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Application of artificial intelligence technology in the digital transformation of small and medium-sized enterprises in China

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Abstract. With the development of a new round of scientific and technological revolution, big data, cloud computing, and other information technologies have injected new momentum into the research of artificial intelligence. The continuous improvement of artificial intelligence technology has had an impact on social life that cannot be ignored. In the wave of digital transformation of global enterprises, the low level of digital construction and blocked digital transformation of small and medium-sized enterprises (SMEs) in China are still prominent. How to seize the opportunities brought by the development of artificial intelligence and effectively apply artificial intelligence to promote the transformation and upgrading of SMEs? To clarify this issue, this paper first uses crawling technology to get the annual reports of SMEs from 2017 to 2021 and analyses how much emphasis SMEs place on AI through Python. Then, this paper analyses the transformation difficulties faced by Chinese SMEs and systematically sorts out the technical means of artificial intelligence that could embed into the main functions of enterprises. Finally, this paper puts forward specific measures for Chinese SMEs to actively apply artificial intelligence for digital transformation and provides suggestions for SMEs to better integrate into the era of the digital economy.

Keywords: artificial intelligence, keyword analysis, small and medium-sized enterprise, digital transformation.

1. Introduction

The Dartmouth conference in the 1950s marked the beginning of artificial intelligence technology. After decades of development, artificial intelligence has entered a new research stage in the 21st century, and its application scope has gradually expanded, providing help for human production and life. Scholars hold different views on the definition of artificial intelligence. Nilson, a professor at Stanford University's Artificial Intelligence Research Center, believes that artificial intelligence is a discipline about how to represent, acquire and use knowledge. Winston, a scientist, believes that artificial intelligence is a technology that uses computer intelligence to achieve various jobs that human beings can do. In a word, artificial intelligence is a science in which humans guide machines to simulate intelligent behaviors such as judgment, understanding, and communication like humans through training them.

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Nowadays, artificial intelligence is widely used in various fields such as medical and health care [1], logistics and transportation [2], and higher education [3]. It also plays a huge role in enterprise transformation and upgrading. Although most Chinese enterprises have made positive attempts, few enterprises have successfully transformed [4]. According to Accenture's 2022 survey data, only 17% of Chinese enterprises have achieved remarkable transformation results, and the overall degree of digitalization is at a low level. In the era of the digital economy, new requirements have been put forward for the operation efficiency, service response, and innovation ability of enterprises [5-6].

This paper selects some GEM-listed companies and makes statistics on artificial intelligence keywords in their annual reports from 2017 to 2021. It is found that SMEs generally pay low attention to AI. Through the analysis of the difficulties in the digital transformation of SMEs in China, this paper believes that SMEs have shortcomings in the transformation environment, transformation willingness, and transformation conditions. The degree of application of artificial intelligence is also low. Therefore, this paper establishes the research on the application of artificial intelligence technology in the digital transformation of Chinese SMEs. According to the current situation of Chinese SMEs' digital development, combined with artificial intelligence technology, this paper puts forward suggestions for digital transformation, so as to improve the application level of science and technology and the core competence of SMEs.

2. Artificial intelligence keyword frequency statistics

2.1. Sample and word selection

This paper selects the data of GEM-listed companies from 2017 to 2021 as the initial research sample, and processes the data as follows: First, eliminate the samples of ST and delisting during the period; Second, only the samples with five consecutive annual reports are retained. Finally, a total of 555 annual reports from 111 SMEs were obtained. The annual report data are from Chinfo. For the selection of artificial intelligence keywords, this paper refers to domestic authoritative research and selects 14 words, including artificial intelligence, business intelligence, image understanding, investment decision assistance system, intelligent data analysis, intelligent robot, machine learning, deep learning, semantic search, face recognition, speech recognition, identity verification, autonomous driving and natural language processing [7].

2.2. Statistical analysis of word frequency

This paper uses Python to make word frequency statistics of AI-related words in the annual reports of SMEs from 2017 to 2021. The total number of terms is shown in Table 1.

Table 1. Total word frequency statistics of artificial intelligence keywords.

