Therefore, it is important to figure out how these enterprises can leverage AI effectively despite their resource constraints in order to maintain or increase market share against competitors. Thus, possible solutions need to be found.

The purpose of this bachelor's thesis study is to explore what practical applications of AI are available and feasible from the perspective of SMEs, such as retail business optimization and automation, customer support, and marketing. Besides, this study will cover the challenges encountered when implementing AI, and the potential benefits that the companies could receive. In the end, the paper will provide some constructive and positive suggestions on how to better utilize or implement AI and AI tools for small-scale enterprises.

Main research questions：

(1) What real-world applications exist for integrating AI into SME businesses across various industries?

(2) What are the potential benefits and key challenges of implementing AI for SMEs?

To address these research questions, a mixed-methods research approach is employed, combining a literature review with case study analysis. The literature review focuses on recent studies and industry reports, and synthesizes existing theories, practices, and findings from relevant research papers, providing a theoretical foundation. Case studies examine real-world examples of SMEs that have successfully adopted AI, and provide detailed insights into the implementation processes and the outcomes achieved.

Thesis Structure:

Chapter 2 - Methodology: This chapter describes the design of this study, that is, why a combination of literature and case studies was chosen for the study. It will also address the selection and analysis of the literature and case studies.

Chapter 3 - Related work (literature review): This chapter will first go through the history and current situation of the commercial applications of AI, which will provide a general background for this topic. Next, the current literature on AI adoption in SME businesses will be assessed and reviewed.

Chapter 4 - Case studies — an examination of real-life case studies on AI adoptions in SMEs, adoption solutions and outcomes will also be covered in detail.

Chapter 5 - Results: This chapter contains the answers to the research questions. It presents some of the beneficial and practical real-world AI applications for SMEs, along with the advantages and some potential challenges related to adoption.

Chapter 6 - Discussion: This chapter discusses limitations in the analysis, and provides recommendations for SMEs on how to leverage AI in their businesses..

Chapter 7 - Conclusion and future work: The final part of the paper will present the conclusion and summarize the research work, then highlight future work directions briefly.

2. Methodology

Research Design:

This thesis uses a mixed-methods design of literature review and focused case study to respond to the research questions The approach aims to provide SMEs with a multifaceted exploration of practical applications of AI in the real world and examine the potential benefits and challenges of implementing and integrating AI into their business operations. The results will provide insights to SMEs interested in leveraging AI.

2.1 Literature review

This study is underpinned by a literature review of the field of study. It is a mini-review of the available academic papers, journals, and industry reports associated with AI applications in SMEs.

Database selection: Relevant literature will be searched from academic databases such as Google Scholar, LUT primo, and IEEE Xplore using keywords like “AI in SMEs”, “AI business application”, “AI for small businesses” and “AI implementation/adoption in business”.

Inclusion criteria: Previous studies will be screened based on their relevance to AI applications in SMEs, benefits, and challenges for SMEs, covering the most common business areas. Publications from the past five years will be given priority to ensure relevance to the current state of AI technology.

Data extraction and synthesis: Key insights such as the use of AI technology or tools, application areas, challenges in implementation, and benefits observed will be curated for analysis. Data will be extracted and synthesized to determine common patterns and gaps in the literature, yielding an extensive view of the current status of the adoption of AI in SMEs.

2.2 Case study analysis

The case study analysis offers empirical insights into what AI technologies, and in which way, have been applied in practice to SMEs in the last years. It aims to complement and corroborate research results by showcasing the AI implementations in real-world examples of SMEs, and their concrete results, which can be used to validate the suitability of such AI tools or technologies for integration into specific SMEs.

A purposive sampling method is used to select SMEs that have successfully adopted AI technologies. The selection criteria for SMEs mainly depend on the size of the enterprise, such as the number of employees. In this study, companies with fewer than 50 people are defined as small-sized businesses, and companies with fewer than 200 people are defined as medium-sized businesses. Additionally, the selection needs to cover the most common business sectors, such as sales, marketing, and customer service. The data for case studies are collected through multiple available sources from the Internet including business newspapers, company use cases and customer stories, and industry publications.

The case studies are conducted from two perspectives: SMEs adopting AI and AI technology providers. Thus, there are two groups of case studies. there are two groups of case studies. The first group of case studies will showcase how SMEs leverage AI to resolve challenges and improve their business operations. The second group of case studies will focus on what AI services are offered by AI technology providers and how they empower SMEs with their services and tools.

The first group of case studies will be analyzed using a structured analysis framework to depict how SMEs availed the opportunities and resolved their challenges to align their business process using AI solutions. The framework focuses on the following aspects:

Company overview and challenge: Provides an overview of the background information about the company, including its size, industry, and specific challenges faced before AI adoption.

AI solutions implemented: Explains a detailed description of the AI technologies and tools adopted by the company.

Outcomes: Presents the results of the successful adoption of AI in the company, including improvements in efficiency, cost savings, and customer satisfaction.

Conclusion: Summarizes the key insights from the case, and reflects on the broader applications and implications of such AI technology in SMEs.

The second group of cases turns the analytical perspective to AI technology providers, exploring the use cases of well-known AI technology providers such as OpenAI, Copy.ai, and Baidu to see what kind of feasible AI solutions they can provide for SMEs.

By combining these methods and techniques, the study can present a robust and comprehensive analysis of AI applications in SMEs. This methodology ensures that the results of this study are well-supported by both theoretical and empirical evidence, offering practical insights for SMEs looking to adopt AI.

3. Related work

This chapter will first briefly go through the history of AI commercial applications to provide background on the topic, where significant milestones in the application of AI in business contexts will be reviewed. Then, the related previous research will be explored and organized to provide insights and supporting materials for the research results.

3.1 Brief history of AI commercial application

The commercial application of AI has a rich history. Even though most of its chapters were written in the past decade, it still goes back a long way. Early uses of AI were primarily in large corporations that invested in what were then cutting-edge technologies. As AI technology evolved, the threshold for adoption decreased, allowing small and medium-sized enterprises (SMEs) to start getting involved (Kaplan and Haenlein, 2019).

The concept of AI was formally introduced in the 1950s. The Dartmouth Conference in 1956 is often viewed as the birth of AI as a field of study. Early commercial applications were limited, but they formed the foundation for future development.

