An Empirical Study on Enterprise Cost Management Informatization Based on Fusion of Cloud Computing Features

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Abstract
In the past ten years, the informatization of Chinese enterprises has been carried out from the beginning to the development and then to the mature process, driven by the government, the market and the multidimensional progress of the whole IT environment. Accordingly, the enterprise information technology infrastructure awareness, investment, construction strategy has undergone profound changes. Through the TCO total cost of ownership, we can find companies in the construction of information technology infrastructure clear context, and from them to grasp the current and future information needs of the characteristics of time. A very important aspect of the analysis of the benefits of desktop cloud solutions is to help companies reduce the cost of operations and operations in the transformation of information. So how can we reduce costs in this article? This article first introduces the Nolan stage model and on the basis of this, an empirical analysis of enterprise information cost management based on TCO is established.

Key words: cloud computing, enterprise information, cost control

1. INTRODUCTION
In recent years, with China's economic reform more and more in-depth, the market economy development model is more and more popular, in the market economy is an indispensable one is the enterprise, and in the market economy is an inevitable phenomenon is the enterprise Between the existence of fierce competition, with the competition between enterprises more and more brutal, companies must consider the cost of saving business operations. According to statistics, due to the rapid development of modern IT technology, the general enterprise IT hardware equipment for three years need to replace the new hardware equipment, in order to meet the enterprise information business system security and business growth needs, so a business information The cost of enterprises in the business management costs will be higher and higher, and how to reduce the cost of enterprise information is also an urgent need to solve the problem of modern enterprises. Cloud computing is a new type of computing, after the 20th century, since the 1980s, from large-scale computer to client-server (Client-Server) after a major change in another change. Cloud Computing is based on Utility Computing, Distributed Computing, Parallel Computing, Network Storage Technologies, Load Balancing, Virtualization, Virtual Computing, Virtual Computing, Virtual Computing, Virtual Computing, Virtual Computing, Virtual Computing, ) And other traditional computer and modern network technology development and integration of the product. Cloud computing can not only organize and flexibly call a variety of ICT information resources, and can achieve large-scale high-performance computing. Cloud computing uses distributed computing and virtual resource management technology, through the network will be scattered ICT resources, including computing and storage, application platform, software, etc., together to form a shared resource pool, and dynamic on demand and measurable The way to provide services to users, so that not only can meet the needs of enterprise development, but also can save information investment, and users can use various forms of terminals (such as PC, Tablet PC, smart phones and even smart TV, etc.) through the network to obtain ICT Resource service.

For enterprises to carry out information technology problems are: capital, talent, technology, management and so on. Which information technology for the first time the investment is very large, resulting in many companies "discouraged", there are two reasons, one is the enterprise is not so much money, the other is the implementation of enterprise information construction problems will cause the front Investment loss. In the desktop cloud system, the enterprise can be the implementation of the traditional information step by step, that is, through the desktop cloud information technology in the process of using the desktop cloud information technology, phased implementation, this approach is not too close to reduce the enterprise Financial risk, but also can improve the utilization of funds.

2. CLOUD PLATFORM AND BIG DATA

2.1. Network big data
Big data is a concept that covers a variety of technologies, simply to say, it is not in a certain period of time with conventional software tools to capture, manage and process data collection. IBM will be "big data” concept is defined as 4V, namely Volume, Variety, Velocity and Value. Big data and cloud computing are inextricably
linked. If the data is an indispensable asset, is the basic resource, needs large data / cloud computing platform provides storage, access and computing support for data assets; cloud computing is a kind of application mode, the core is the data processing technology.

Big data based on cloud computing to solve the traditional financial institutions capital supply and demand information asymmetry between the traditional financial institutions, intermediary function and capital allocation status will be gradually weakened, capital supply and demand through the financial data platform for the main spontaneous polymerization and rapid spread, instead of the traditional channels of financial institutions to carry on financing and loans. Internet financial platform to open up the main capital suppliers and demand of the entire value chain, due to the traditional financial institutions deposit interest rates no market, the Internet financial platform through a higher rate of return.

