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# **Business Value of Vertical IOS: An Extended ROI Case Study of a Networking Company in China**

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## **Abstract**

*With the advent of supply chain competition era, vertical IOS (Inter-organizational Information System) is becoming a more and more important part of IS expenditure, and therefore the problem of how to evaluate its business value is absolutely worth of research. Hence, the purpose of this paper was to propose a model, which summarized the business value of vertical IOS by means of case study, which studied a networking company in China. The paper put forward a practical model, which gave a framework of how to evaluate the business value of Vertical IOS from three dimensions with each dimension involving several factors based on supply chain research. The case in this paper used this model as the framework of evaluation and also as a validation of the usability of the model. At the end of the paper, the author identified 3 management practices, which related to how to evaluate and to fully utilize the business value of vertical IOS.*

## **Key Words**

Business value, vertical IOS, case study, three-dimension-model

## **1. Introduction**

The increasing expenditure on information systems (IS) had been accompanied by an increasing demand to measure the business value of the investment (Cronk & Fitzgerald, 1999). On the other hand, to meet the growing challenges, more and more companies were looking to co-operate with their supply chain partners. (Edwards, Peters & Sharman, 2001). All these researches paid high attention to the problem of business value of Inter-organizational Information System (IOS). Early studies on IS business value could be traced back to 1980s, when evaluation approaches focused on a single system, using only a financial perspective (Hamilton & Chervany, 1981a, 1981b). Later studies introduced the

concept of IS's overall contribution to organizational performance (Bender, 1986; Turner, 1985). However, dissatisfaction with the limited scope of these measures led to the development of a number of multi-dimensional methodologies (Banker & Kauffman, 1991). In addition, IOS was also a very flourishing research field, which studied diverse aspects of systems based on information technology that transcends organizational boundaries. There were numerous version of definitions put forward by different researchers at different time (Johnston & Vitale, 1988; Suomi & Reima, 1988; Bakos, 1991; Chismar & Meier, 1992; Konsynski, 1993; etc). Apart from the various definitions, many researches suggested different taxonomies, such as Konsynski et al. claimed 4 types of IOS in 1993 while Kumar et al. divided IOS into three main kinds in 1996. Both emphasized the kind of vertical IOS. Also there were researchers conducting the research on the causation of IOS (Kumar, van & Han, 1996) and the value of IOS (Sabherwal & Vijayasarathy, 1994). Though the previous research had provided us with numerous evaluation methodologies, they failed to consistently identify positive correlation between IS expenditure and organizational performance (Sethi et al., 1993). In addition, there was almost no paper research on the Business value on a particular IS, such as IOS.

With the advent of supply chain competition era, vertical IOS was becoming a more important part of IS expenditure, and therefore the problem of how to evaluate its business value was crucial to both researchers and practitioners. Hence, the purpose of this paper was to propose a model, which summarized the business value of vertical IOS by means of a case study, which studied a networking company in China. The rest of the paper is organized as follows. Firstly, literature review on IS business value, IOS and ROI were presented in section 2, which was followed by the general case background in section 3. Then there came the description of our research approach in section 4. Based on the literature review and case background, the model was introduced in section 5. According to this model, research findings were concluded in section 6. And then a brief conclusion of effective management practices was provided in section 7. Finally the paper was concluded in section 8.

## **2. Literature Review**

### **2.1 IS Business Value**

Value was defined as "the worth, desirability or utility of a thing" (Concise Oxford Dictionary).

Early evaluation approaches focused on a single system, using only a financial perspective (Hamilton & Chervany, 1981a, 1981b). Later studies introduced the concept of IS's overall contribution to organizational performance (Bender, 1986; Turner, 1985). Dissatisfaction with the limited scope of these measures led to the development of a number of multi-dimensional methodologies (Banker & Kauffman, 1991). Part of the current confusion might be due to the plethora of terms used to describe the concept. These included IS effectiveness (Iivari & Ervasti, 1994), IS success (DeLone & McLean, 1992), IS influence

(Mason, 1978), IS impact (Gurbaxani & Whang, 1991; Vogel & Nunamaker, 1990), and "IS business value" (Katz, 1993; Broadbent et al., 1995). Hence it was generally accepted that future research should first focus on defining the "IS business value" construct before considering the development of appropriate measures (Banker et al., 1993). Thus began the prelude of the definition of IS business value, such as "ability of IS to gain competitive advantage" (Hitt & Brynjolfsson, 1994), "an economic measure of IS investment in relation to productivity usually at the organizational level" (Jordan, 1995), and "impact of IS on business performance" (Mukhopadhyay, 1995). The focus of recent definitions of IS effectiveness and "IS business value" moved more to organizational concerns, as two given information systems could be effective (doing the right things) but might vary greatly in the value they added to the business (Cronk & Fitzgerald, 1999). Marguerite et al defined the IS business value as "the sustainable value added to the business by IS, either collectively or by individual systems, considered from an organizational perspective, relative to the resource expenditure required"(Cronk & Fitzgerald, 1999).

