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AN INDICATOR SYSTEM FOR ASSESSING ENTERPRISES E-READINESS AND ITS APPLICATION IN CHINESE RETAILING[1]

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Abstract

Although e-business becomes increasingly important to business world, an inappropriate implementation of e-business has resulted in enterprise's tremendous resources being down the drain. To minimize the cost of inappropriate e-business implementation in the future, an enterprise should make a self-assessment to make sure whether it is e-ready for e-business. Th paper, drawn upon several existing e-readiness assessment models, proposes a new e-readiness indicator system. The proposed indicator system has 5 hierarchical levels with 67 items as the indicators. Using this indicator system, an enterprise can have a whole picture of the enterprise's e-readiness and help the enterprise's executives make decision on e-business implementation. The e-readiness indicator system was used to assess the e-readiness of retailing enterprises in China. Research findings were presented and discussed finally.

Keywords: E-business, e-readiness, assessment, indicator system

Introduction

E-Business is improving business performance through connectivity by including new technologies in the value chain and connecting value chains across businesses in order to improve service, reduce costs, open new channels and transform competitive landscapes (Deise et al. 2000). As the information technology rapidly improving, more and more firms have established a vision of e-Business, and believe that the e-Business will be the ultimate form of enterprise management. E-Business will not be an option any more; rather it will become a necessarily factor of businesses, such as financial service, publication, retail, manufacturing, and any other industries. E-Business is a crucial part of modern corporations' strategy plan. The businesses that fail to implement e-Business will lose the opportunity in the new century.

In the scope of e-Business, ERP, CRM, SCM and other application implementation are surging in the nation's economy society. However, it is still a question whether the investment of e-Business can reciprocate corresponding profit. A survey claims that the overall investment of IT in the Unite States has exceeded one trillion dollar, 80% of which does not bring back prospective benefits (Tian 2001). It is surprising that it happens in the Unite States, the nation that has the strongest ability of IT utilization. In China, where IT application is still under developing, more consideration should be focused on the initiative of e-Business implementation. The key issue is that the IT managers should learn how to utilize information, rather than only how to operate

computer (Davenport 1994). Implementation of e-Business without deep consideration would only bring enterprises beautiful appearances of modern management, but it would not ensure enterprises gain competitive advantages.

For solving the above questions, the paper will try to abstract the common features and factors of successful and unsuccessful e-Business, in order to form a set of indictors system for the enterprise e-readiness assessment. APEC and Cisco brought the term of e-readiness forward at the end of 90's. But the term may be applicable to different objects. APEC defines the "e-readiness" as the degree to which a nation, a region, a city or a community is prepared to participate in the digital economy (http://www.ita.doc.gov/td/industry/otea/ecommerce/apec/). However, the term "e-readiness" by Cisco is applicable to enterprises, which means that the preparation degree to which an enterprise or organization is implementing e-business (Hartman et al. 2000). The "e-readiness" of this paper is the second meaning. An indicator system is a tool by which an enterprise can get a clear vision of its e-readiness level. A good e-readiness will bring corresponding benefits, and vice versa. Through the assessment of the enterprise's current situation, the enterprise can get a full vision of the enterprise's e-readiness, realize what kinds of efforts will be improved more for the e-Business change. Furthermore, the enterprise can make right decision of e-business implementation. Therefore, a rational, logical and valid assessment indicator system is fundamental and important for e-readiness research and application.

The paper first focuses on the previous research of the common features and factors of successful and unsuccessful e-Business, and then compares several existing e-readiness assessment models. Combining the results of the researches and the merits of the assessment models, the paper proposes an e-readiness indicator system as the method to assess an enterprise's e-readiness. The indicator system has 5 hierarchies like a tree consisting of three assessment aspects that have their own sub-aspects, which have some issues. The 67 leaves of the tree are the indicators. Using indicator system by an enterprise can give out a full vision of the enterprise's e-readiness and help the enterprise's executives make decision of e-business implementation. Finally, based on the investigation of more than 20 retailing enterprises in China, this paper uses the e-readiness indicator system to assess the e-readiness level of retailing enterprises in China.

