An Empirical Study on the Impact of ERP Implementation on the Performance of Listed Companies

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Abstract. This paper analyzes the impact of ERP implementation on the operating efficiency and performance of listed companies through empirical research. By collecting the financial data of 40 listed companies, the paired sample T-test was used to test the impact of ERP implementation on the listed company's operating efficiency and performance. The final research results show that the impact of ERP implementation on the operating efficiency of listed companies is not significant; the use of ERP has a significant lag effect on the performance of listed

1. Introduction

Informatization is an inevitable choice for modern enterprises in the 21st century. In order to better realize enterprise informationization, more and more enterprises choose to introduce ERP systems. ERP is short for enterprise resource planning. It will reengineer process management, procurement process management, inventory material management, sales management, human resource management and financial management to achieve data management through the role of informationization. ERP system can greatly simplify the operation process of the enterprise through the flat and integrated management structure of each link, which enables the enterprise to respond quickly to market demand, increase market sensitivity, make the operation of the enterprise more efficient and improve the overall efficiency of the company. At the same time, through the continuous simplification of the various stages of the enterprise, the production cost of the daily operation and management of the enterprise is also reduced, which undoubtedly makes the enterprise more advantageous when competing with other businesses and improves the market competitiveness of the enterprise.

Despite the many benefits of ERP implementation, its impact on business performance has been controversial. Although most companies have implemented ERP in part or all of the company more or less under the encirclement of the informationization wave, they have to admit that many companies only do superficial work and do not really play the ERP utility. Moreover, some people think that the high investment and high risk of the enterprise in the early stage of ERP will bring great instability to the enterprise. Therefore, scholars at home and abroad have been continuously studying the impact of ERP on the enterprise. But one thing to be sure is that the impact of ERP implementation on business performance should be based on the ERP installation time in the short-term and long-term.
2. Research Hypothesis

2.1 Indicator Selection

When selecting indicators, the following conditions must be met: 1. The principle of full truth. Performance indicators must be able to demonstrate the business operations of the company truthfully and comprehensively. 2. Measurable principles. Performance indicators must be digitized to facilitate measurement comparisons and measure their level. 3. Strategic consistency principle. Performance indicators must be consistent with the strategic development goals of the current period. If the strategic goal of the company is to increase net profit or improve operational efficiency, the performance indicators should be adjusted accordingly.

Research on corporate performance from a cost perspective is often less comprehensive than a profit perspective. Therefore, this paper chooses two indicators of return on assets and net sales margin to measure the impact of ERP implementation on business performance. In terms of profit, these two indicators better represent the financial profitability of the entire enterprise, so these indicators are often used in measuring the overall performance of the company. Since these two indicators have different definitions in different databases, it is easy to cause standard inconsistency, so we have made a unified definition.

Total net assets profit (ROA) = net profit × 2 / (initial total assets + total assets at the end of the period)× 100%

Net sales margin (ROS) = net profit / operating income × 100%

ERP can provide a variety of functions, including inventory control, manufacturing scheduling and production, sales management, automated supply chain control, financial and cost accounting control, human resources management, customer interaction management, etc. These different functions have a comprehensive impact ERP's corporate operating efficiency. Therefore, considering the impact of ERP on inventory turnover, the paper uses inventory turnover rate as an indicator to measure whether ERP system can bring changes in operating efficiency.

Inventory turnover rate (ITR) = cost of goods sold / average inventory

2.2 Research Hypothesis

The ERP system simplifies the original complex process, reduces inventory, and improves enterprise productivity by properly integrating all aspects of the enterprise information, including customer information, financial information, human resources information, supply chain information, and production information. Therefore, ERP data sharing and standardized, automated processes can help companies improve operational efficiency. According to the point, the paper proposes H1: ERP is not significant for improving the operating efficiency of listed companies.

ERP has a long implementation cycle, high implementation complexity, and involves the integration of decision-making systems and daily operational software modules. Therefore, a large number of resource processes need to be re-integrated and configured, which requires long-term adaptation of systems, people, and processes. The high investment of ERP and the long-term implementation of the ERP determine that the profitability of the company is unlikely to be significantly improved in the short term. Based on this, this paper proposes H2: there is a lag when ERP improves the performance of listed companies.

3. Research Design

3.1 Data Collection

In order to clarify the implementation of enterprise ERP, we select search keywords such as “enterprise name + ERP system implementation” to find relevant corporate news and corporate annual or quarterly reports on ERP implementation in major search engines. Through the information, we can confirm the ERP start time, online time, the success of ERP implementation and the type of ERP software used. This method of collecting data has been widely used at home and abroad. If only the
start time of the ERP project can be determined, the online time of the ERP is not clearly obtained. According to the convention, the ERP implementation time is artificially set to 1.5 years. Therefore, we set the time of ERP on-line artificially as the next year when the enterprise starts ERP without knowing the time of ERP on-line. Taking this as an example, we selected 60 representative Chinese listed companies on Sina Finance, and used the financial data for the first three years of 2010 and the last five years of 2011 as sample data.

3.2 Research Methods
From the research experience of scholars in the past, the research on performance of ERP should be carried out separately in the short-term and long-term. Therefore, the age research method is used to determine the impact of ERP implementation on business performance. The ERP is officially launched in the current year as ERP=1, and then the following years are defined as ERP=2,3,4. The ERP start-up time is defined as ERP=0, which was defined as ERP=-1, -2, -3 in the previous years. According to the needs of the research situation, we can average the financial data of the first three years of ERP implementation and then average it, which can reduce the impact of accidents on financial data. After the data is processed, the paper first makes a descriptive statistics on all the data, from which the general conclusion can be intuitively drawn. After completing the statistical description, the financial data from the short-term to long-term (1-4 years) is compared, and the paired T test is used. The results can be verified against the assumptions made in this paper.