From the above definition, it was clear that there were several groups of specific IS business values, and therefore all of these should be induced into several dimensions. Marguerite et.al defined three dimensions of IS business value as follows. (1) System dependent dimension: value that was added to the organization as a result of the system characteristics. This value might be reflected in measures such as accuracy, response time, downtime, semantic quality, timeliness, etc; (2) User dependent dimension: value that was added to the organization as a result of user characteristics. User characteristics included skills and attitudes that might result in effective or ineffective use of the system; (3) Business dependent dimension: value that was added to the organization as a result of business factors such as alignment between system and business goals. This value might be reflected in the realization of business goals (Cronk & Fitzgerald, 1999).

## 2.2 Inter-organizational Information System

IOS was a system based on information technology that transcended organizational boundaries. Johnston et al. defined IOS as "an automated information system shared by two or more companies (Johnston & Vitale, 1988). An IOS was built around information technology, that meant around computer and communication technology, and facilitated the creation, storage, transformation and transmission of information. An IOS differed from an internal distributed information system by allowing information to be sent across organizational boundaries". There were also other definitions such as "Inter-organizational systems (IOS) are automated information systems that cross company boundaries." (Suomi & Reima, 1988); "Inter-organizational systems are information and communication technology-based systems that transcend legal enterprise boundaries"(Bakos, 1991; Chismar & Meier, 1992; Konsynski, 1993); "Information system exceeding the boundary of a single company based on information and communication technology"(Bakos, 1991; Chismar & Meier, 1992; Konsynski, 1993); etc.

There were several kinds of IOS, with each having its own characteristics. In order to give each a deeper understanding and to propose more appropriate management mechanism,

some researchers conducted research on the taxonomy of IOS. Konsynski et al. suggested four kinds of IOS, namely, marketing and logistics system, virtual system, industry shared platform and electronic market. The marketing and logistics system meant the inter-linkage between buyer and seller; the virtual system represented the most primitive form of shared platforms, involving agreement only on data interchange protocols and basic operations procedures. However, industry shared platforms involved direct support for transactions, introducing new economies and disciplines to the market; while in the electronic market, besides executing the transaction between buyer and supplier, the intermediary also enacted as a coordinator of market, such as matching, negotiation, etc. (Konsynski & Benn R, 1993). Kumar et al. raised a more succinct taxonomy, which classified IOS into three kinds according to the relationship between the organizations, and they were IOS with information putting together, supply chain IOS (also called vertical IOS), and network IOS respectively (Kumar, van & Han, 1996). In this paper, we focused on the research of vertical IOS.

Some researchers once studied the problem of building approach of IOS. According to (Premkumar & Ramamurthy, 1995), the building approach of IOS could be divided into active and passive ways. They also pointed out that the relationship among related organizations (such as competitor pressure and gap of operation ability) and the characteristics of the company (such as the inner requirement and the support of management level) were two main decisive factors, which influenced the building approach. In our paper, the company in the case study adopted the passive building approach, and it was interesting to notice how that building approach worked on the Return on Investment.

When coming to the vertical IOS, the main value was to achieve competitive advantage or compete with the supply chain of its competitors, so called competition between supply chains (Sabherwal & Vijayasarathy 1994). Thus the expected benefits of Supply Chain Management (SCM) equaled to the value of vertical IOS. Edwards et al. pointed out the value of SCM was to improve their competitive positioning through lower costs, enhancing working capital management, accelerating time-to-market, coordinating all activities across the "extended enterprise", compressing the time from product development to market introduction, and reducing order delivery time (Edwards, Peters & Sharman, 2001).

## 2.3 Return on Investment

Mahmood (1993) suggested that there had been three main categories of studies on the field of evaluation methods: those using a "key ratios" approach, those using a "competitive interaction approach," and those relying on a "microeconomic" approach. ROI (Return on Investment) was a commonly used evaluation method belonging to the "key ratios" approach. A ROI was got when "Net Present Value of Profits & Expenses" divided the "Investment" of the project (Lenskold, 2002). In this case, the extended ROI method, which included not only quantitative return but also qualitative return.