Key Factors of Successful E-Business

While the e-Business is implemented globally, many researchers focus on the factors of the cases of success and failure e-Business, and find the key factors of successful ones.

Barua et al. (2001) think that, firstly, before the e-business implementation, senior managers must recognize the nature of IT, business process and e-business readiness throughout the value chain. And secondly, they should know the e-business drivers of its company. These drivers include business process, IT applications (customer orientation, supplier orientation and internal orientation), and systems integration. Obviously, it is unwise to implement e-business when lacking of enough drivers.

Larsen et al. (2001) indicate that a proper information system implementation plan is a key factor for a successful e-Business. A good plan should cover the following fields: identification of the opportunities for e-b, identification of the weakness in current IS applications, making e-b budgets, monitoring of e-b project, evaluating e-b investment, analyzing e-b trends within the industry and identification of e-b skills training and development. The e-b implementation plan is an indispensable part of the enterprise e-Business strategy. A proper e-b plan can give a firm basement for the future change, and it is one of the most important factors for a successful e-Business.

The research by Gulati and Garino (2000) indicates that enterprises should base their own features to make decisions whether to completely extend their brand to the Internet or build a separate new e-business. For brand maintenance, business management, operation management and asset management, different levels of e-business integration have their own advantages. Therefore, enterprises should assess their own features and decide the way and depth of e-business implementation to ensure the benefit e-business bring back.

Smith claims, in the paper by Maruca (1999), that whether to implement e-business are questions that whether the implementation can strengthen the relationship between firms and customers, and whether it can explore new markets. The implementation is proper only when it can help an enterprise fulfill customers better.

Feeny (2001) proposes three e-opportunities: e-operations, e marketing, and e-services. All of businesses should know how to develop themselves in the three e-opportunities domains, and this issue also belongs to the field of e-ready assessment.

Willcocks and Plant (2001) create a framework with four crucial strategic quadrants: technology, brand, service and market. In practice, laggard companies never made it pass the technology quadrant. On the other hand, leading and medium-performing organizations quickly moved beyond the first quadrant. Implementing e-business into the latter three quadrants will generate real benefits. But, whether an enterprise can achieve this is determined by its abilities and conditions.

Burke thinks, in the paper by Maruca (1999) that some e-business initiatives in retailing failed just because enterprises had not realized the true advantages of e-business, and had not combined the advantages with their environment. Greenbury thinks, in the paper by Maruca (1999), that when they prepare to implement e-business, enterprises must consider the different reaction of managers, staff and customers. A successful e-business should leverage the advantages of the traditional store, without weakening the existing channel.

After surveying and analyzing e-b initiatives by more than four hundred companies, Cisco concludes that four types of factors are critical for the success of e-b. They are leadership, management, competences of an organization and technology.

After reviewing the above literature and considering China's companies' situation, we think that the critical successful factors for e-b are internal requirement, external environment, and organization competence and IT application and acceptance. The factors will be included in the following indicator system.

E-Readiness Assessment Models

Some organizations, based on their views on the key successful factors of e-business, have proposed their e-readiness assessment indicator systems such as APEC's e-Commerce Readiness Assessment Guide **http://www.ita.doc.gov/td/industry/otea/ ecommerce/apec/**), Harvard's Readiness for the Networked World (**http://www.readinessguide.org/**), Cisco's Net-Ready Assessment, PricewaterhouseCoopers' emm@E-Business Maturity Model (**http://www.emmalite.com/prod**) and MIT's e-readiness data model (Siegel et al. 2002). Here we will have a look on the existing e-ready assessment methods and propose our assessment indicator system. They, respectively, belong to two kinds of assessment systems, region e-readiness assessment and enterprise e-readiness assessment. Although this paper focuses on the enterprises assessment, we have to analyze region assessment method because it was developed earlier and more successful than enterprise ones.