Keyword	Word Frequency	Keyword	Word Frequency
Artificial Intelligence	1727	Deep Learning	0
Business Intelligence	10	Semantic Search	7
Image Understanding	0	Face Recognition	120
Investment Decision Assistance System	4	Speech Recognition	31
Intelligent Data Analysis	153	Identity Verification	13
Intelligent Robot	85	Autonomous Driving	236
Machine Learning	119	Natural Language Processing	80

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It can be seen from Table 1 that the sample SMEs in this study pay low attention to artificial intelligence, and the number of relevant words appearing in each annual report is less than five times on average. This result can reflect the attitude of the whole SME group towards the application of artificial intelligence to a certain extent. The keywords that appeared more were artificial intelligence, intelligent data analysis, machine learning, face recognition, and autonomous driving. This shows that SMEs have applied this kind of technology to some extent. However, it is worth noting that the number of occurrences of deep learning and image understanding is 0, indicating that the application of AI in SMEs is still in the preliminary exploration stage.

To further analyze the annual trend of the word frequency of artificial intelligence keywords, this paper makes statistics on the word frequency of each keyword according to the year. After screening the image understanding and deep learning with the word frequency of 0, the results are shown in Figure 1. To make the images more readable, this paper divides the annual word frequency into three grades: 0-10, 11-100, and above 100, which are labeled as Figure 1(a), Figure 1(b), and Figure 1(c) respectively. It can be seen from Figure 1 that the overall number of keyword frequencies is flat or rising with time. This shows that SMEs have gradually increased their attention to artificial intelligence technology in operation in recent years. However, from a practical point of view, the overall application level still needs to be improved.

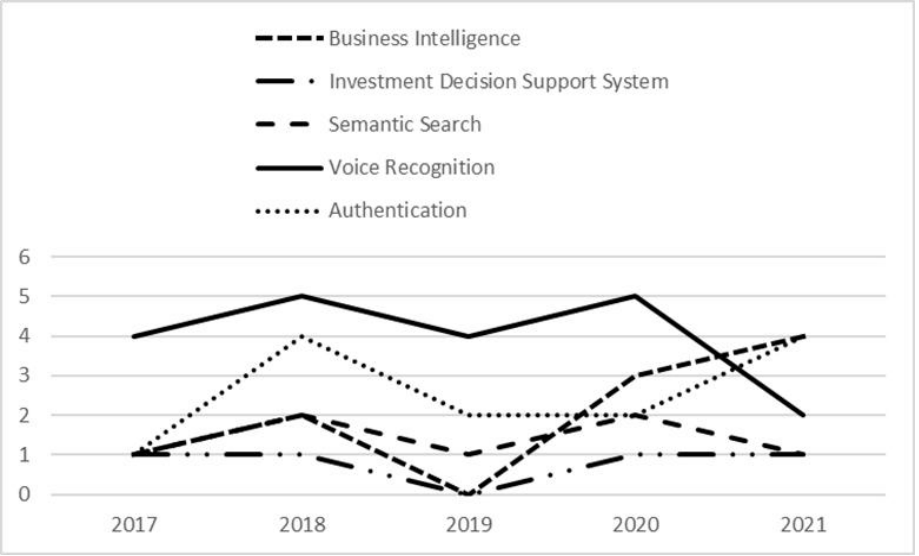

Figure 1(a). Word frequency number change graph (0-10).

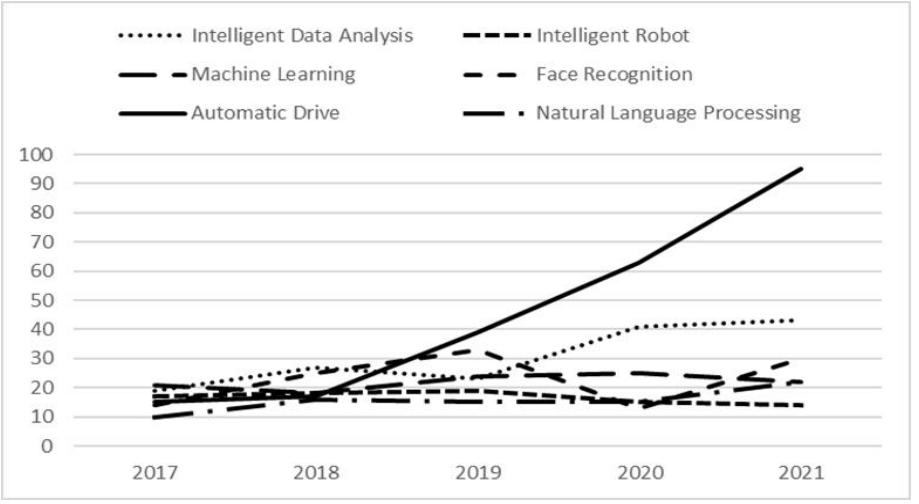

Figure 1(b). Word frequency number change graph (10-100).