### 3. Case Background

With the Internet downturn in 2000 and the dot-com implosion in 2001, the network equipment industry began its toughest year. In 2000, the whole network equipment industry had revenue of \$49.3Billion, with a growth rate of 32.17%; while in 2001, the whole industry's revenue dropped down to \$45.4Billion, with a negative growth rate of -8% (In Stat MDR, 2001, 2000, 1999). No wonder the CEO of Cisco said, "In many ways, fiscal 2001 was like two different years, starting out even more positive than we anticipated through December with year-over-year growth in the 60 percent-plus range and then turning into an extremely challenging second half of the year." (Lee, 2001)

Another point about this industry worthy of notice was that the market shares remained top-heavy, with the top four vendors representing almost 65 percent of revenues. The largest one even claimed 42 percent of manufacturers' revenue share of the total networking equipment market in 2001 (In Stat MDR, 2001).

To survive in such an astringent market, the whole industry had to embark on cutting down the manufacturing cost and sales cost. Traditional ways such as layoff could in some way cut cost; however fully utilizing advanced Information Technology was a more effective way, especially in cutting the sales cost. In early 2001, the leading companies in this industry began to boost their Vertical IOS plan: integration of their commerce sites and partners' back-end systems through a combination of off-the-shelf software and RosettaNet standards (Karpinski, March 16, 2001).

In this case, we conducted a research on the ROI of a company, which was a distributor of the world's biggest manufacturer in China (called Company X hereon out of confidential concern), which carried through a vertical IOS project with its upper-stream manufacturer in this winter of the whole industry.

The project began in May of 2001 and lasted almost one and a half years. Figure 1 listed the five (5) phases of the project. The processes involved in this project were closely related with PO (Purchase Order) execution, and they were product information update, product configuration, PO submission, PO status update, and pre-check in respectively. The real line in the figure meant the process in intra IS or real goods, while the dashed line meant the process in the IOS. The arrowhead meant the direction of information flow. The key difference between pre-Vertical IOS and post- Vertical IOS lied in the dashed lines. When there was no this vertical IOS between company X and its partner, all the information was transmitted by hand in batch. But things changed essentially when there existed the vertical IOS, in which all the information between the two companies could be transferred automatically in real time by means of off-shelf Vertical IOS software and RosettaNet standards.

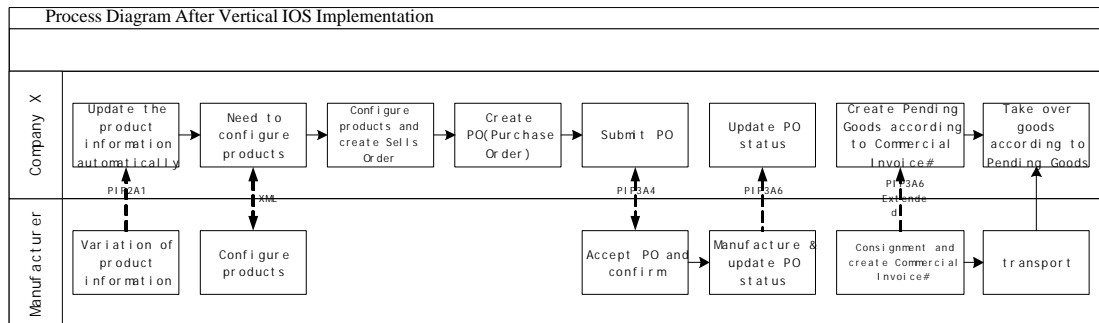


Figure1: Process Diagram after vertical IOS implementation

To implement such a cross-organizational project, the project team was made up of four parts, namely, the management team, the technology team, the business team, and the partner (the upper-stream of company X).

- Management team: it was the organizer and coordinator of the whole project, and communicated with the rest three parts directly.
- Technology team: it was the hero behind the scenes, making the plan and implementation. By the way, although this team was not a department of Company X, it was a strategic partner instead. It was this team who built the ERP of Company X, and hence it was natural that this team was quite familiar with the business process of Company X.
- Business team: it was made up of the two main departments having close relationship with PO.
- Partner: it was a very active role in the whole project team. As mentioned above, this project was a passive Vertical IOS when Company X is concerned, as its partner rather than Company X itself was the initiator of the project. It also constituted the proposal for project and played a crucial role in Company X's choosing business standard and Vertical IOS software vendor.

## 4. Research Approach

In this paper, we adopted case study research method due to the lack of a cumulative theoretical base of "Business value of IOS", and the need to examine complex phenomena in depth, as well as the sensitive nature of the data that had to be collected. But the most important reason was that there were only a few companies now in China with this kind of vertical IOS in place.