APEC's E-Commerce Readiness Assessment Guide

APEC is one of earlier organizations to put forward its e-readiness assessment model and tool as of July 1997. The E-Commerce Readiness Assessment Guide frames critical issues for advancing electronic commerce across the region. The tool is operational because any one of countries or regions can make self-assessment. The result of assessment reflects the e-business degree in the region and can be used as references to making e-business decision (**http://www.ita.doc.gov/td/industry/otea/ecommerce/apec/**). The APEC e-Commerce Readiness Assessment Guide has been specifically developed to assist APEC economies achieves the aim to help governments develop their own focused policies according to their specific environment, for the healthy development of e-commerce. Hong Kong government, for example, assessed its e-readiness in 2000 (**http://www.info.gov.hk/digital21/eng/ ecommerce/ec_assessment.html**).

The Guide covers six key domains of e-readiness and every one of the domains have one hundred indicators one of which has more options for the choice in self-assessment. The six domains are Infrastructure and Technology including thirty-five indicators, Access to Necessary Services including twenty-four indicators, Current Level and Type of Use of the Internet including twelve indicators, Promotion and Facilitation Activities including 9 indicators, Skills and Human Resources including 9 indicators, and Positioning for the Digital Economy including eleven indicators. The assessment method is qualitative because the choice for one indicator is descriptive and could be more than one. The result of the assessment is the overview of the region's e-readiness, not comparative with other regions.

Harvard's Readiness for the Networked World: A Guide For Developing Countries

The Center for International Development at Harvard University together with IBM developed the tool "Readiness for the Networked World -- A Guide For Developing Countries". It describes the determinants of a region, especially a developing

country's Readiness for the Networked World, and a diagnostic tool that systematically examines those factors to assess its readiness in order to help make polces of e-business. This tool is online and self-assessment with 8 languages version.

This indicator system has five categories including nineteen indicators, ranking each by levels of advancement in Stages One through Four. The five groups are Network Access with 6 indicators, networked learning with 3 indicators, networked society with 4 indicators, networked economy with 4 indicators, and network policy with 2indicators. After self-assessment, the Guide neither offers specific advice nor suggests that the only route from Stage Two to Stage Four be through Stage Three. Nor does it provide an overall score; it seeks only to offer a starting point in an Information and communication technology planning process.

MIT E-Readiness Data Model

The MIT e-readiness research team is currently developing a new framework and data model for aggregating relevant data into a robust and customizable tool for evaluating e-readiness. The framework is designed to account for the diverse needs of different e-business applications, to highlight alternative paths to e-business, and to clarify the possibilities within different economic contexts (Siegel et al. 2002).

The e-readiness model has three main dimensions including several measurable components. Three dimensions are "Access" which is composed of two parts infrastructure (wireless density, the number of ISPs, etc.), and services (telephone prices, postal services, etc.); "Capacity" which is further broken down as social (literacy rate, poverty index, etc.), economic (GDP per capita, number of credit card accounts, etc.), and regulatory/strategic (telecom competition, openness of trade, etc.); "Opportunity" which are applications not yet focused on up to now, such as: e-banking, B2B, B2C, B2G, C2C , marketing/information search, comparison of alternatives (aggregation), payment, delivery of goods, logistics, interface with public administration, etc. The main goal of this model is to facilitate the assessment of alternative e-readiness pathways both within and across key dimensions of e-readiness. Also the model can be further applied to determine potential paths for development of a given opportunity within a country.

Cisco's Net-Ready

While APEC Guide focuses on the overall e-readiness of a region or economy, Cisco aims to assess the readiness of a specific enterprise or organization. In Cisco's dictionary, the term "e-business" refers to all the internet-based business applications, including business-to-business, business-to-customer, customer-to-supplier, and business-to-employee applications. The purposes of the assessment are to compare the enterprise in e-business with the benchmarking, to classify the enterprise into one of the four e-business types, and to make more advances by reducing the weakness in e-business strategies.