Under the era of big data Internet financial reform and the operation process of the Internet bank platform to establish a market choice and government regulation based on Internet financial model innovation, mainly in the big data Internet financial company, the third party payment platform, P2P Internet lending platform to raise public financing platform of Internet and Internet financial portal platform. The financial impact of the Internet on the financing of SMEs is mainly embodied in four aspects: forced mechanism of traditional financial institutions, financing of small and medium-sized enterprises more comprehensive, scientific, SME financing services more targeted, the small and medium-sized enterprise financing cost decreased significantly. Finally, from the legislative level policy system construction, the cultivation of multi subject Internet financial platform, to strengthen the third party data market construction and coordination mechanism in four aspects of Internet financial platform for big data background of financing the development of Internet Bank for small and medium-sized enterprises positive impact.

![Network big data](image)

**Figure 1. Network big data**
As present, the main financial platform for the Internet era of big data has the ability to use search engines, data, cloud computing and social networking platform, reduce the information asymmetry between supply and demand, and thus produce a variety of different from the traditional financial profit model. First, the big data Internet financial companies. Big data Internet financial companies have accumulated massive user transaction data, analysis and mining user consumption habits and supplier transactions, and thus more accurately predict the lending capacity of users of consumer behavior and suppliers, as well as traditional financial institutions and financial services platform marketing, loan risk management and other aspects of value creation.

The next big data era of small and medium-sized enterprises can be divided into small and medium-sized enterprises and big data platform Internet platform in the small and medium-sized enterprises, for a large Internet data platform of small and medium-sized enterprises based on the operation data, the trade data, customer data, logistics, sales data, authentication information, financial data, corporate credit monitoring data index analysis and data mining, and analysis of the innovation of the SMEs, management and financial behavior, dig out the potential and value of small and medium-sized enterprises, the financing demand forecast and design innovative products competitive, provide comprehensive financial services, enhance customer stickiness.

2.2. Cloud platform

Hadoop is an open source software framework for distributed processing of massive data. Hadoop can support PB level mass data, scalability is strong. Reliable, efficient, scalable and open source characteristics, so that the Hadoop technology has been rapid development, and in 2008 to become the top Apache project. From
Google released MapReduce, Amazon use Hadoop to become one of the world's first supplier to provide mature cloud computing services, now and then IBM, DELL, Microsoft, EMC2, Alibaba, Tencent in the domestic and foreign manufacturers have their own commercial Hadoop platform, Hadoop has made brilliant achievements, applied more widely.

![Hadoop platform](image1)

**Figure 4.** Hadoop platform

Hadoop is currently the development of big data is the most mature open source platform, attracted a large number of Internet companies, the traditional IT equipment manufacturers and new enterprises to participate in the project development and practical application of the process. For a long time in the future, Hadoop open source ecology will still be able to play a positive role in promoting the development of large data applications and technologies. Big data / cloud computing platform is the development and application of specific needs associated. The first requires massive off-line data processing, the TB level of data processing and analysis of data delay requirements is not high, when using the Hadoop platform, using MapReduce, mahout, HDFS and HBase, you can complete the distributed processing of massive data, data mining and data storage; with the sharp increase of the amount of data, data diversity also more and more rich, the data dimension is also more and more high, in a real time system response time data itself is second sensitive, then Hadoop platform will not be fully applicable in such applications, Spark came into being, the calculation can quickly analyze data using memory.

![Cloud computing model](image2)

**Figure 5.** The cloud computing model

### 3. NALAN MODEL OF THE BASIC THEORY

Nolan model was proposed by Harvard Business School Professor Nolan in the 1970s, this model is mainly used in information systems management. Nolan model to consider the enterprise information construction is divided into the implementation of the stage, the stage requirements from low to high order, and each stage can not cross, Nolan model that enterprise information construction is divided into six stages: The initial stage, the popularization stage, the control phase, the integration stage, the data management stage, the
mature stage.