This case study research design involved multiple sources of data collected in a structured manner. Sources of data in this case included:

- Senior managers: These participants constituted a very significant group of "key actors" in the development of implementation of the Vertical IOS project.
- Related department managers: These participants referred to the persons who were in charge of the department which were affected by the Vertical IOS. They enacted a very important role in process redesigning and implementation of the whole project.

- **Related Employees:** These participants were the persons who really went through the implementation of the Vertical IOS project and experienced the change that brought by it.
- **Planning documents:** Confidential planning documents concerning technology and business were accessed.
- **Other organizational documents:** Material related to organizational structures and responsibilities, external reports and reviews, documentations, plans and presentations on this Vertical IOS project were referred to.
- **Annual report analyses (1997-2002):** The five-year annual reports for both Company X and its upper-stream partner were analyzed.

Focused interview sessions followed by grading questionnaires were conducted to the participants of each team mentioned above. The grading questionnaires adopted 5 grades, and from 1 to 5 meant very unsatisfied, a little unsatisfied, average, a little satisfied and very satisfied respectively.

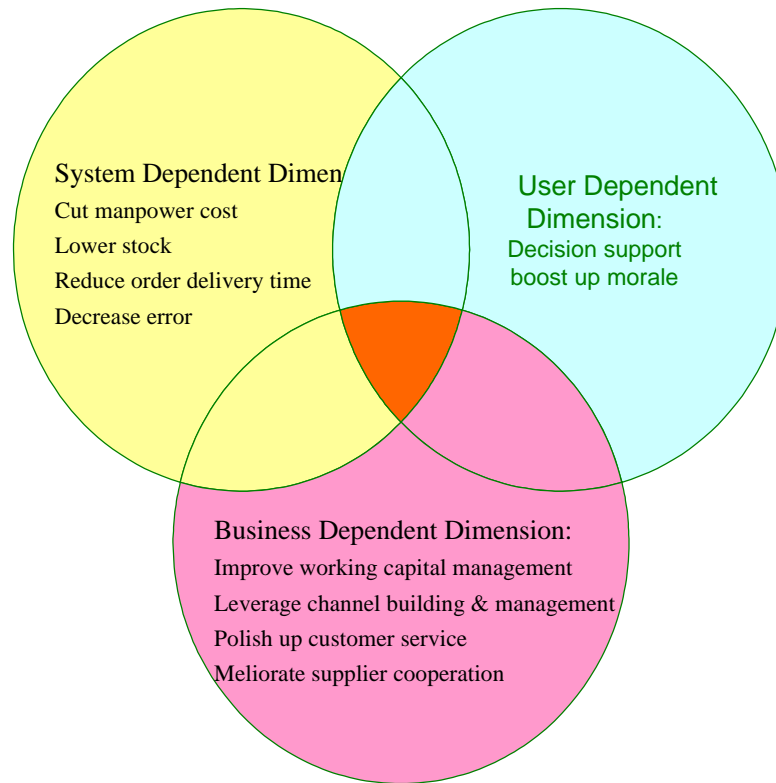
## **5. Model**

Based on the literature review in IS business value and Vertical IOS, a systematic and operational model on how to measure the value of Vertical IOS business value was proposed, which was followed by a detail explanation of all the dimensions and indices and the equations for all quantitative indices.

### **5.1 Model Construction**

The literature review section above had reviewed the three IS dimensions (Cronk & Fitzgerald, 1999) and also the value of SCM put forward by Edwards et al. By integrating all these literature together, a model of Vertical IOS business value was proposed. (See Figure 2)





*Figure 2: model of business value of Vertical IOS*

Just like what Cronk et al. had proposed, this model also divided the business value into three dimensions, and they were system dependent dimension, user dependent dimension, and business dependent dimension, respectively. But it was only the foundation of our model because the purpose of this paper was to find a model evaluating the business value of a Vertical IOS. So in each dimension, the theories of Vertical IOS were integrated into it seamlessly. The literature review section had cited that the value of SCM was to improve their competitive positioning through lower costs, enhancing working capital management, accelerating time-to-market, coordinating all activities across the “extended enterprise”, compressing the time from product development to market introduction, and reducing order delivery time (Edwards, Peters & Sharman, 2001). Hence, on the system dependent dimension, the model took into account four indices and they were cut man-power cost, lower inventory, reduce order delivery time and decrease error respectively; on the user dependent dimension, the model put forward two indices and they were decision support and boost up morale respectively; and on the business dependent dimension, the model proposed four indices and they were improve working capital management, leverage channel building and management, polish up customer service and meliorate supplier cooperation respectively.