From the late 1980s to the mid-1990s, the AI field experienced a major downturn known as the AI winter. During this period, the funding and interest in AI were significantly reduced due to the limitations of expert systems and the high cost of implementation (Omoumi et al., 2021).

The rise of the Internet and improved machine learning algorithms led to the resurgence of AI in the late 1990s and early 2000s. The emergence of data mining and natural language processing applications impacted several sectors including e-commerce, customer service, and online search. Companies like Google and Amazon began to use AI for recommendation systems and search algorithms, showing the potential of AI to transform business operations (Russell & Norvig, 2010).

The current boom in AI began in the 2010s, characterized by breakthroughs in deep learning and big data, which significantly improved AI capabilities, including image and speech recognition. AI's commercial applications have become widespread, with enterprises using AI to achieve a wide range of functions such as predictive analytics, customer relationship management, and operational automation.

From the beginning of the 2010s, major tech companies started incorporating machine learning (ML) into their business logic to analyze user behavior and preferences, thus enhancing the related service's personalization. On the other hand, AlexNet's success in the 2012 ImageNet competition demonstrated a major leap forward in the application of deep learning (DL), especially in image and speech recognition, which is crucial for industries such as retail and automotive (Krizhevsky, Sutskever, and Hinton, 2012).

Several AI-as-a-Service AIaaS platforms were launched by tech giants in the mid-2010s, allowing organizations, including small businesses to access and integrate AI capabilities into their own systems (Hatch, 2014). Furthermore, chatbots and virtual assistants have become prevalent in customer service, demonstrating the impact and direction in which natural language processing technologies are likely to develop and improve in the real world (Vinyals and Le, 2015).

In the late 2010s, robotic process automation (RPA) became common in industries including manufacturing and finance to streamline operations and reduce costs (Willcocks, Lacity, and Craig, 2017). Meanwhile, AI-driven analytics leveraging big data have been increasingly used in decision-making processes in marketing and logistics (Marr, 2018).

The development of large language models (LLM) like GPT-3 by OpenAI has opened new dimensions and possibilities in natural language processing, content creation, and software development (Brown et al., 2020). Since the release of ChatGPT in 2022, many competing models have been released. Among those popular LLMs, some of them, like BERT, Claude, GPT-3.5, and GPT-4, belong to big companies; others like Falcon, Gemma, and Llama are open-source. These models are capable of performing a variety of language-based tasks, which means they are promising in customer service, content creation, creative writing, data analysis, marketing, and beyond. (Guinness, 2024)

3.2 Literature Review

Many studies have attempted to understand the possibilities and dynamics of AI adoption within small businesses. In this section, a range of previous studies will be explored to showcase what kind of AI real-world applications have already been discovered, and what kind of issues exist in the business world for AI adoption.

AI for marketing, operational efficiency, customer experience, and decision-making

One significant study area focuses on AI's impact in the business context, including marketing, supply chain management, and customer relationship management (CRM). For example, Huang and Rust (2018) show how AI technologies such as chatbots and personalized marketing tools are capable of changing business service operations by automating and personalizing customer interactions, improving not only efficiency but also customer satisfaction, with the latter being more critical for small businesses reliant on competitive differentiation.

Some researchers have delved into AI’s role in optimizing inventory management and forecasting consumer behavior in the retail sector, demonstrating significant efficiency improvements and marketing enhancements (Hossam, Ramadan, & Magdy, 2024). Moreover, in manufacturing, businesses employ AI to boost production efficiencies and enhance quality control, backing up AI’s pivotal role in operational optimization (Hooda et al., 2024).

In terms of efficiency, the combination of robotic process automation (RPA) and AI also provides a good solution. The research analyzed a case study of an SME in Germany, which focused on its daily order entry process. This research hypothesized that using these technologies could reduce the time required for these processes by more than 50% compared with the traditional manual order entry method. However, despite these improved efficiencies, some doubts exist as discussed in this study that RPA and AI were superior to traditional methods in general and in the context of SMEs in particular.
(Salmen, 2022).

The study by Szedlak, Poetters, and Prinz (2020) titled “Application of Artificial Intelligence in Small and Medium-sized Enterprises” applies a mixed-methods analysis through surveys, interviews, and case studies. First and foremost, they survey a group of SME owners to understand the primary areas of AI usage, then conduct in-depth interviews with selected participants to gather detailed insights. Moreover, the collected data is complemented by the study of a series of successful AI adoption cases to discover the practical applications and business impacts. Based on the above analysis, they categorized the AI tools adopted by SMEs into different types. These are automated customer service tools such as chatbots and automatic response systems which are used to enhance customer interaction. AI-driven logistics and supply chain management tools that optimize inventory, scheduling, and delivery processes. AI-data analytics tools that analyze data sets to extract insights for operational improvement and business strategy.

AI’s role in enhancing decision-making processes within business organizations has been proven. According to Mikalef et al. (2020), AI-driven analytics strengthen organizational decision-making, thereby fostering a dynamic capability that enables businesses to sense and seize evolving market opportunities effectively.

Adoption benefits and barriers

As Szedlak et al. (2020) summarized in their study, there are several major benefits to integrating AI into an SME's business operations. One is improved efficiency. For example, the automation of most daily tasks can save a lot of unnecessary time and improve operational efficiency. Another benefit is cost reduction, which can be made through optimized operations, reduced labor costs, and minimized errors. In specific business operations, such as customer service, successful AI adoption can improve responsiveness and personalization in customer interaction, leading to higher customer satisfaction rates.

In the study by Vial (2019), the author elaborates on the issue of digital transformation where small and medium-sized enterprises face specific challenges and opportunities, including AI technology integration. As Vial highlights, these businesses often struggle with the complex dynamic of integrating advanced digital technologies into their operations to remain competitive. Through a literature review, the research identifies major barriers to digital transformation, which include the cost of technology, lack of expertise, and reluctance to change. From Szedlak’s study, we can also draw a similar conclusion about the key challenges faced by SMEs, including the high initial investment required for AI technologies for small businesses with limited budgets; the complexity of integrating and maintaining AI systems; and cultural or organizational resistance to adopting new technologies.

