The Correlation Analysis Between the Informatization Level and the Profit Growth Rate of Small and Medium-Sized Enterprises

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Abstract: In recent years, the important field of information management is to improve the informatization level of Small and Medium-Sized Enterprises (SMEs). Background: At present, with the continuous development of computer technology and the gradual realization of informatization in all walks of life, the application of information technology in small and medium-sized enterprises has a direct impact on work efficiency and profit growth. Methods: This paper investigates 6 small and medium-sized enterprises (SMEs) to empirically studies the positive relationship between enterprise informatization level and enterprise profit growth rate by using the gray correlation analysis method. Results: The level of informatization is positively related to the growth rate of interest rates in small and medium-sized enterprises (SMEs). Conclusion: SMEs should optimize the construction of enterprise information infrastructure platforms, promote the standardization and integration of enterprise information systems, create a sound information data network system, and strengthen the training of enterprise informatization talents in the future.

Keywords: Small and Medium-sized Enterprises (SMEs), Informatization level, Grey Correlation Analysis Method.

1 INTRODUCTION

Nowadays, the information age has come, and people pay more attention to information technology, and gradually devote themselves to the information industry [5]. In small and medium-sized enterprises (SMEs), information technology is very critical, and relevant information personnel needs to pay attention to it. However, at this stage, there are still some small and medium-sized enterprises (SMEs), whose economic development is limited by information technology, because the development level of these enterprises is not high, and at the same time, the internal facilities of these enterprises are not perfect, making them unable to keep up with the pace of the times. At present, SMEs focus on the profit growth rate of enterprises. Is there a certain correlation between the profit growth rate of SMEs and their information level? If the level of enterprise informatization level is positively related to the growth of enterprise profit margin, the enthusiasm of SMEs for information resource management will be improved, and the amount of investment in all aspects of information resource management will also be increased, which will greatly promote the healthy and sustainable development of SMEs.

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2 LITERATURE REVIEW

Under the background of the information age and knowledge economy, the problem of information management has become an unavoidable problem for small and medium-sized enterprises, which account for a significant proportion of the organizational form in the economic structure, and an important fundamental problem related to the competitiveness and operation of small and medium-sized enterprises and even the economic development of each country. [6]. With the development of the market economy, SMEs are under increasing pressure. To improve their competitiveness, SMEs must upgrade their management, strengthen information construction and implement information management. Many small and medium-sized enterprises have already started their information management plans, but many small and medium-sized enterprises have many problems that can not be ignored in information management [1]. The adoption of information management will help promote the innovation and development of enterprises in all aspects of the operation process. Enterprises will operate more smoothly, help enterprises save human costs, and maximize the use of enterprise resources to help enterprises save resource costs [10]. Due to the small scale and limited capital and other resources of small and medium-sized enterprises in China, the level of enterprise informatization development is low. At present, most small and medium-sized enterprises in China are still in the primary stage of informatization development. Many SMEs are still willing to choose traditional methods such as manual recording in information management, human resource management, accounting information management, etc. Compared with large domestic enterprises, the informatization development of small and medium-sized enterprises is far behind [15]. For enterprise operations, the goal is to improve productivity, and performance evaluation is an important organizational form and management means to define goals. Therefore, in enterprise informatization construction and information system application, evaluating the performance of informatization application is an important management means to achieve the goal of informatization application. Only through performance evaluation can we clearly understand the efficiency of enterprise informatization input and output [11]. Some managers have divorced their understanding of informatization from reality and invested large costs in building management information systems. However, the enterprise informatization systems built are inconsistent with the management business processes, leading to idle resources. Enterprise managers should have a clear understanding of the role of information technology [14]. According to relevant data, currently, small and medium-sized enterprises have not formulated corresponding institutional measures in the development of implementing information management mode, which makes the information management mode unable to play its maximum role in time [7]. The construction of information management requires not only the purchase of hardware equipment but also the purchase of software equipment, maintenance fees, personnel training fees, and other related expenditures. The overall cost of information construction is not a small amount. Many small and medium-sized enterprises do not have the strength to support it, and information construction is a continuous investment. Therefore, the fund shortage of SMEs has a certain impact on the efficiency and efficiency of enterprises, which is also an important reason why the informatization construction of SMEs can not keep pace with the development of the times [3].