The four indices on the system dependent dimension depended on some fundamental data, and the relationship between these data and the four indices could be denoted as a fish bone diagram as follows. (See Figure 3)

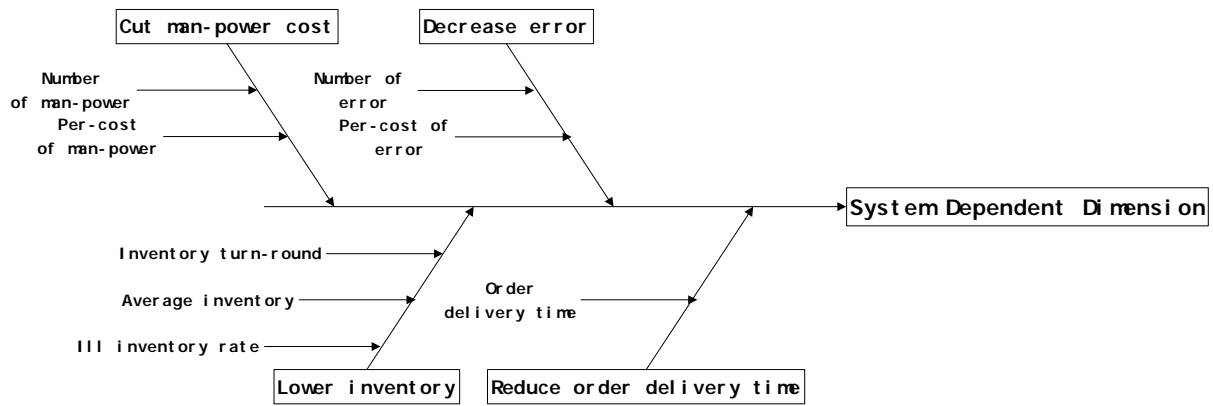


Figure 3: relationship of the system dependent dimension and its four indices

The business value on the system dependent dimension could be measured based on the four indices in the Vertical IOS related processes.

The two indices in the user dependent dimension were decision support and boost up morale.

Decision support meant the extent of the decision support to the business provided by the data of the vertical IOS. It was well known that data was a large fortune for a business and the major value of data was its support to decision making. Generally speaking, the value of decision support could be measured from four factors, and they were improving decision-making efficiency, enhancing the collection and analysis of the business information, reinforcing cost management, and strengthening financial analysis. Obviously, it was very hard to find some quantitative data to calculate the four indices, and certain qualitative methods such as “importance and satisfactory grading questionnaires” could be used instead.

Morale was a measure to the extent that the employees of a company tried to realize the goal of that company. The morale of employees included the recognition and proudness of the company, the passion to work, effective communication between departments and departments, the support to employees, and the coherence among employees.

The four indices in the business dependent dimension were improving working capital management, leveraging channel building and management, polishing up customer service and meliorating supplier cooperation respectively and they were based on the four indices in the system dependent dimension. Because of the reduced error rate and order delivery time, the relationship with suppliers and service to customers were improved. Since the celerity of the order delivery process, the average time that per order took up reduced, and so increased the number of order that could be dealt with every year, so that the working capital management was improved. Another factor resulting the improving of working capital management was the decreasing of average inventory and ill inventory. So it was safe to say that there were close relationship between the indices in the system dependent dimension and the indices in the business dependent dimension. (See figure 4).

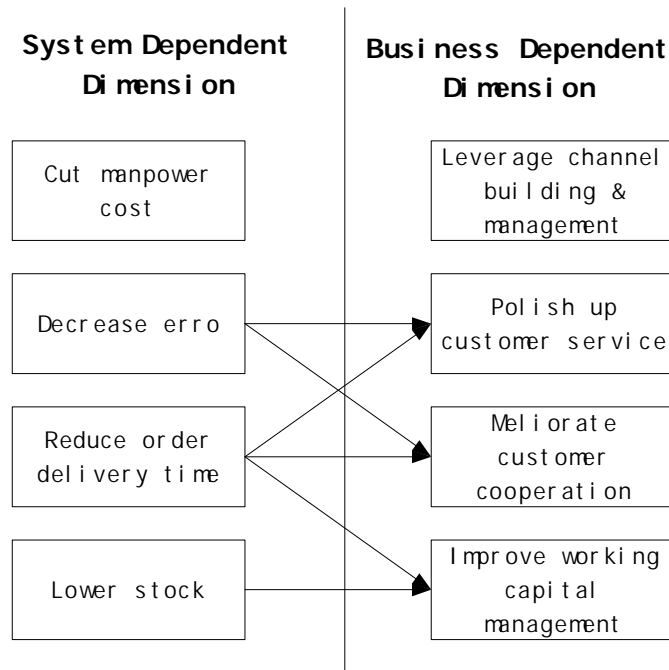


Figure 4: relationship between the indices in two dimensions

Furthermore, it was founded that the values in these three dimensions were somewhat lapped over. For instance, the value of reducing order delivery time in the system dependent dimension sometimes was a causation of the value of improving working capital management in the business dependent dimension. And the value of leveraging channel building and management in the business dependent dimension was one factor of the value of decision supporting in the user dependent dimension. So here the Venn diagram was used to show the interactions of these business values in different dimensions.