Entrepreneurs's attitude

The research by Ray, Kim, and Morris (2021) particularly focuses on studying the attitudes of small business owners toward AI and their intentions to adopt such technologies. They found that there is a mix of enthusiasm for the benefits of AI and concerns about the costs and complexity of implementing AI systems.

AI adoption data in SMEs

29%	Small businesses already adopted AI
37%	Small businesses think that the major problem of not adopting AI in business is lack of expertise
1,467	A survey of CEOs of SMEs pointed out that out of all the current technologies, AI had the maximum impact on the businesses
41%	Small companies are developing AI strategies for future sustenance
25%	A study from Deloitte and Stanford University stated that 25% of small businesses are currently using AI in some or the other form
85%	Owners of small businesses say that technology helps them to succeed

Table 1. Adoption rate of AI in SMEs

According to Table 1 (Source: Yadav & Dwivedi, IJFMR, 2023), the adoption rate of AI in SMEs reveals several key insights. Firstly, only less than 30% of surveyed small businesses have already adopted AI, while 37% see the lack of expertise as a major barrier to adopting AI. Additionally, 41% of small companies are developing AI strategies for the future. The data also shows that most small business owners have a positive attitude toward AI applications in business, 85% of them believe AI can help their business succeed. (Yadav and Dwivedi, 2023)

SME gaps in technology adoption

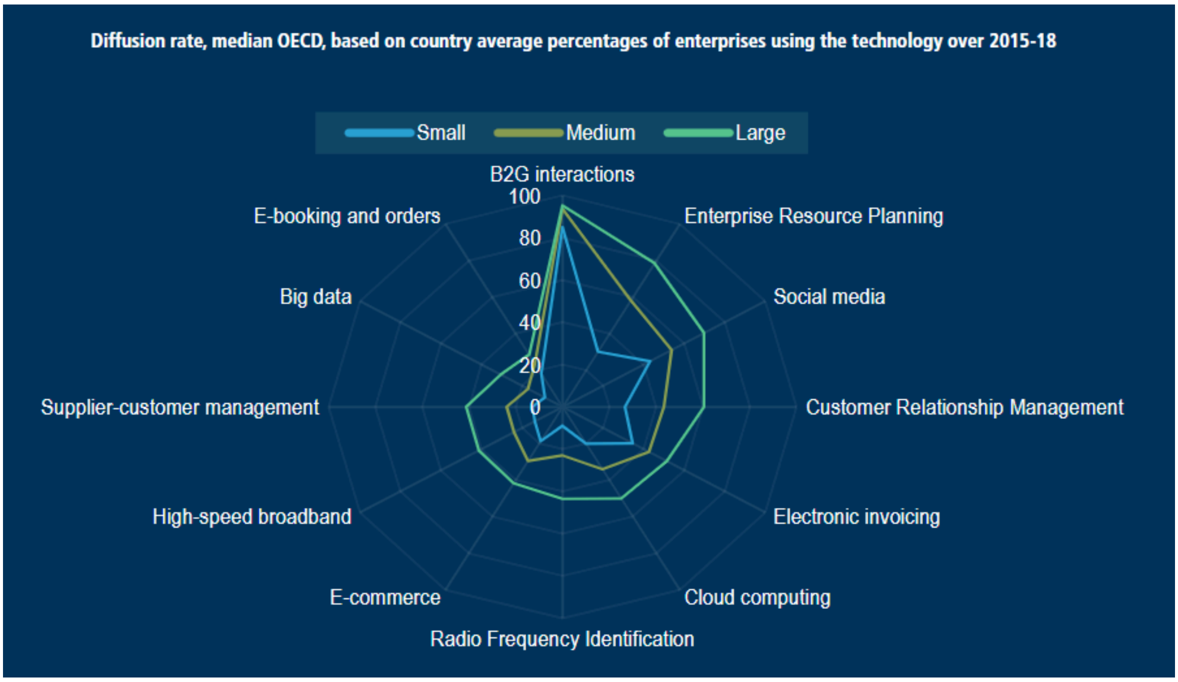

Figure 1. OECD report's radar chart that illustrates the gaps in technology adoption

According to the OECD's report (2020), most small businesses are lagging behind in digital transformation. From the radar chart above, it is clear that larger firms have a higher adoption rate for all business areas compared to small and medium firms. High adoption areas for SMEs are B2G (Business-to-Government) interactions, social media, and electronic invoicing. The chart shows a large gap where small companies are significantly behind in adopting more advanced digital technologies related to enterprise resource planning, customer relationship management, big data, etc.

4. Case studies

This chapter explores AI applications across different sectors. Through detailed case studies, the integration and outcomes of AI technologies will be examined. Each case study highlights specific AI tools and platforms, demonstrating their impact on different business operations. These real-world examples show AI’s role in offering cost-effective solutions that empower SMEs to compete in the current digital age.

Case 1: SmithDigital’s Integration of rasa.io for enhanced marketing and client engagement (Rasa.io, 2023)

Company Overview and Challenge:

SmithDigital is a full-service digital marketing agency in South Carolina, dedicated to helping businesses achieve their marketing goals by incorporating more efficient and effective solutions. Before partnering with rasa.io, SmithDigital had not given much thought to AI and considered that using email newsletters would be too time-consuming and costly to incorporate into their marketing strategy at the time. Other platforms like HubSpot were considered but did not meet all their needs before they discovered rasa.io.

Solution:

SmithDigital chose an integration between rasa.io and HubSpot, thereby allowing the company to streamline its email marketing efforts by automatically syncing subscriber data between the two platforms. After connecting rasa.io and HubSpot, and syncing up subscriber data, SmithDigital can utilize rasa.io to create and send personalized newsletters to each subscriber. The rasa.io platform works by leveraging artificial intelligence to analyze subscriber behavior and preferences and automatically tailor relevant and engaging content to each recipient. Additionally, SmithDigital can track client engagement to measure the effectiveness of its email marketing campaigns and make data-driven decisions about how to improve them.

Outcomes:

The rasa.io platform was easy and quick for the company team. After the adoption, the team spent less than one hour per month on half a dozen weekly client newsletter campaigns. In other words, SmithDigital is saving over 75 hours per month in creating and distributing newsletters, while still providing clients with tailored and high-quality content through the use of AI newsletters.