Enterprise informatization is people-oriented. It is not simply computer matching, but more importantly human factors. It is necessary to recognize what enterprise informatization is and how carry it out. How to promote the faster development of enterprises with the help of enterprise

informatization is the key to the construction of enterprise informatization. The active participation of employees will have an impact on the effective operation of the whole system. Enterprises must be based on their talent exploration and training, people-oriented, all staff training, establish a good enterprise information team, and promote enterprise information management [13]. In addition to the impact on the development of enterprises, the level of informatization will also affect the demand for enterprise elements. A supply chain is an important way for enterprise informatization to play the above role. The improvement of enterprise informatization reduces the information cost of both supply and demand sides in the financing market, which is conducive to the development of virtual economy supply chain finance. [4]. Relying on the Informatization Association, Internet Association, and various industry alliances, we will hold enterprise informatization expert seminars, Internet on-site meetings, in-depth integration of "industrialization and industrialization" and other activities to awaken the demanded awareness of all demand subjects for enterprise informatization construction, change their ideas, and create a good atmosphere for traditional industries, small and medium-sized enterprises to achieve transformation and upgrading through cloud computing and industrial Internet to accelerate informatization. Create an urgent awareness of information construction in the whole society, especially among senior managers of enterprises, improve the information awareness of cadres, masses, and enterprise employees, understand information construction knowledge and create an atmosphere of information knowledge sharing and continuous learning. [8].

3 MATERIALS AND METHODS

3.1 Research Object

This time, the author investigated 6 SMEs in Guangzhou Shawi SME Park and mastered various relevant data on their informatization. According to the requirements of the enterprise, the name of the enterprise is replaced by A.B.C…. These six enterprises label them as (1) Guangzhou A Solid Wood Furniture Co., Ltd., (2) Guangzhou B Technology Co., Ltd., (3) Guangzhou C Industry Co., Ltd., (4) Guangzhou D Plastic Technology Co., Ltd., (5) E Electronics Industry Co., Ltd., and (6) F Shoes Co., Ltd. According to the results of the questionnaire, the order of profit growth rate of the six enterprises is (5) (2) (4) (6) (3) (1). The following is an empirical analysis using the correlation analysis method in the gray system theory. The following is an empirical analysis of the correlation between the informatization level of these six SMEs and their profit growth rate using the gray correlation analysis method.

3.2 Research Method

The basic analysis steps of the grey relational analysis method are as follows:

(1) Establish evaluation indicators, collect relevant data, and establish a matrix consisting of n data sequences (1):

$$(X'_1, X_2, \cdots, X'_n) = \begin{pmatrix} X'_1(1) & X'_2(1)\cdots & X'_n(1) \\ X'_1(2) & X'_1(2)\cdots & X'_n(2) \\ \cdots & \cdots & \cdots \\ X'_1(m) & X'_2(m) & X'_n(m) \end{pmatrix} \tag{1}$$

(2) The maximum value of each index is used to establish a reference number series, and the original data matrix is standardized.

(3) The absolute difference between the index sequence (comparison sequence) of each evaluated object and the corresponding element of the reference sequence is calculated in turn.

That is $\left|X_0(k) - X_i(k)\right|$, which k=1,2,3... n; I=1,2,3,..., n (n is the number of evaluation objects).

(4) Determine $\min\limits_{i=1}^{n}\min\limits_{k=1}^{m}\left|X_0(K) - X_i(K)\right|$ and $\max\limits_{i=1}^{n}\max\limits_{k=1}^{m}\left|X_0(K) - X_i(K)\right|$

(5) Calculate the correlation coefficient. The correlation coefficient between each comparison sequence and the corresponding element is calculated by the following formula:

$$\xi i = \frac{\min\limits_{i}\min\limits_{k}\left|X'_0(K) - X'_i(K)\right| + \rho \cdot \max\limits_{i}\max\limits_{k}\left|X'_0(K) - X'_i(K)\right|}{\left|X'_0(K) - X'_i(K)\right| + \rho \cdot \max\limits_{i}\max\limits_{k}\left|X'_0(K) - X'_i(K)\right|}$$

Which (k=1,..., m)

In the above formula, ρ is the resolution coefficient, which is taken within (0,1). If ρ is smaller, the difference between the correlation coefficients is greater, and the discrimination ability is stronger. The value is 0.5 under normal research conditions

(6) Calculate the value of the correlation coefficient. For each evaluation object, calculate the mean value of the correlation coefficient of its m indicators and the corresponding elements of the reference sequence, to reflect the correlation between each evaluation object and the reference sequence, and describe it as the correlation sequence, which is recorded as (2):

$$r_{0i} = \frac{1}{m}\sum_{k=1}^{m} W_k \cdot \xi(k) \quad \text{(Which k=1,2,... m)} \tag{2}$$

If each indicator plays a different role in the comprehensive evaluation, the average value of the correlation coefficient can be calculated

(7) According to the correlation order of each observation object, comprehensive evaluation results are obtained.