Cisco's Net Readiness assessment tool is quantitative. It has four categories: leadership, management, competence of organization and IT acceptance. Each category consists of indicators. The total number of indicators is fifty-seven (**http://www.cisco.com/pcgi-bin/front.x/NR_Survey/NR_SurveyGen/TakeSurvey?survey=980**). The method of assessment is scorecard. The possible answer for each indicator is one of the five: 5, 4,3,2,1. "5" stands for completely agreement with the description of the indicator according to the status of the enterprise. "4" stands for some agreement. "3" stands for neutrality. "2" and "1" mean, respectively, some disagreement and completely disagreement. After answering all the questions (assessment on the indicators), the results are the average value of each category and the total average value for the whole categories, which is the quantitative degree of the enterprise's e-readiness. The average value is across 0 to two hundred.

PricewaterhouseCoopers's emm@E-Business Maturity Model

PricewaterhouseCoopers, together with Carnegie Mellon University, developed an assessment framework for e-business called emm@ E-Business Maturity Model (**http://www.emmalite.com/**). Using this tool, any enterprise or organization can assess its e-readiness degree over some criteria, identify gaps and risks between its current capabilities and those need to develop or put in place in order to develop or adjust a comprehensive e-business strategy.

The emm@ model has nine types of domains one of which has ten indicators, covering strategy, organization and competencies, performance management, delivery and operations, value network processes, security and privacy, systems and technology, tax,

and legal. When an enterprise assesses its e-readiness degree, it has to choose one of the three options for each indicator according to its status now. Three options are "not done", "In progress" and "Done", which have their corresponding values "0", "50" and "100". As soon as finishing all questions, the enterprise would get three reports provided by the tool. The reports are domain heat map that provides a summary rating for each of the 9 domains; benchmarking by primary region, which compares the enterprise to others in the region across each of the 9 domains; benchmarking by industry, which compares the enterprise to others in the same industry across each of the 9 domains.

The Comparison of Different Models

Although there are two kinds of assessment methods, region-oriented e-readiness assessment method and enterprise-oriented e-readiness assessment method, both are common and different. They have the following same characteristics:

- Having systematic and operational set of indicators
- Being hierarchical indicators
- Being self-assessment

Besides the commons, the differences are obvious:

- Region-oriented method being qualitative, but enterprise-oriented being quantitative
- The region's itself assessment status is the only result for the region-oriented method, but the results of enterprise assessment include both the itself status and comparison against benchmarks, such as the best all over the world, the best of the same industry enterprises all over the world, the best of the same industry enterprises in the region, the best of enterprises in the region, and the average of the above.

Because this paper is focused on the enterprise e-readiness assessment, we especially compare the differences and commons between Net-ready and emm@:

- Not only can the indicators be understood, but also the answers can be easily chosen.
- There are several benchmarks for comparison so that the enterprise knows more its advantages and disadvantages and the gaps between the benchmarks.
- The assessment results of quantitative and qualitative combination are more stringent.
- There are some limitations or problems for these two models. Firstly, some factors in the indicator system are more important than others, that is, the different factors are not weighted. But the two models do not represent this characteristic. Secondly, although different industries have commons, they have some special characteristics. Should the different industry have different assessment indicator systems? Finally, Chinese enterprises have different cultures from American ones. Should the indicator system reflect different culture background?

In order to remedy the above three problems, this paper studies the weighted indicator system based on the retailing industry under Chinese environment.

Proposing an Indicator System for Enterprise E-Readiness Assessment

Based on the above literature review and comparison, we propose an indicator system to assess enterprises e-readiness. Through the assessment, enterprise can reduce the cost of improper e-business implementation, and find the weakness in the management for future e-business change.

We analyzed all the factors in the Cisco and emm@ models, some key successful factors for E-B combined with Chinese retailing corporation current situation. According to the following criteria, we selected the e-readiness assessment factors:

- Based on the existing e-readiness assessment factors of Cisco and emm@ models
- Based on the key successful factors research by some scholars
- Based on the principle of necessity but simplicity
- Based on the current situation of Chinese retailing corporations

First, we proposed a draft indicator system. Then, we discussed it with some managers of Chinese corporations and scholars and revised it several times. Finally, we get the final indicator system. The indicator system is established from three aspects of enterprises e-readiness: internal requirement, external environment, and organization competence and IT application and acceptance.