Conclusion:

This case exemplifies that AI can automate labor-intensive tasks, and be used to personalize services for better marketing outcomes. Besides, SmithDigital's experience with rasa.io offers several lessons for other SMEs considering AI adoption. First is to start with clear objectives, SMEs need to define what they hope to achieve with AI and select tools that align with these goals. The second is to ensure that new AI tools can seamlessly integrate with existing systems to maximize efficiency.

Case 2: Stikets' use of AI in enhancing customer experience (IBM, 2023)

Company Overview and Challenge:

Stikets is a label manufacturer and distributor headquartered in Barcelona, Spain. It was founded in 2010 and specializes in custom labels and stickers for children's products. Currently, the company has only 50 employees but fulfills more than 350,000 orders per year from more than 30 countries, both for personal and professional use. It operates primarily in the online retail space. The challenge Stikets faced was managing a high volume of customer inquiries daily, which strained their customer service resources.

Solution:

Stikets turned to IBM Watson Assistant, an AI-powered virtual assistant. The AI assistant is integrated into Stikets' customer service operations, and deployed on the IBM cloud to ensure high availability and scalability. The AI assistant called Stiky is trained with FAQs and transactional data to handle a wide range of customer interactions, from product inquiries to order status checks and troubleshooting. Besides, the AI system is specifically designed to recognize and respond in multiple languages based on Stikets' diverse customer base.

Outcomes:

Deploying the fully functional AI assistant Stiky took only 10 weeks, including integrating Stiky with the client's Zendesk platform, which automatically creates help tickets that are routed to human live agents for follow-up. The AI assistant Stiky can provide 24/7 support to customers, and resolve up to 90% of customer queries about products, shipping, pricing, and more, allowing the company's customer service agents to have time to solve more challenging questions and issues. Sticky is highly efficient, averaging 165 conversations per day and achieving a 92% positive customer satisfaction rating. The company was satisfied with the results, and plans to further integrate AI across other areas of its business operations to streamline processes, and looks to expand the role of AI in providing predictive insights into customer preferences and behavior.

Deployment Period	10 weeks
Availability	24/7
Ability to Answer Customer Queries	90%
Average Conversations per Day	165
Customer Satisfaction	92%

Table 2: Data about AI assistant Skity

Conclusion:

Stikets' successful integration of AI into their customer service operations shows a typical example of how small businesses can leverage AI by partnering with AI technology providers to improve their business operations, offering valuable insights for other SMEs considering similar AI implementations.

Case 3: Zapier's customer stories

Sub-Case 3.1: The Millshop Online - Innovating fabric design with AI and automation. (Zapier, 2023)

Company Overview and Challenge:

The Millshop Online is a fabric company based in the UK. They faced the challenge of maintaining a competitive advantage and innovating in a traditional industry known for its resistance to adopting new technology. Danny Richman, as an SEO specialist saw an opportunity to leverage AI to create and design unique patterns. The Millshop Online greenlit his idea to develop an AI-powered service that allowed customers to order made-to-measure fabric designs. However, developing an AI service typically requires a team of developers and significant investment. Besides many technical hurdles, the project needed to be launched as soon as possible to capitalize on the market opportunity.

Solution:

Danny utilized Zapier and multiple AI tools to automate the bulk of the work. Zapier is an automation tool known for its capability to integrate with many different AI tools and models, thus it was used to connect multiple AI models and services to automate tasks. Over 85 Zaps were created to manage the service (Zaps are automated workflows in Zapier), and they ranged from ensuring appropriate content submission, handling the flow of requests, generating custom fabric designs, and automating emails. AI image generators like Midjourney were used to create design elements. GPT-4 was employed to generate and debug code, making the development process faster and more efficient.

Results:

The entire project was completed in only 12 weeks from ideation to launch. The AI tools and Zapier helped save approximately 40,000 dollars, compared to traditional development methods. The developed AI-powered service called FabricGenie allowed customers to describe the fabric they wanted or upload a photo of their room, and within minutes, receive design options to purchase directly from The Millshop Online. It received over 2,000 requests within two days of launch. The Millshop Online successfully sent out and sold many products based on the FabricGenie designs. Besides, the innovative use of AI has sparked interest from other furniture and fabric retailers looking to form partnerships.

Conclusion:

By integrating AI and automation, The Millshop Online revolutionized their design process and offered personalized fabric designs to their customers. The Millshop Online's success with FabricGenie shows the potential of AI and automation for SMEs, even in traditional industries. This case embodies the use of AI to unleash creativity, illustrating AI tools can help businesses generate creative assets. FabricGenie serves as a powerful example of how SMEs can utilize AI to stay competitive and open up new markets and opportunities for innovation.

Sub-Case 3.2: **How Zapier Tables and ChatGPT prevent missed sales leads for results grow. (Zapier, 2024)**

Company Overview and Challenge:

Results Grow is a marketing agency in Texas, USA. The company focuses on supporting home service businesses. The company found out that some of their clients were losing potential leads because they were not quick to respond to customer inquiries. Operations manager Ryan Blackburn discovered many clients were underdoing kitchen renovations or HVAC installations, and simply couldn't be in front of their computer screen following up with leads while in the field. Such delays often result in lost business opportunities. One client lost over 300 leads because the staff responsible for following up with leads was also working in the field. The leads were left unanswered for two to three days, and by that point, they had already gone to other service providers. Initial solutions considered, including hiring additional staff, extending office hours, and reallocating staff time, were not feasible for the client.

Solution:

Ryan solved this problem by creating an AI bot with the help of Zapier and ChatGPT which answers automatically to leads, processes requests, and asks for scheduling in-home consultations. This was how the implementation went: First, Ryan created detailed prompts for ChatGPT, including instructions on the types of conversations it would handle and ensuring it reflected the client's tone and style. He then built a database using Zapier Tables to store common questions and standard responses. This database also stored lead information and previous conversations. Every time a lead submitted new information, Zapier automatically mapped the relevant context from the Tables to ChatGPT. This way, the bot's answers could seem more human-like and relevant to the conversation going on.