4 RESULTS

The Informatization evaluation index system of this paper will adopt the research evaluation system [12] and combine it with the actual situation of SMEs in this survey, with minor modifications, as shown in Table 1:

Table 1. The level of the IRM's Evaluation Index.

Character	Index	Interpretation
X1	The proportion of the investment in IRM	Reflects the informationize investment
X2	Every one hundred people computer owner-ship	Reflects the proportion of the hardware facilities
X3	The rate of the connecting Network	Reflects the rate of connecting Network
X4	The rate of the information coverage	Reflects the application status of the market, sales, and technology in IRM
X5	The proportion of the IRM talents	Reflects the proportion of talents in IRM
X6	The proportion of IRM security spending	Reflect the proportion of the security spending in whole IRM spending

(1) To establish a six matrix by the above index:

Table 2. Sixth order matrix.

Number (%)	1	2	3	4	5	6
X1	8	9	6	7	10	6
X2	25	67	33	44	61	35
X3	38	84	57	54	78	66
X4	23	68	34	45	72	32
X5	13	53	26	67	54	37
X6	7	21	11	26	27	10

(2) Determines the reference sequence and original data standardization by the maximum

$\{X_0\}=\{10，67，84，72，67，27\}$

Table3. Data Standardization.

Number (%)	1	2	3	4	5	6
X1	0.8	0.9	0.6	0.7	1	0.6
X2	0.37	1	0.5	0.66	0.91	0.52
X3	0.45	1	0.68	0.64	0.92	0.79
X4	0.32	0.94	0.47	0.63	1	0.44
X5	0.19	0.79	0.39	1	0.8	0.55
X6	0.26	0.78	0.41	0.96	1	0.37

(3) Calculates $\left|X_0(K)-X_i(K)\right|$ absolute difference value and establishes the matrix:

Table4. Matrix established by Absolute Value Difference.

Number (%)	1	2	3	4	5	6
X1	0.2	0.1	0.4	0.3	0	0.4
X2	0.63	0	0.6	0.34	0.09	0.48
X3	0.55	0	0.32	0.36	0.07	0.21
X4	0.68	0.06	0.53	0.38	0	0.56
X5	0.81	0.21	0.61	0	0.2	0.45
X6	0.74	0.22	0.59	0.04	0	0.63

(4) Determines the $\min\limits_{i=1}^{n}\min\limits_{k=1}^{m}\left|X_0(K)-X_i(K)\right|$ and $\max\limits_{i=1}^{n}\max\limits_{k=1}^{m}\left|X_0(K)-X_i(K)\right|$

$\min\limits_{i=1}^{n}\min\limits_{k=1}^{m}\left|X_0(K)-X_i(K)\right|=\min\limits_{i=1}^{n}$（0.20，0，0.32，0，0，0.21）=0

$\max\limits_{i=1}^{n}\max\limits_{k=1}^{m}\left|X_0(K)-X_i(K)\right|=\max\limits_{k=1}^{m}$（0.81，0.22，0.61，0.38，0.20，0.63）=0.81

（5）Calculating correlation coefficient

ρ=0.5 ξ_1=（0+0.5*0.81）/（0.2+0.5*0.81）$\approx$0.669，similarly all the other value can be calculated and builds the matrix of Calculating correlation coefficient:

Table5. Resulting Correlation Coefficient.