The Internal Requirement is to clarify whether the goal of e-business initiative is rational, whether the enterprise can benefit from e-business, whether products or services supplied by the enterprises meet the requirement of e-business, and whether the overall e-business plan is appropriate.

The External Environment is to clarify whether the industry is fit for the e-business and whether the value chain is fit for the e-business.

The Organization Competence and IT application and Acceptance is to clarify whether management structure of the enterprise is fit for e-business, whether it has the motivation system, whether the corporation culture is fit for e-business, whether the IT applications are accepted by all employees.

In each of the aspects, there are some sub-aspects, each of which concerning one or more issue of enterprise e-readiness. Each issue consists of several indicators. There are 67 indicators in the system. The hierarchy of the indicator system is shown in Figure 1. Figure 2 shows the top three levels of the indicator system.

Each aspect, sub-aspect, issue and indicator has the weight attribute. The weights of the indicators are determined by some experts' judgment and calculated with AHP method. Every indicator is a statement with five options: absolutely no, basically no, neutrality, basically yes, and absolutely yes. The score of the answers ranges from 1 to 5, correspondingly. For example, for the specific indicator "the goal of e-business is to achieve standardized management", the enterprise current condition is "basically yes", and then the score of the indicator is 4. Through the assessment, every indicator should get an independent score, and the values of every issue, sub-aspect and aspect are additive scores combined with their weights.

The Application of the Indicator System

To relate the indicator system to the reality, we took a survey among 20 typical chain retail stores in China, and assessed their e-readiness degree using the indicator system. Here we consider the arithmetic average value of the 20 companies' indicators value as the value of every indicator for the whole industry. Based on the average value of every indicator, the value of every issue, sub-aspect and aspect is calculated with weights. The values of three aspects, which stand for the e-readiness degree of Chinese Retailing Industry, are shown in Figure 3. We also do the standard variation analysis as shown of Table 1.
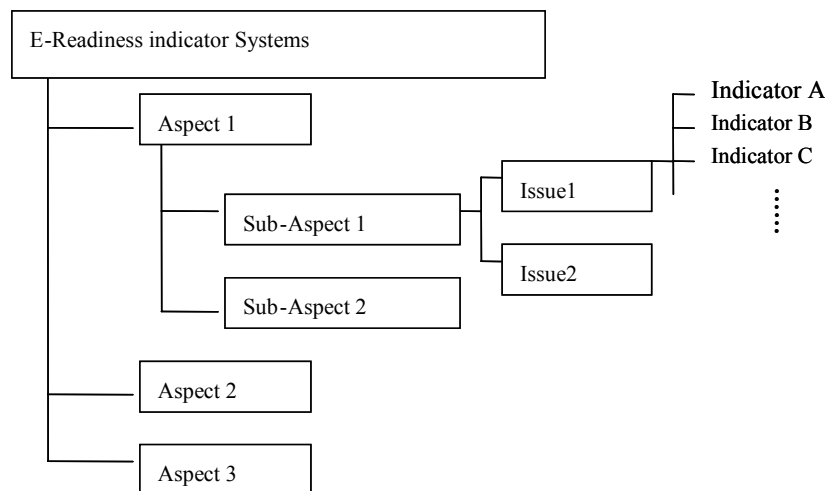