Results:

The AI bot significantly improved lead management for Results Grow's clients. It answered queries without delay and just as effectively as a human staff. The client saw an obvious increase in booked consultations. During the first year, 30 percent of all appointments were made through the chatbot and contributed over $134K in annual revenue.

Conclusion:

The integration of Zapier and ChatGPT provided 24/7 automated customer service and transformed lead management for Results Grow's clients. The AI bot guaranteed timely follow-ups, reduced missed business opportunities, and freed up human resources. This case embodies the application of AI and automation to streamline operations and enhance efficiency, particularly for SMEs with limited resources.

Sub-Case 3.3: Automating invoicing and expenses with AI at Wee Beastie Gardens. (Zapier, 2024)

Company Overview and Challenge:

Wee Beastie Gardens is a sustainable gardening business launched by Dr. Nadia Dewhurst-Richman in the UK. This small business faced challenges managing administrative tasks in a busy daily schedule. Like many small business owners, Nadia prioritized client work, leaving little time for operational tasks like invoicing and expense tracking. This often resulted in late payments and difficulties in tracking business expenses.

Solution:

The digital business consultant, Danny Richman, created an automation system that made things easier by automating Nadia's administrative tasks. He utilized Zapier, Jotform, and OpenAI to build an automated workflow that allowed Nadia to record voice messages and automatically convert them into invoices, expense logs, or task lists. A simple form was created with Jotform to record Nadia's voice requests. The voice recordings were transcribed and parsed into structured data that could be further analyzed with OpenAI. Zapier was used to connect Jotform, OpenAI, and other relevant platforms to automate the whole process from start to finish.

Results:

This automated workflow transformed Nadia's ability to administrate, reducing Nadia's burden and allowing her to focus more on her core gardening service. Now she could handle invoicing and expense logging directly from the field in real time. AI-powered transcription and categorization ensured that everything was accurately documented. Furthermore, the swifter creation of invoices helped streamline the payments which meant faster cash flow for Wee Beastie Gardens.

Conclusion:

This case shows that even small businesses in traditional manual fields can benefit greatly from AI and automation. Using AI and automation to handle routine tasks can be a good and efficient option for small businesses. It can help small business owners free up time for core business activities. As AI technology becomes more commonplace, more and more user-friendly tools are available to ensure that business owners can adopt and use the technology effortlessly.

Case 4: Viable - Automating customer feedback analysis (OpenAI, 2023)

Company Overview and Challenge:

Viable: A startup that wanted to help businesses get customer feedback faster, make it easier to understand and work better together to turn it into actionable insights. The problem was, that analyzing hours upon hours of customer feedback manually was extremely time-consuming and subject to human errors due to the vast and intricate nature of the data. Because of this, Viable required a better way to streamline this process and deliver the data-driven results needed by customers.

Solution:

Viable integrated OpenAI's GPT-4 in their customer feedback analysis tools to auto-analyze feedback for their users and trained it on a large scale of previous customer feedback data to improve accuracy over multiple contexts. After implementing the AI system, it would be able to analyze huge volumes of unstructured text data, to produce reports with great depth in it for their clients

Results:

What once took weeks in analysis now took minutes with the AI, without the need for extensive human labor, this kept costs down significantly. In addition to saving time, top-performing automation also increased accuracy and efficiency which directly impacts customer satisfaction and loyalty due to the smarter and more consistent results.

Conclusion:

This case exemplifies the power of AI to revolutionize data analysis to help SMEs improve business operations. By integrating AI and automating the analysis of unstructured data, Viable provides businesses with accurate and actionable insights that drive better decision-making and improve customer experience.

Case 5: AI service provider - Copy.ai for content creation

Copy.ai has been offering AI technology that specializes in creating written content through advanced LLMs. Their platforms are designed to complete related tasks such as content creation, social media posts, product descriptions, and various other writing jobs with high efficiency and quality. More often than not, it can be difficult for SMEs to keep up with content production and publish as much as they planned to, due to resource and time shortages, thereby impeding their marketing objectives and further business development.

AI solution provided by Copy.ai:

The platform offered by Copy.ai enables small to medium enterprises to create various types of content by employing AI based on their inputs and particular needs. It is capable of generating content ranging from blog posts and advertisements to email newsletters and social media posts. Furthermore, it offers customization and flexibility, whereby users only need to provide their brand details, target audience, and additional guidelines to acquire content that perfectly matches their brand profile.

Results:

Copy.ai serves as a useful helping hand to deal with writer's block and come up with creative ideas. The platform provides a broader range and inspiration for content, which enriches the quality and variety of marketing materials. SMEs save significant amounts of time on content generation, enabling them to focus on other important business operations. The AI tool ensures businesses are able to generate more content in less time, serving marketing purposes without having to add more workforce. Instead of outsourcing, SMEs can deploy this powerful AI tool to cut huge costs on every word. Due to its affordability, professional-grade content can now be accessible to established small businesses on a budget.

Example user cases:

SMEs can leverage Copy.ai to produce daily social media posts, guaranteeing a steady stream of engaging content that resonates with their followers and bolsters their online presence. E-commerce SMEs can utilize Copy.ai to create detailed and compelling product descriptions, improving product listings. Marketing businesses can take advantage of Copy.ai to draft personalized email newsletters, enhancing customer interaction through high-quality and tailored content.

Case 6: AI digital human industry in China, and how it revolutionizes SMEs in E-commerce.

In 2023, generative AI's rapid development has significantly accelerated several industries' revolutions. Driven by large language models, the intelligence of digital humans has been improved to another level. Thus, many new opportunities have been created for the digital human industry. According to the "2024 White Paper on the Development of China's Virtual Digital Human Industry" by iiMedia Research, the Virtual digital human industry market size in China reached 333.47 billion yuan and is expected to grow to 640.27 billion yuan by 2025.

As the technical threshold and implementation costs of digital people decrease, more and more businesses are beginning to get involved in this industry, and more companies are willing to integrate this technology into their businesses. According to the data from Tianyancha, more than 417,000 new related companies were established in 2023. Among these businesses, over 60% are small businesses with a registered capital of less than 2 million yuan.