## 5.2 Formula of Each Index

It had been pointed out in the last section that the most quantifiable indices were the four indices in the system dependent dimension, and they were also the foundation of the value in the business dependent dimension. So in this section, the formula of these four indices would be given out as follows. (See Figure 5)

- |  |
|--|
| <p>(1) Value of Cutting Manpower Cost<br/>= Manpower needed <math>\times</math> Salary of this Kind of Manpower</p> <p>(2) Value of Decreasing Error<br/>= Error Times Per Year <math>\times</math> Loss Per Error</p> <p>(3) Value of Lowering Stock<br/>= Decrease of Average Inventory <math>\times</math> Discount Rate + Decrease of<br/>Inventory <math>\times</math> Loss Per Inventory</p> <p>(4) Value of Decreasing Order Delivery Time<br/>= Sales Revenue Per Year <math>\times</math> Decrease of Order Delivery Time<br/><math>\times</math> Discount Rate</p> |
|--|

*Figure 5: Formulas of the four (4) indices in the system dependent dimension*

These formulas would be used in the following section.

## 6. Study Findings

With all these data from different interviewees, the ROI of this project was calculated. The ROI was achieved with "Net Present Value of profits & costs saved" dividing the "Net Present Value of investments" of the project. All the profits, costs saved and investments were considered within the 5-year-period investment cycle. The profits & cost saved included the error decreasing, order delivery time reduction, stock lowering, manpower cutting and probable rebating caused by the Vertical IOS project. The investments included the software, hardware, consulting fee, manpower cost, etc.

As a whole, it was a successful project with a relatively satisfactory ROI. The ROI under 3 different evaluations was shown in Figure 6 below. Under the condition of average estimation, if the expected rebate was not considered, the 5-year-NPV of net income reached \$709,905 with the ROI of 361%; while if the expected rebate was considered, the 5-year-NPV of net income reached \$1,161,749.3 with the ROI of 590%. Under the condition of optimistic estimation, if the expected rebate was not considered, the 5-year-NPV of net income reached \$1,126,103.1 with the ROI of 633%; while if the expected rebate was considered, the 5-year-NPV of net income reached \$1,816,484.3 with the ROI of 923%. Under the condition of pessimistic estimation, if the expected rebate was not considered, the 5-year-NPV of net income reached \$321,915 with the ROI of 164%; while if the expected rebate was considered, the 5-year-NPV of net income reached \$1,673,444.4 with the ROI of 342%.