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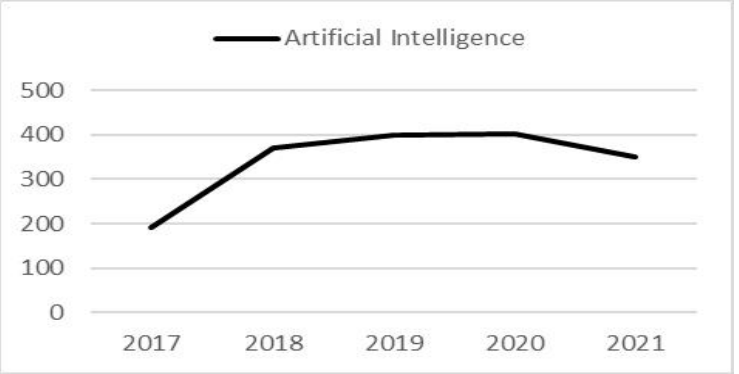

Figure 1(c). Word frequency number change graph (above 100).

3. Transformation difficulties faced by Chinese SMEs

3.1. SMEs face greater transformation risks

Due to their small-scale and single business model, SMEs have a weak ability to resist risks. In the face of digital transformation that requires more upfront investment, managers of SMEs tend to adopt conservative strategies to maintain a stable status quo. Moreover, SMEs have weak financing capacity and generally lack sufficient funds to invest in digital transformation. In addition, SMEs are in a disadvantaged position in terms of talent acquisition capabilities. In the face of a complex and changeable external environment, the phenomenon of brain drain of SMEs is serious, which aggravates the vulnerability of SMEs.

3.2. SMEs lack digital transformation thinking

Some SMEs do not have a deep enough understanding of digital transformation and fail to recognize the need for digital transformation. As a result, the transformation intention of SMEs is not strong, the transformation measures are relatively shallow, and systematic transformation planning has not been formed. After the impact of COVID-19, some enterprises have realized that digital transformation has a promoting effect on improving enterprise risk control, but they have not yet formed a complete understanding of digital transformation. The lack of transformational thinking leads to the lack of initiative in SMEs, which cannot actively explore digital transformation based on their actual situation.

3.3. Insufficient use of digital technology in SMEs

SMEs generally have the problems of weak digital technology foundations and a lack of digital talents. For most Chinese SMEs, the application of digital technology is limited to the use of information means for offices [7]. They only use digital technology for the informatization transformation of some functions. In addition, there are still a small number of micro-enterprises implementing the traditional office mode, without using artificial intelligence, big data, cloud computing, and other digital technologies. Chinese SMEs lack complete digital transformation infrastructure, low level of informatization, and insufficient supply of core digital technology, which leads to the more difficult digital transformation of SMEs.

4. Technical means of artificial intelligence embedded in the enterprises' main functions

4.1. Application of artificial intelligence in human resource management

Artificial intelligence can be combined with the six modules of human resource management to improve the intelligent degree of human resource management through centralized and standardized dynamic management of data [8]. For example, artificial neuron technology can compare and analyze employee historical data, predict employee turnover rate, and provide data support for human resource planning for HR. Big data and intelligent algorithms can be used in personnel recruitment,

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appointment, and employee relationship management to achieve more accurate person-post matching and master dynamic employee information. By building a learning data platform, knowledge within the enterprise can be circulated, and staff training and development work will be more liberalized and fragmented. In addition, the performance evaluation and salary management of employees can also make full use of artificial intelligence technology, through face recognition, touch recognition, and other ways to check the attendance of employees and establish an operating model to automatically calculate the salary of employees.

4.2. Application of artificial intelligence in marketing

With its strong learning ability and analysis ability, artificial intelligence can process a large amount of information in a short time and obtain valuable parts from it. In writing marketing ads, natural language generation technology can be used to turn data into text that fits human reading habits, providing personalized advertising messages to potential customers. In addition, artificial intelligence can also segment customer groups according to behavior habits based on big data to achieve precision marketing. 53 Degrees North retail chain uses the Brandy floss algorithm to improve marketing accuracy [9]. In addition, conversational AI, such as ChatGPT, which has recently become popular around the world, can replace human customer service to some extent and improve the efficiency of customer relationship management.