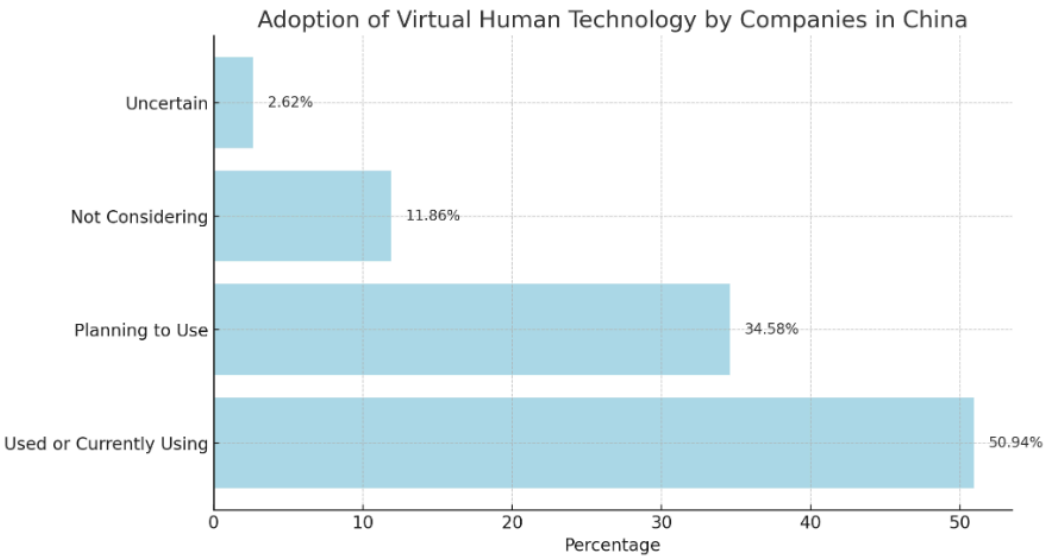

Figure 2. Adoption rate of digital human technology by companies in China

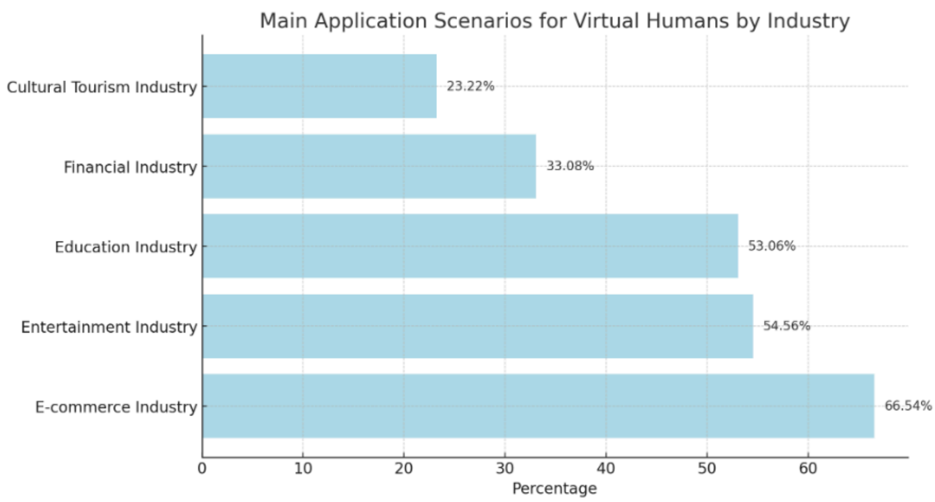

Figure 3. Companies utilize digital human technology in different industries

Based on the data (Figure) shown in the report by xkb.com.cn, more than 50 percent of interviewed companies have used or are still using digital human technology, and more than 30 percent of companies are planning to implement this technology. Noticeably, the main application sector for digital humans is e-commerce.

Speaking of e-commerce in China, it is necessary to introduce live-streaming e-commerce, which is an online retail trend in China, where hosts introduce and sell products directly to consumers through live-streaming platforms. It has become a major force in China's e-commerce sector, driving sales across diverse product categories.

Digital human technology can be used to replace the host in live e-commerce. According to a report by Geekpark, during the Double 11 shopping festival in 2023, major e-commerce platforms launched 24-hour non-stop live steaming mode, and Baidu's AI-driven digital human platform "Hui Bo Xing" provided efficient AI-powered solutions for them. Hui Bo Xing can allow merchants to generate exclusive digital humans in just 5 minutes. The digital human public library and sound library have nearly 100 free professional avatars and sounds to choose from. It covers different genders, age groups, and steaming styles to meet the needs of different product categories. It also has AI scripts and AI interactive Q&A capabilities based on Wenxin Yiyan - one of the LLMs.

Many domestic brands in China such as Baixiao T and Ttouchme utilized the AI digital human from Hui Bo Xing, starting 24-hour streaming to sell their products. Many small and medium-sized merchants used Hui Bo Xing's AI digital human to achieve one-click live streaming at a very low cost. As a result, the domestic clothing brand BaixiaoT used the AI host to showcase a wide range of products, increasing order volume by at least 50%. And the original perfume brand "Ttouchme" utilized digital humans to replicate their top-selling human host, increasing order volume by 100%, at only 1/20th the cost of real-person hosts (Geekpark, 2023).

Here is another example of how AI digital humans help small businesses. Jiang Kanglin, a tea farmer and intangible cultural heritage inheritor from Jiangsu, China, is 66 years old and has no experience with e-commerce and AI technology. However, he successfully sold his tea nationwide with the help of Baidu's Hui Bo Xing platform, which launched a digital avatar that replicates Jiang's appearance, voice, and movements to host 24/7 live streams to promote and sell his products.

From the above cases, it is clear that AI digital human technology has lowered the technical threshold and cost, making it more affordable and worthwhile for individuals and SMEs, helping them to make more profit and expand their brand presence.

5. Results

After a literature review of a series of studies in recent years, supplemented by case studies, the most common, popular, and emerging commercial uses of AI can be derived. Additionally, the results section will answer another research question, showing the benefits and possible challenges SMEs face in adopting AI and integrating it into their business.

5.1 AI applications in SME businesses and potential benefits

This study summarizes two types of business applications of artificial intelligence and the adoption benefits each brings to businesses. The first is commonly adopted in the industry and business operations. The second is the new commercial applications of AI in recent years, which have shown great potential and are promising for most SMEs.