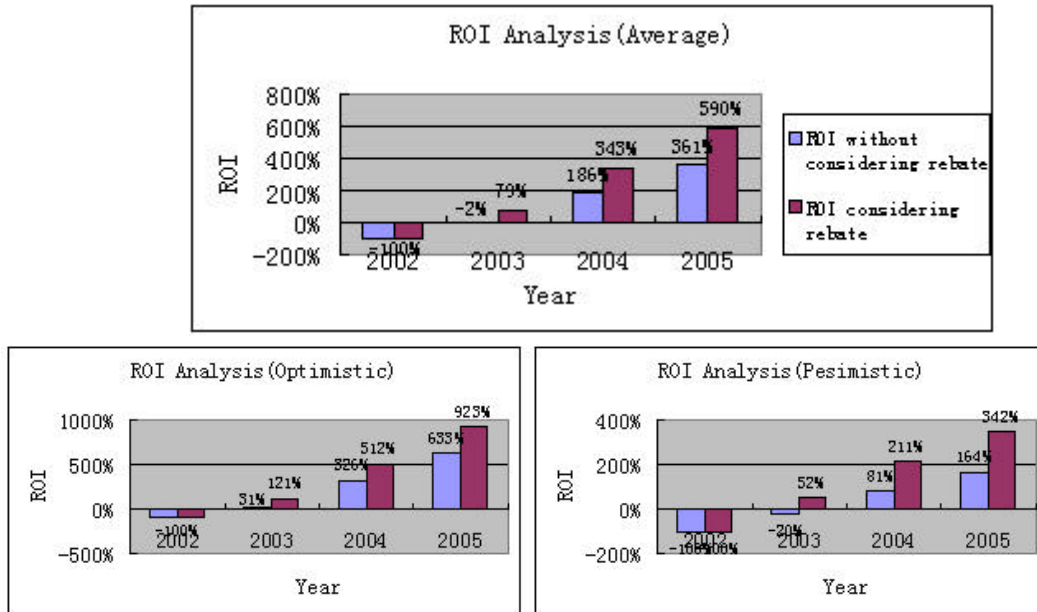


Figure 6: ROI analysis of this Vertical IOS project

### 6.1 System Dependent Dimension

Figure 7 showed the business value from the system dependent dimension. The business value in this dimension relies on four factors, namely, decreasing error, reducing order delivery time, lowering stocks and cutting manpower cost. And the 5-year-NPV of the operational cost saving was \$906,770. The two factors of lowering stocks and decreasing error were the most distinctive ones, with each accounted for 75% and 21% respectively. It should be noticed that the cost saving of “cut manpower cost” was almost a negligible factor in this dimension, only accounted for 1%. As a matter of fact, it was quite natural because the labor cost in China was so low that it was not the bottle-neck of cost-saving as in some western countries. Hence, to evaluate the business value of a project in China, how much manpower was reduced is not a critical index, and the indirect business values such as lower stocks must be taken into consideration.

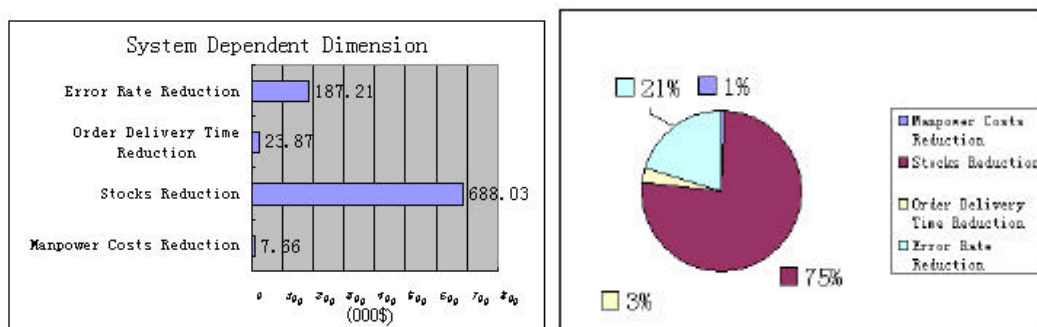


Figure 7: business value from the system dependent dimension

## 6.2 User Dependent Dimension

As a whole, there were two factors in our model having close relationship with this dimension, one was decision support, and the other was boost up morale.

With this Vertical IOS, Company X could get data related with its sales activities more quickly, more accurately, and more integrally than ever before, and those data made the decision making more scientifically. In our grading questionnaire, when taking the difference between the level of satisfaction with the pre- Vertical IOS and post- Vertical IOS phases into account, it was obvious that the highest one was “improve decision making ability”, with the grade climbing up from 3 to 4.33. Take the constituting PO as an example. With the data provided by the Vertical IOS, the PO managers could hold the detailed data which were helpful to his decision making, such as the product name, serial number, quantity of the products sold to all the end-customers, when the sold-products were submit order, when they were transported out from the warehouse of its upper-stream manufacturer, when they were transported into the warehouse of Company X, when they were delivered to end-users, etc. All in all, they could conduct the entire process management during their selling procedure. In that case, the whole channel could be so transparent that they might use these data to do as many analyses as they wished. And all the result of analysis could be helpful to the decision making of when, which and what amount of products to purchase, even realize the just in time purchasing.

This Vertical IOS project also played a very important role in boosting up morale. The result of grade questionnaire showed that this project upgraded the morale greatly, such as recognitions and pride of the company, passion to job, communications among different departments etc. In particular, the grade of “communications among different departments” climbed up from 3.25 to 4.0.

## 6.3 Business Dependent Dimension

Just like the executive director of Company X had said, “The keys for a distributor like Company X to gain competitive advantage are improving working capital management, leveraging channel building and management, polishing up customer service, and meliorating supplier cooperation.” Very luckily, we found this Vertical IOS project aligned with these strategies very well.

When working capital management was concerned, one aim of this project was to curtail the operating cycle in order to enhance the profit rate of working capitals. For example, in the old “submitting PO” process, the PO should be submitted twice: once in the ERP of Company X and another time on the website of its up-stream manufacturer. Therefore the cycle from SO to PO would be around 3 days. But with the new Vertical IOS, this task could be executed only once, thus the cycle could be condensed to 2.5 days. Although only 0.5 days is cut, its related cost saving was estimated to be \$33,278.2.