Number (%)	1	2	3	4	5	6
X1	0.669	0.802	0.503	0.570	1	0.503
X2	0.393	1	0.403	0.534	0.818	0.458
X3	0.424	1	0.559	0.536	0.853	0.659
X4	0.373	0.871	0.433	0.526	1	0.420
X5	0.333	0.659	0.399	1	0.669	0.458
X6	0.353	0.648	0.407	0.910	1	0.391

5 DISCUSSION

Calculates the average of the correlation coefficient

r_{01} =(0.669+0.393+0.424+0.373+0.333+0.353)/6=0.424

r_{02} =(0.802+1+1+0.871+0.659 +0.648)/6= 0.830

The same procedure may be easily reached：

r_{03} =0.451 r_{04} =0.679 r_{05} =0.890 r_{06} =0.482

To sum up, the ranking of information resource management level of these six enterprises is (5) E Electronics Industry Co., Ltd., (2) Guangzhou B Technology Co., Ltd., (4) Guangzhou D Plastic Technology Co., Ltd., (6) F Shoes Co., Ltd., (3) Guangzhou C Industry Co., Ltd., and (1) Guangzhou A Solid Wood Furniture Co., Ltd. The sorting result is consistent with the enterprise profit growth rate fed back by the enterprise.

The above empirical research shows that there is a positive relationship between the level of information capital management and the profit growth rate of SMEs. Nowadays, many small and medium-sized enterprises are faced with problems such as a lack of funds and resources within the enterprise, but the author believes that the investment of small and medium-sized enterprises in information resource management can be said to be crucial because these investments can achieve profit synchronous growth. Therefore, SMEs should strengthen their confidence and improve their information resource management level.

6 CONCLUSION

In the future, small and medium-sized enterprises can continuously improve their information management level with big data as support. Promote the construction and development of small and medium-sized enterprises through the establishment of the information management model system. While improving information management, do a good job in the construction of the basic platform of information management to ensure the improvement of the information level of small and medium-sized enterprises. According to the typical Nolan six-stage model (Nolan) of enterprise informatization development stage research, enterprise informatization can be divided into six stages: initial stage, expansion stage, control stage, unified stage, data management stage, and mature stage. The first three stages have the characteristics of the computer age, and the last three stages have the characteristics of the information age. The turning point is the time for information resource planning. Nolan stressed that any organization must develop from one stage to the next when implementing computer-based information systems, and cannot achieve leapfrog development. In the future, SMEs can improve the informatization level from the following aspects.

(1) Optimize the construction of enterprise informatization basic platform. Under the background of the big data era, SMEs should establish sound data management thinking, focusing on the construction of high-quality information basic management platforms. At present, the information infrastructure of small and medium-sized enterprises often cannot fully meet the

requirements of the big data era. Enterprises should pay attention to the construction of information talents and technical equipment to provide support for the construction of information management infrastructure platforms. It is necessary to improve the data processing, storage, and analysis of information systems, effectively integrate and upgrade resources, so that enterprises can obtain support in management decisions, promote further development of enterprises, and obtain corresponding power support.

(2) Promote the standardization and integration of enterprise information systems to achieve the stable construction of enterprise information management systems, it is necessary to design from multiple aspects, such as top-level design, process management control, and terminal, to achieve data exchange and association at different levels, form a system integration model, and make enterprises obtain space for improvement in the development process.

(3) Create a perfect information data network system, and make a good investment in informatization. The enterprise management should take the product as the center, and the management mode should take the service as the core. Fundamentally, the new management model should start from the following aspects: form a data information network model, which mainly covers the product information in the production process of enterprises, and infiltrate employees and service content into it. Employees should be assessed to strengthen their comprehensive ability so that they can establish correct concepts and cognition, form a new mode of thinking, give play to the actual value of data, and provide good support for enterprise information construction through sorting out and screening information resources. Under the condition of fully implementing the utilization of resources, we should attach importance to the personalized characteristics of information networks within enterprises and strengthen the updating and implementation of enterprise management models. In addition, we should do a good job of investing in information technology. Small and medium-sized enterprises should form a sound financing plan according to their specific conditions, invest information funds in an all-around way, highlight vitality and vitality, and better face market competition.

(4) Strengthen the training and construction of enterprise informatization talents. For enterprises, the acquisition of informatization talents is a difficult point as well as a key point. First of all, enterprises should, through close cooperation with colleges and universities, and the implementation of school-enterprise cooperation, use the excellent talents of the school as the support to tap and cultivate the information talents needed for their development. Secondly, based on the current development situation, enterprises should look for information management talents that can be trained from enterprises to improve the information management level and ability to existing managers. Thirdly, enterprises should be good at using external excellent information management resources. For example, some enterprises that do not have the strength to build an information management team suitable for their development can temporarily hire some external information consulting and management companies to use their professional knowledge and management systems to improve their management effects.

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