4.3. Application of artificial intelligence in financial management

The digital reform of financial management is one of the necessary links to enterprise digital transformation. To make finance more automated and intelligent, we can start with the following aspects.

First of all, according to the actual situation of enterprises, we can build an intelligent management accounting sharing platform with the help of digital technologies such as data mining and artificial intelligence. Secondly, the model is used to efficiently integrate and analyze financial data, and the visual analysis results are output for enterprise managers to make decisions. Finally, the application of human-computer interaction technology in financial management can be further expanded, intelligent financial robots can be introduced to simulate the consciousness of financial personnel, efficiently complete financial work, and realize the automation of financial processes [10].

5. Suggestions for SMEs to apply AI to promote digital transformation

5.1. Correctly understand digitalization and change the development concept

First, managers of SMEs should deepen their understanding of digitalization, adapt to the general trend of digital transformation with a correct and positive attitude, and integrate digital transformation into long-term enterprise strategies. At the same time, SMEs should maintain their sensitivity to the development of science and technology and take the initiative to understand the development status of digital technologies such as artificial intelligence. Only by constantly understanding cutting-edge information can enterprises layout development paths in a long-term perspective and avoid short-sighted behaviors. Although digital transformation is difficult for SMEs, it can bring immeasurable benefits to enterprises from the perspective of long-term development. SMEs should change the traditional development concept as soon as possible, and formulate systematic and complete digital transformation plans based on their reality.

5.2. Comply with national policies and actively seek resources

At present, China attaches great importance to the digitalization process of SMEs and has issued a series of relevant preferential policies, involving enterprise financing, technology construction, talent introduction, and other aspects. According to local enterprises' characteristics and resource advantages, local governments have issued targeted transformation support policies and measures for SMEs. For example, Shandong province proposed at the 2023 Industrial Forum on Digital Transformation of

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SMEs that it would further strengthen the construction of digital infrastructure such as 5G and industrial Internet in the future, and train digital specialists to provide support for the digital transformation of SMEs. Some leading digital enterprises, such as Alibaba and Tencent, also help SMEs transform by providing mature platform technology. Managers of SMEs should actively respond to the call of the government, be good at making use of the opportunities brought by the external environment, and take the initiative to seek development resources for enterprises.

5.3. Improve the technical foundation and actively use artificial intelligence

Artificial intelligence technology has been injected with greater capabilities and unlimited possibilities in the progress of science and technology, which can assist enterprises in data management. Integrating artificial intelligence into various functional departments and realizing information sharing in each link can effectively improve work efficiency and enhance managers' grasp of the current situation of enterprise development. Referring to the technical means summarized in this paper, SMEs can combine their characteristics, start from the technology with less investment and low construction difficulty, obtain the dividend brought by intelligence, and increase the investment in other core digital technologies with little by little, to gradually improve the digital technology system of them.

5.4. Recruit digital talents and provide digital training

SMEs not only need to prepare for digital transformation in hardware aspects but also need to equip them with the required soft power. For existing employees, SMEs should provide technical and awareness training supporting digital transformation. At the same time, enterprises should pay attention to the impact of job characteristic changes on employees' psychology and behavior, and provide necessary psychological counseling to employees on time. Human resources departments should integrate digital technology talents into the recruitment planning of enterprises, increase investment in artificial intelligence technology talent reserve, and make talents form the internal driving force of digital transformation.

6. Conclusion

With the rapid development of the digital economy today, artificial intelligence technology has become the core driving force to promote the digital transformation of enterprises. Consciously building a technological foundation and introducing artificial intelligence technology is the only way for SMEs to enhance market competitiveness and reduce risk impact. According to the annual report data of Chinese SMEs crawled by Python in this paper, SMEs pay insufficient attention to artificial intelligence (the number of words), and the application of technology is not comprehensive enough. This study has implications for SMEs to increase their investment in AI and integrate AI technology with their various business processes. Moreover, in the actual application, we should also pay attention to the enterprise's situation and formulate complete application measures to keep up with the development tide of the digital economy.

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