As for leveraging channel building and management, the Vertical IOS could provide data in the channel, which meant that the channel was totally under control. In supply chain management, the channel was a very precious fortune.

Although this IOS was only between Company X and its up-stream partner, it also fetched value to its customers. Firstly, it enhanced its credibility to its customers. Without the IOS, the data exchange between Company X and its up-stream partner was mostly done by human hand, which was vulnerable to mistakes. If a product supposed to be shipped to Shanghai was shipped to Beijing by mistake, then the customer in Shanghai would inevitably complain because company X couldn't send their good at right time, right place and right quantity. Secondly, it shortened the response time. In the old "product configure" process, the product could only be configured on the website of its up-stream manufacturer and only one designated person had the username and password to do so. When the products needed to be configured, the salesperson sent the request to that person by means of a defined procedure, and after configuration, the result was given back to the salesperson. Generally speaking, the configuration time was 20 minutes while the whole cycle time should be around 1.5 hours. That is to say, though one could meet the requirement put forward by the customer in 20 minutes, he had to ask them to wait for another 1.5 hours, as he could not start his work at once. In the new system with the Vertical IOS, salesmen could make their configurations in ERP as soon as their customers wanted them to do so.

The building approach of this IOS was passive, which meant that it was driven by up stream partner, not by itself, and hence it was not surprising that the greatest business value in the business dependent dimension was meliorating supplier cooperation. In addition to selling products, its up-stream manufacturer also wanted Company X to report the channel information. It was well known that distributor was the frontage of the whole supply chain, and in order to get the keenest market information and enhance the veracity of market forecasting, the key factor was whether it was possible or not to get enough data from the channel. So from the very beginning, the up-stream partner required all its distributors to provide monthly POS (Point of Sale, the name of its sales report). However, the monthly POS had its inherent short-comings Firstly, the cycle time was so long that the data were outdated; secondly, the data were collected by human hand so that there were often mistakes embedded in the report. With the building of this Vertical IOS, company X could share its channel data with its up-stream partner in real time. Once having these channel data, the upper-stream manufacturer could institute sales strategies more congruous with the demand; at the same time, it could find the business processes needed to re-engineer, and hence it could improve the efficiency of the process from the standpoint of the whole supply chain.

## **7. Effective Management Practices**

To evaluate and to fully utilize the business value of Vertical IOS, the following practices should be noticed:

1. The objective of exchanging data was to better utilize these data, and only the latter could realize business value. Although there was no requirement for legend IS to build IOS, it

should be noticed that the legacy system in the two parts would play an important role in deciding the business value of the IOS. IOS was just the bridge between two different IS, and it only provided the possibility of exchanging data; however, if the company could not utilize these data to support decision making, then where come the business value?

2. The dominator in the supply chain should be the driver of this kind of Vertical IOS. On one hand, it was the biggest winner because the transparency of the whole channel could help it to manage the supply chain as an “entire company”. On the other hand, it was the only member who had the enough power to push the plan. So the dominator should give pull and push to the other part involved in the IOS. In this case, without the rebate given by its upper-stream manufacturer, the 1-year-ROI would be -2%, and consequently Company X might not continue the project next year at all. Thus, there would not be the 3-year-ROI of 361%. However, once Company X had the rebate, the 1-year-ROI would rise to 79%, which would give it enough courage to continue the project at gain great success in the future.

3. The business value of Vertical IOS should not limit to the quantitative value such as time, stocks, and also include qualitative value such as decision support and morale; not limit to the direct value such as manpower, and also include indirect value such as polishing up customer service.

## 8. Conclusion

This paper explored how to evaluate the business value of Vertical IOS. Based on the literature review on business value of IS and IOS theory, the paper put forward a model of a framework about how to evaluate from three dimensions: system dependent dimension, user dependent dimension, and business dependent dimension with each involving several factors based on supply chain research. The case in this paper validated the usability of the model with solid data. At the end of the paper, three management practices on how to evaluate and to fully utilize the business value of Vertical IOS were identified.

There were still limits in this paper. The study, by taking a single case-based approach to one specific network equipment distributor in China, could be seen as limited in design and in the interpretive nature of the findings. Conclusions reached here were limited by the study's focus on the single case.

An important extension of this study, therefore, would be to conduct a survey to gather data at a broader sample into analysis. This could include, for instance, which business value of Vertical IOS was the most important to companies.

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