the initial stage: In the initial stage, because the enterprise management or enterprise information department on the PC machine know less, but also not clear in the enterprise IT information technology how to help manage, do not understand its advantages. IT information technology on the demand side, are generally due to office needs and mentioned on the agenda, and the application of PC mainly in the enterprise's financial sector, enterprise information is not yet popular, in the initial stage.

the control phase: As a result of the lack of planning the previous stage of IT information construction caused by the enterprise IT information investment return is relatively low, causing the attention of business managers. At this point the enterprise IT information understanding has been very clear, know what their business needs, so to strengthen IT information planning, clear software, hardware procurement plan, so at this stage, some of the functional departments to achieve Internal network, but there may be "information island" and the phenomenon of low utilization of resources.

the integration stage: On the basis of the control phase, enterprises through the IT information of the re-planning and design of the enterprise is relatively scattered IT organizations and information systems for unified integration and management, people, financial, material and other resources within the enterprise to achieve resource sharing. Make more efficient use of existing IT resources. Although the ability to integrate resources, but this situation will spoil the integration of high cost, time-consuming, unstable system phenomenon.

the data management phase: Enterprises through the previous four stages, the construction of IT information more clearly. Enterprise IT information construction rose to the corporate strategic level, the information gradually become a very important resource for the enterprise. In this case, enterprises can achieve a unified data platform in the data, information, management, and can form a network within the enterprise, the data can be shared, office system upgrades, IT resource utilization increased.

mature stage: In the mature stage, enterprise information system can meet the needs of all levels of the enterprise, from the bottom of the transaction to the top management decision support. IT and management of the real combination of internal enterprises, outside the enterprise, involving the supply chain upstream and downstream resources can be effectively integrated, greatly enhance the competitiveness of enterprises.

Generally speaking, the development of enterprise information in the process of the general stage can not jump. Therefore, enterprises in determining the development of management information system strategy, or in the development of management information system planning, should first understand the enterprise at what stage, and then according to different stages of different characteristics to help enterprise management information system.

The first four stages of the above six stages are the evolution of the computer mainframe and microcomputer era, and the latter two stages are the first two stages of the Internet age and information technology era, which are different stages of development of different technologies. Because of the concept of different technical periods, Nolan proposed the "four kinds of growth process" on the basis of the model, that is, the development of enterprise information is going through four kinds of processes:

1) Build applications and integrate them;
2) The growth of IT management and control capabilities;
3) the establishment of the organization;
4) IT awareness of the increase.

Even through the emerging technology to achieve leapfrog development, information management in the growth process can not be one step.

4. NOLAN MODEL TO GUIDE THE CONSTRUCTION OF CLOUD COMPUTING INFORMATION

If in accordance with the Nolan model theory, cloud computing information construction will go through different stages, and the various stages can not jump. But also from the Nolan model of the stage theory, can not step in place, the various stages can not cross the "traditional Nolan stage model is from the mainframe era to the computer age, and then to the network era of different technology period of continuation, many foreign large enterprises Has gone from the mainframe era to the Internet age of the six stages, and many enterprises in China, especially small and medium-sized enterprise information implementation late, just to catch up with the new era of information technology development, on the one hand can adopt the new technology to achieve the stage Leapfrog development, on the other hand can use information outsourcing and cooperative development of the way to shorten the information construction cycle.

Enterprises can be based on the IT audit, to determine their own position, that is, to understand their own in the whole process of information at what stage, and then apply the Nolan stage model to guide the cloud
computing information construction, the phased strategic planning of information technology. Enterprise information in the integration phase and data management stage, the enterprise information system more and more, IT infrastructure investment costs are growing, corporate CIO should strengthen the enterprise information TCO overall budget control.

According to the above description, TCO (Total Cost of ownership) is a kind of technology which is used in the informationization and transformation of the company. The core idea is to include in a certain period of time. The cost of acquisition and the total cost per year. In some cases, according to the life cycle of different products will be divided into different time ranges for the average cost of comparison, in general, many cases use 3-5 years as a cycle.