3.3 Empirical analysis

3.3.1 Descriptive Statistics. Through the descriptive statistics of the total net assets profit, net sales margin and inventory turnover rate before and after the implementation of ERP, it can be concluded that the inventory turnover rate has increased in the year of implementation of the ERP system, and then presented in the implementation of 1-4 years. It fell, but the decline was not big. It can be seen from the data that the change in inventory turnover rate is not obvious, indicating that the impact of ERP implementation on inventory turnover rate is not significant, which also verifies the hypothesis H1 made earlier. The total net asset interest rate fell significantly within three years after the implementation of ERP, but began to rise gradually in the fourth year of implementation, which may be due to the need to inject large amounts of funds to develop ERP during the ERP investment period. Therefore, the early high cost seriously affected the company's total net asset interest rate. The net profit margin of sales has fallen sharply within 3 years after the implementation of ERP, and it has gradually increased since the fourth year. As previously assumed H2, there is a significant lag in the impact of ERP implementation on business performance, which determines that the impact of ERP on business performance needs to be observed in a few years. This also verifies the hypothesis H2.

| ITR     | Minimum | Maximum | Mean | Standard value |
|---------|---------|---------|------|---------------|
| ERP=-3  | 1.6754  | 5.7521  | 3.3357 | 1.4201531     |
| ERP=-2  | 1.6268  | 10.9871 | 4.092961 | 2.3753299    |
| ERP=-1  | 1.5155  | 8.9935  | 3.748948 | 1.8184504    |
| ERP=0   | 1.7097  | 8.6208  | 3.955857 | 2.0766620    |
| ERP=1   | 1.4081  | 9.4422  | 3.843317 | 2.3938827    |
| ERP=2   | 1.2823  | 9.5020  | 3.462633 | 2.3040134    |
| ERP=3   | 1.4260  | 10.7372 | 3.440658 | 2.3034919    |
| ERP=4   | 1.5444  | 7.2528  | 3.160617 | 1.7831686    |

| ROA     | Minimum | Maximum | Mean | Standard value |
|---------|---------|---------|------|---------------|
| ERP=-3  | 1.6408  | 20.2127 | 8.751200 | 6.5352877 |
| ERP=-2  | 1.2279  | 54.8719 | 14.600256 | 15.6531704 |
| ERP=-1  | -6.8530 | 44.4801 | 9.783796 | 12.2194145 |
| ERP=0   | 1.0214  | 42.5372 | 9.714109 | 10.9473529 |
3.3.2 Paired Sample T-test. After descriptive statistics on the collected data, take the average inventory turnover rate, total net asset interest rate, and net sales interest rate of the first three years of ERP implementation to reduce the impact of abnormal data. Then make a paired T-tests with each of the four years after implementation. The Sig in the table is the P value in the statistics, which indicates the significance level of the hypothesis test. If the Sig value is <0.05, then what needs to be done is to reject the null hypothesis; conversely, if Sig>0.05, the null hypothesis is established.

The results in Table 2 show that the inventory turnover rate is Sig<0.05 in the first year and the second year, indicating that the impact of ERP on inventory turnover rate is significant in the two years; and Sig>0.05 in the third and fourth years. In the past two years, the impact of ERP on inventory turnover was not significant. Based on the four-year data, it can be seen that the ERP implementation has no significant impact on the inventory turnover rate. In other words, the impact of ERP implementation on operating efficiency is not significant.

The total net asset interest rate in the first year Sig <0.05, indicating that the first year after the implementation of ERP is significant, and the Sig value is greater than 0.05 in the next three years, indicating that the impact of ERP implementation on the total net asset interest rate is not significant. In the same way, the net sales margin is also significantly affected by the implementation of ERP in the first and second years, but not in the third and fourth years. This shows that the ERP implementation has played a downward role in the performance of the performance indicators, and then began to pick up, which also shows that the hypothesis H2. In other words, the role of ERP implementation on the performance indicators has a significant lag effect.

4. Conclusion and Recommendations

4.1 Conclusion and Analysis

Through the empirical analysis of 40 listed companies implementing ERP, this paper finally draws the
following conclusions: 1. The implementation of ERP has no significant effect on improving the operating efficiency of listed companies. 2. There is a lag in the impact of ERP on improving the performance of listed companies. The reason why operating efficiency not significant is that it is affected by some special industrial influences. For example, textile industry is difficult to integrate with ERP system because of its extensive management model. So what should be done is to eliminate the special industries or to increase the number of samples as much as possible to weaken the impact of the special industries. The reason why ERP has lag influence on the performance is that the high investment and complexity of ERP system make it difficult to integrate into the enterprise in the short term and exert its value.

4.2 ERP Implementation Recommendations
In order to better understand these issues and reduce them in the implementation process, as much as possible to reduce the possibility of failure, you need to build a more effective management model. Combined with the research conclusions, the following advices are proposed: Firstly, enterprises implementing ERP should not only pay attention to the social environment, but also fully understand their own industry characteristics, and the characteristics of the industry. The advanced management concepts of the ERP system are combined to the industry to achieve the effect of one plus one and more than two. In addition, it is necessary to make reasonable implementation of ERP in accordance with the size of its own company. Investment should be gradually invested without having a significant impact on the company's operating performance. Secondly, in view of the lag of ERP on business performance, we must pay attention to solving the contradiction between ERP and enterprises in the early stage of implementation. In addition, for the investment of a large amount of cost in the short term, it is necessary to make reasonable arrangements with the company's funds to prevent the phenomenon of capital turnover from opening up.

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