5.1.1 Common applications

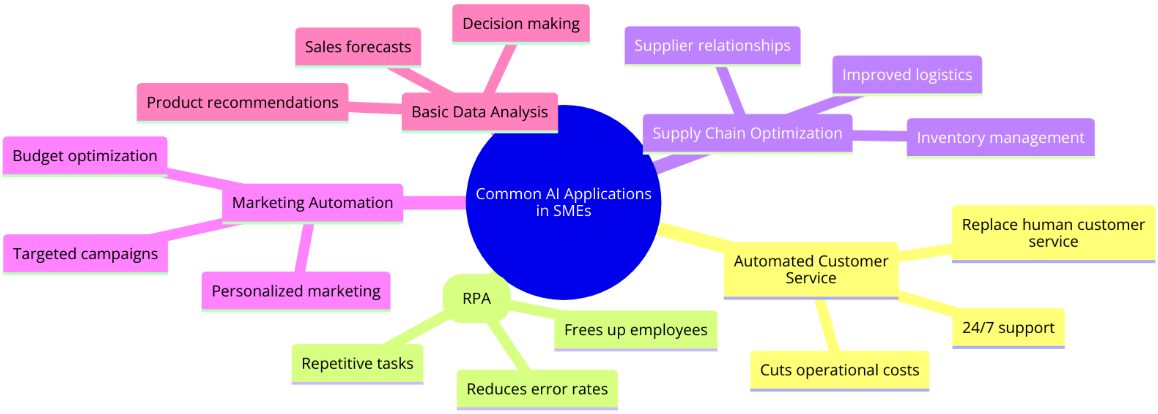

Figure 4. Common AI applications in SMEs

Automated customer service (Chatbots)utilizes chatbots incorporated into business platforms such as websites, social media, and messaging apps, to instantly handle queries. In many real-world cases, it is common to create an automated workflow for customer service by using automation and AI tools. These can lessen the need for human agents, cutting expenses while allowing constant client assistance, and improving customer satisfaction.

Process Automation (RPA) uses automation and AI tools to perform repetitive tasks such as entering data (order entry), invoicing, and processing transactions. The workflow automation solutions allow companies to redeploy staff members previously consumed by repetitive tasks, empowering reassignment to more strategic analysis and problem-solving better suited to human acumen. For example, Zapier, which is mentioned in cases, is a well-known automation platform. Users can combine AI with other tools or models to create automated workflows, which can not only reduce the error rate but also greatly improve work efficiency.

Supply chain optimization uses AI to analyze data across the entire supply chain, thereby optimizing inventory levels, improving logistics for delivery routes, and managing supplier relationships effectively. It can help SMEs reduce risks of overstocking and stockout, and also improve customer satisfaction through on-time delivery.

Marketing automation and optimization use AI to automate and tailor content creation, and optimize marketing strategies and actions based on customer behavior data. SMEs can utilize this technology to achieve a series of marketing activities, including personalized email marketing, targeted ad campaigns, and tailored social media content creation. Especially for those SMEs with limited marketing budgets and employee shortages, this technology can help them optimize their budgets and employee allocations by automating marketing content creation and focusing resources on high-return marketing activities.

Data analysis uses AI tools to handle large volumes of qualitative and quantitative data to perform analytics. In the case studies, the SME integrated the OpenAI service to analyze customer feedback and provide actionable insights reports. Generally, SMEs can use such

AI tools and platforms to make sales forecasts, product recommendations, and other business enhancement activities. For example, the AI system analyzes a customer's past purchases and search history data to predict what products the customer might be interested in next.

5.1.2 Emerging application - AI-powered digital humans

Which can be applied in e-commerce, working as digital sales agents and helping SMEs replace their human hosts for 24/7 non-stop live-streaming product demonstrations and sales, costing just hundreds of yuan per day. In addition to its applications in live-streaming e-commerce, this technology can also be applied in marketing and customer services, such as creating product promotional videos quickly and customizing AI digital humans to serve as shopping guides, retail concierges, and virtual assistants. Low-cost virtual digital human solutions are increasingly entering the market, expanding their audience from large enterprises to SMEs. Nowadays, standardized solutions with much lower costs for smaller businesses are emerging. Customization of a digital human's appearance and voice only requires tens of thousands of yuan per year.

5.2 Possible challenges

Literature review and case studies showed that AI technology has different benefits in different business areas. However, the potential challenges for SMEs working towards the adoption of AI technologies are generally the same.

Cost of Implementation:

Implementing AI technologies requires a significant initial investment, including costs related to acquiring the necessary hardware, software, and expertise. For many SMEs with limited budgets, these expenses may not be affordable and can be prohibitive for AI adoptions. The financial burden associated with AI adoption is a major challenge faced by SMEs (BusinessTechWeekly, 2023).

Lack of technical expertise:

Implementing and maintaining AI systems require specialized knowledge that small businesses don't have access to. In fact, technical expertise is often scarce in many SMEs. This is the technical gap that makes it harder for the majority of SMEs to effectively integrate and taking advantage of AI technologies. As Hartree Centre mentioned, SMEs must either upskill current employees or recruit new talent qualified to manage AI tools (Hartree Centre, 2023).

Integration with existing systems:

Integrating AI seamlessly into current business operations, processes, and systems can be a big hassle and take a long time. Those changes in workflow are risky to the business and require much more resources in order to maintain effectiveness. Moreover, the problem of suitability remains critical. For example, as Salmen (2022) suggests, due to the high costs involved in RPA implementation, companies need to analyze possible processes in advance to ensure their suitability.

Scalability:

According to the GPAI report, scalable AI solutions that can expand with the business are how SMEs can benefit in the long term and remain lean and efficient (GPAI, 2023). Ensuring that the applied AI solutions scale with the growth of the business is both critical and difficult. This requies that SMEs need to invest continuously in AI capabilities to maintain their competitive edge as they grow.

Resistance to change:

This is an inevitably common barrier confronting many organizations. Employees and companies may be hesitant to embrace new technologies due to fear of job displacement or discomfort with altering established familiar business processes. As BusinessTechWeekly discussed, when workers often feel threatened by automation, this resistance can considerably slow down the adoption of AI technologies (BusinessTechWeekly, 2023).