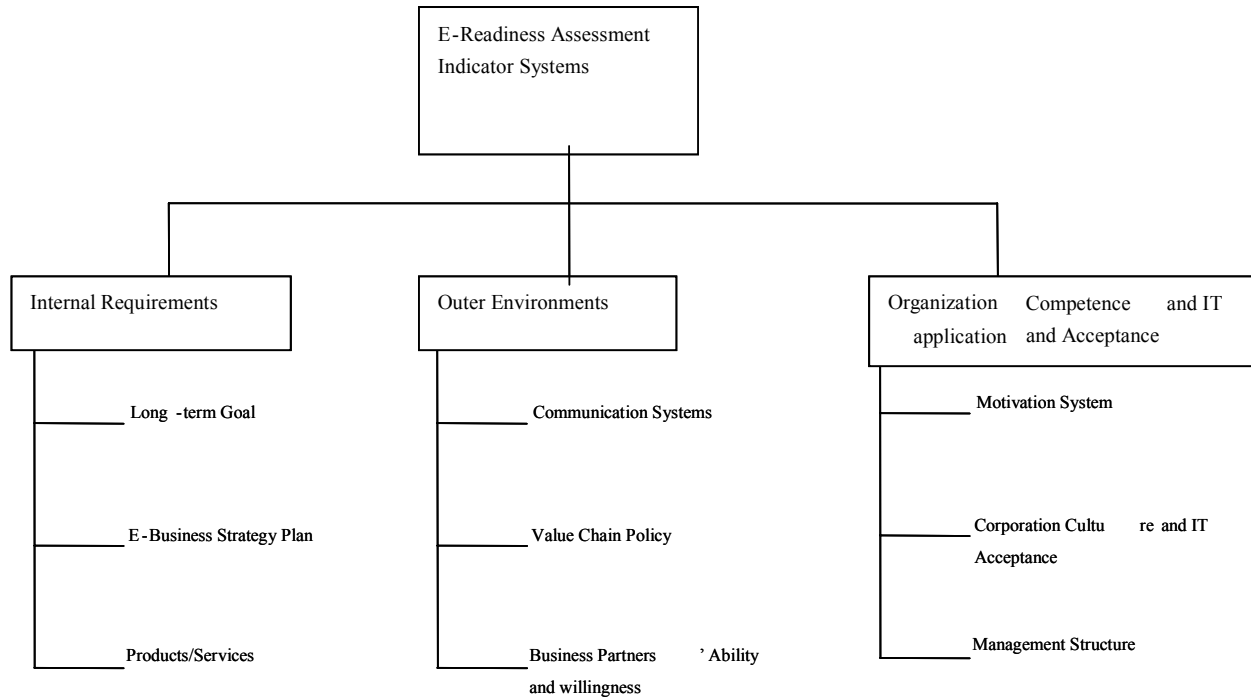**Figure 1. The Hierarchy of E-Readiness Indicator System**

Figure 2. The First Three Levels of the Indicator System

- Long-term Goal
  This aspect has a not so satisfying value, with little deviation. The reason for the little deviation is that the concept of e-business has spread widely and quickly, and most executives have added the e-business's benefit into their long-term goal.
- Strategy and Plan
  In this aspect, the value of e-readiness is little higher than that of the long-term goal, however the deviation is much higher than the former. The reason should be that, although the enterprises know "what they should be", but some of them have not applied the goals into specific strategic plan, scientifically and rationally.
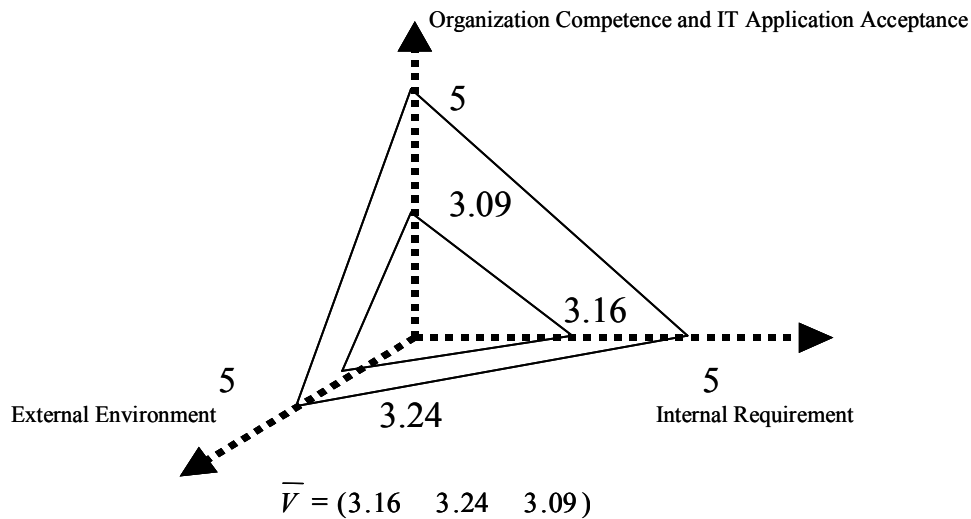