TCO analysis of the angle it is through a calculation method to calculate how we go in the equipment investment, equipment operation, energy saving and emission reduction throughout the whole process to achieve the best state. As a general cost of ownership, including some sub-costs, equipment costs, deployment costs, operating costs, maintenance costs, opportunity costs, etc., we often put the TCO in two parts, one is CAPEX, the other is OPEX. CAPEX (Capital Expenditure) generally refers to the investment of capital and fixed assets.

The cost structure of the desktop cloud is similar to the cost structure of an enterprise data center. It mainly includes two aspects: CAPEX (Capital Expenditure), including hardware and software and deployment cost. On the other hand, Operating costs, OPEX (Operating Expense), mainly include electricity costs, maintenance and management costs. In order to make a clearer analysis of the cost changes of TCO in the desktop cloud system in office system reengineering, the TCO model is modeled on the operation of the desktop cloud in the enterprise information transformation.

First define the various costs in the model. According to the TCO analysis theory, the total cost of operating the desktop cloud system is CTCO, the total cost of ownership, Ccapex represents the fixed input cost, Copex represents the operating input cost, and the total cost of CTCO can be obtained by adding the fixed input cost Ccapex and the operational input cost Copex. According to the TCO theory, the total cost of the system operation can be expressed as follows:

$$CTCO = Ccapex + Copex$$

CHW represents the cost of hardware, CSW represents the cost of the software, CDep represents the cost of deployment, and the fixed input cost Ccapex can be derived from the hardware cost CHW, the software cost CSW, the deployment cost CDep, so it can be expressed as follows,

$$Ccapex = CHW + CSW + CDep$$

The cost of electricity is expressed by CPower, CMan represents the cost of management and maintenance, and the operating cost of Copex can be derived from the cost of electricity CPower and management maintenance cost CMan, so it can be expressed as follows.

$$Copex = CPower + CMan$$

So the total cost of CTCO can be expressed as the following formula, see the type,

$$CTCO = Ccapex + Copex = CHW + CSW + CDep + CPower + CMan$$

According to the expression formula of the total cost, the cost change before and after the project transformation can also be expressed by the formula. It is divided into two big aspects for the cost change before and after the project transformation, one is the change of the fixed input cost and the other is the operating cost change.

$$\Delta Ccapex = Ccapex1 - Ccapex0$$
$$\Delta Copex = Copex1 - Copex0$$

Where 1 represents the transformation, 0 represents the transformation before.

According to the desktop cloud total cost of ownership formula, you can detail the cost of enterprise information in the process of subdivision table. In the specific desktop cloud information construction process can be compared with the traditional data center TCO analysis of the difference between.

5. CONCLUSIONS

According to the Nolan stage model theory, this paper guides the enterprise informationization of desktop cloud into six stages, analyzes the different characteristics of each stage, and obtains the process needed for enterprise information transformation in desktop cloud mode. Based on TOC analysis Under the theory of enterprise information transformation cost comparison model, than the traditional PC office model and desktop cloud office model under the advantages and disadvantages. In addition, the TCO analysis model was used to study the purchase cost, the deployment cost, the operation cost and the maintenance cost in the traditional PC office mode and the desktop cloud office mode in five years, and got the following conclusions:

In the purchase cost of the engine room to buy the cost, according to a cycle of 5 years to calculate the desktop cloud office mode, the total cost of the purchase of the engine room is only the traditional PC office
model costs 37%, saving 3160.19 million. Office purchase costs in the desktop cloud office mode, the total cost of the purchase of the engine room is only 42% of the cost of traditional PC office mode.

In terms of deployment costs, the desktop cloud office model requires 14 million yuan of cost, while the traditional PC office model does not need, but relative to the front of the room costs and office costs, the desktop cloud savings costs far more than the desktop Deployment costs in cloud mode.

In terms of operating costs, in the desktop cloud mode of the room electricity and office electricity costs can save 70.6737 million yuan, saving up to 81.39%.

In terms of maintenance costs, the desktop cloud office model is more advantageous, the maintenance cost is the traditional PC office model cost of 47.37%.

So for the company's research, the use of desktop cloud office model is better than the traditional PC office model.

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