Data quality and availability:

It’s a common scenario when SMEs are ready to adopt AI, but it turns out their data isn’t. The AI system relies heavily on large volumes of high-quality data to feed the AI algorithms. However, collecting, organizing, and analyzing necessary data poses challenges for SMEs, because usually most of them don’t have clear data management strategies and struggle with sourcing and handling the data required by AI (McKinsey, 2023).

Data privacy and security concerns:

AI systems usually utilize large datasets containing sensitive information. Ensuring data security and privacy is crucial yet challenging, especially for SMEs that may lack robust and well-rounded cybersecurity measures (BusinessTechWeekly, 2023; Hartree Centre, 2023).

Regulatory and ethical considerations:

For SMEs that are just beginning to implement and use AI in their business, managing a range of ethical and regulatory considerations is difficult but necessary. These considerations include ensuring fairness, transparency, accountability, privacy, and compliance with relevant laws and standards.

6. Discussion

This section explains the meaning of the research results and their relatedness to the previous research, analyses the limitations of the study, and considers the wider implications. Additionally, based on the research results, practical suggestions are provided to SMEs for better leveraging AI technologies.

Generally, the findings from this research resonate well with similar prior research focusing on AI adoption relevant studies and their impact, advantages, and obstacles related to AI adoption in SMEs. The research findings answer the research question by summarizing the most common AI applications in SMEs via literature review and case study and benefits achieved from the adoption of AI in SMEs and also several of the challenges in implementation faced by SMEs.

Furthermore, the emerging AI application discovered through case studies differentiates this study from previous research. The new business application of AI digital human technology has been rarely explored in the existing literature on AI adoptions, especially in SMEs. This new discovery can contribute to filling the gap between past research and the current situation of the adoption of AI in SMEs and can give new insights to SMEs.

6.1 Research limitations

This study has a limited scope. Firstly, the literature review didn’t cover all of the previous existing studies and research related to AI adoptions in SMEs. Secondly, the study selected a few case studies, which are individual cases in specific business areas such as marketing, retail, and e-commerce business areas, and different businesses may experience AI adoption differently. Therefore, these cases don’t fully represent the diverse range of AI applications in SMEs. The results may not apply to all industries or regions. For example, live-streaming e-commerce is very popular in China compared to other regions, which means that using AI digital humans for live-streaming is more suitable for SMEs in China.

On the other hand, since AI technologies and their applications are rapidly evolving and transforming, the research results may become outdated due to new technological breakthroughs and advancements.

Besides, the data collected in the case studies may be subject to biases or inaccuracies as some of them are self-reported data from SMEs. Another limitation is that the case studies predominantly focus on successful AI implementations and adoptions in SMEs, potentially overlooking challenges and failures experienced by other SMEs.

6.2 Practical advice for SMEs

As McKinsey (2023) recommended, SMEs should first develop a clear AI adoption strategy to guide implementation and ensure alignment with business objectives, starting by defining their goals for AI adoption, such as improving customer service, optimizing the supply chain, or enhancing marketing efforts.

Start small and scale gradually. Companies can start by launching a few pilot projects to prove the value and feasibility of the AI solution, and to create a positive case within the wider organization. This way, successful pilot projects can then be scaled up incrementally (BusinessTechWeekly, 2023). For instance, an SME looking to enhance its customer service function could deploy an AI chatbot in a pilot mode to automate basic queries in order to evaluate its performance before scaling its deployment to more sophisticated customer interactions. It is important to continuously measure the performance of AI initiatives using key performance indicators (KPIs), and use these insights to iterate and improve the implementation.

Meanwhile, SMEs should also invest in employee training to upskill them for AI integration. For example, a marketing SME could train its staff to use AI-powered analytics tools to understand customer behavior better and tailor marketing strategies accordingly. Companies should also foster a culture of continuous learning and innovation and equip employees with the resources and tools they need to keep up with the latest AI trends and technologies.

More importantly, SMEs should consider partnering with the experts in AI or with the firms that provide AI services to gain insights and support for AI adoption. Such collaboration can help SMEs manage technical and regulatory challenges more effectively. Besides, SMEs can also take advantage of AI-as-a-Service (AlaaS) platforms, which offer scalable AI solutions on a subscription basis, helping companies harness cutting-edge AI capabilities without major initial expenses on skilled manpower and hardware. For instance, using AlaaS platforms — small retailers can analyze customer data and offer personalized deals to achieve personalized marketing without needing AI capabilities in-house.

Last but not least, data is a significant matter for SMEs to adopt AI. As indicated in the challenges section, most SMEs believe they are AI-ready while their data is NOT. As a consequence, proper data management is necessary to support data quality and security. This includes setting up data collection protocols, securing data storage, and complying with relevant data protection regulations.

By following the practical advice, SMEs can begin adopting AI technology relatively smoothly and navigate the complexities of AI applications more effectively, take advantage of these advanced technologies with less cost and hassle, and maintain a competitive advantage in the market.

7. Conclusions and future work

This thesis examined how AI could be used in SMEs in the real world, and determined the benefits and challenges of implementing AI within SMEs. Through both literature review and case study analysis, the study aimed to find suitable and feasible AI adoption solutions for SMEs with limited resources and bridge the knowledge gap between existing research and current AI adoption development by providing real-world case study examples of successful AI integration in SMEs.

The study identified various AI uses in SMEs, such as data analysis, automated customer service, process automation, inventory management optimization, marketing personalization, and automation. In addition, AI-powered digital human technology has been identified as a new emerging AI adoption in SMEs. It can be applied in but is not limited to, customer service and marketing in the retail industry. These research questions are answered and provide good insights for SMEs wanting to start with AI in their businesses.

As Szedlak et al. (2020) stated, AI can be a game-changer for SMEs, making them more competitive compared to larger companies. However, for AI to have a broader adoption and impact, there are significant challenges that need to be resolved, such as bringing the costs down; lowering barriers to entry and adoption, and providing education and training programs to support and upskill SMEs.

Further research will build on these results and extend the range of case studies to a variety of other industries and regions to more generally understand the adoption trends of AI in SMEs. This work can be used as a reference for encouraging and inspiring SMEs to embark on and benefit AI in the future.

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