$$\overline{V} = (3.16 \quad 3.24 \quad 3.09)$$

Figure 3. The E-Readiness Degree of Chinese Retailing Industry

Table 1. E-Readiness Value and Variances

Aspects	Sub-aspects	Value	Standard deviation
Internal Requirement (3.16)	Long-term Goal	3.02	0.46
	Strategy and Plan	3.48	1.09
	Products and Services	2.86	1.14
External Environment (3.24)	Communication System	2.95	1.10
	Value Chain Policy	3.56	0.72
	Partner's ability and willingness	3.51	1.04
Organization Competence and IT Application and Acceptance (3.09)	Motivation System	3.36	0.86
	Corporation Culture and IT Application and Acceptance	3.07	1.65
	Management Structure	2.93	1.33

- Products and Services

  The value of this aspect is the lowest in all the value. However this may mean nothing except that the products and the services offered by the enterprises are not so standardized to fit current technology. The only way to solve this problem is to develop and adopt new solutions to overcome the innate disadvantages of the products and services. There are also some variances in this aspect, due to the difference between the products and services of different enterprises.

- Communication System

  There are some difficulties in the progress to build a Value Chain Communication System. Lacking an effective and efficient communication system would greatly impede the implementation of enterprise e-business.

- Value Chain Policy

  The value of the aspect is quite good, with little deviation. The reason is that the companies surveyed are all mature big chain stores, all of which have established formal value chain policy.

- Partner's Ability and Willingness

  The e-readiness degree of this aspect is good, which is coincident with the fact. However, some enterprises' business partner has not enough capability and willingness to cooperate into the e-business initiative, which causes a high deviation in the assessment scores.

- Motivation System

  This aspect has a moderate value and deviation, which means all the enterprises have established sound performance assessment and stimulation systems. However there still exists some opportunity to further improve the systems.

- Corporation Culture and IT Application and Acceptance

  Generally, the status of corporation cultures is not suit for e-business implementation. Although the executives have established some concepts of e-business, the common staff has not. Also there are obvious variances in Corporation Culture, and this conclusion is quite close to the fact. During the survey we found that some companies already adopted Information Technology highly into their management and operation. The managers and staff of the companies can operate computer craftily and utilize net resources in a great level, while we can hardly find any computer terminal in some other companies and the executives of which have little rational idea about e-business except some basic concept.

- Management Structure

  Generally, from the lowest score in the nine aspects we can conclude that, the current executives of Chinese enterprise have worked in traditional company for a very long time and are familiar with traditional management mode. So it would take a long time for them to adapt the new management concepts and operations in the information age, whether or not they have any idea about e-business. Also there are great variances between different enterprises. Some enterprises have formed comprehensive, fully functional and effective change management team, while some others have not.

Conclusion

Through the assessment on China's 20 retailing enterprises from the three aspects – internal requirement, external environment, and organization competence and IT application and acceptance, business leaders would know whether an enterprise is e-ready for e-business implementation. They can also know what kinds of efforts are needed for a better e-business implementation. While the indicator system is initially established and applied to one industry of China, more researches are needed to further improve the assessment method. Our future studies include (1) to verify the assessment model using empirical data and consider weights for each indicator. Further, more retail stores will be assessed to have a more reliable e-readiness evaluation of Chinese retailing industry.

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