



Research Article

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Research on Electronic Business Information System based on DEA model

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ABSTRACT

An electronic business information system includes an information center and a search platform. The information center is adapted for a user to access through a public communication network based on DEA, and includes an information database storing a plurality of business profiles each having an interface subject. The interface subjects of the business profiles are selectively interchangeable when the business profiles are correlated with each other. The search platform communicatively links with the information center for the user to search through the information database, wherein when a search request is sent to the information center through the public communication network, the information center selectively sorts out the business profiles matching with the search request to generate a search result.

Keywords: preference sequence DEA model; The average transverse rate; Information system;

INTRODUCTION

The present invention relates to an information system, and more particularly to an electronic business information system and a method thereof for searching business information, wherein the search result is generated from uniformly designed template structures and in a predetermined interface language so as to optimize a search application of a particular user.

With the advance of information technology, searching information through Internet has become part of their daily life for many people. A typical search process usually involves the submission of a search request to a search server which is linked to a particular search database, a matching of the search request with the relevant information in that search database, and production of a search result by the search server, wherein the search result is transmitted from the search server to the user's terminal and displayed by a displaying device, such as a monitor.

For search engines such as "YAHOO" or "GOOGLE", when one conducts a search for a subject by keyword(s), a great list of websites that contain such keyword(s) will be sited and listed for logging in. However, in business purposes, the searchers generally just need to search for kinds of product or companies which provide the required services or products. These common search engines fail to provide such immediately results to the searchers all over the world. In other words, for conventional search engines, when one is trying to search a particular item, the search results may be totally out of context because the conventional search engines will search for the particular item wherever that particular item appears in the web or in the relevant yellow pages. For example, when the user is searching "bicycle" with the aim of comparing prices and sales locations, the search results may consist of a technical website describing the working principles of bicycles. This kind of search results will be of little use by the user. Electronic yellow pages search engines such as "YELLOWPAGES.COM" or "YELLOW.COM" provide domestic search for entities within a district or a country. However, due to the convenience of worldwide transportation and the World Wide Web, there is no more domestic business and, in fact, most of the product or

service providers are international entities who are capable to sell products or provide services to anyone all the world or even have national branch companies or offices in different countries. For example, the "WALMART" has thousands of stores all over different states of the United States and different cities of different countries. It may provide different products and stocks in different stores. Similarly, a consumer or buyer of a product or a service that meets his or her requirement would not mind where this product or service comes from whatever country or district.

With its unprecedented growth over the few ten years, the internet has finally made us a real global village but language remains an important issue. Language barriers prevent people from understanding all of the online information they seek. There is no real international search engine or web site that can provide information of searching product or service providers in different countries with different languages support for different searchers of different countries. For example, an American searcher may merely find product or service providers listed in English language and located in the United States. If the searcher wants to search for product or service providers in other countries or in other languages, he or she must log out the original web site and then log in another web site with the same search engine or using another search engine to do so. In other words, the searcher cannot compare searched information of the products, services, and/or the product or service providers with that of the other countries in different languages.

In addition, the search engines will generally confine the scope of a particular search to a particular locality and the search results thereby produced are the consequences of largely truncated search processes. For example, when one is searching a book entitled "Harry Potter" using an American based search engine, the search result may consist of a plurality of Americans bookstores which sell that particular book. However, when the user is comparing the price of that book at various different bookstores (which may not necessarily be in America), he may not be able to get a comprehensive search results. An obvious example is that if there is a United Kingdom online bookstore which sells "Harry Potter" at a discounted price, the user will not get this piece of information because the search process may be truncated to discard United Kingdom's bookstores.

Moreover, as a matter of fact, the majority of websites posted on Internet are written in English. This is partly because English, being a recognized international language, is widely accepted all over the world. Conventional search engines, such as "YAHOO" and "GOOGLE", are usually user-friendly and interactive so that they present little problems for daily applications.

Difficult problems arise however, when one is trying to search a local website using an English-based search engine, or indeed search engines in any other language different that of the local website. For example, using an English version yahoo to search for a Chinese or a French local website (which do not written in English) is very inconvenient. In order to resolve such difficulty, some search engines incorporates translation function whereby websites in a particular local language is translated by a predetermined dictionary so that the local websites (after translation) are matched and sorted alongside with the language of the search request so as to broaden the scope of the corresponding search result.

An associated difficulty in this area is that no one can guarantee the quality of the translation so that the search result may turn out to contain a vast number of unrelated websites. The situation will be even worse when the search request is inaccurately translated. At the end of the day, it may be that the search result contains web data which is completely irrelevant.

DEA MODEL

A typical information system in colleges and universities have a library information management system, financial system, educational system and logistics system, etc., the construction of the system's purpose is to solve a specific business needs. This article mentioned information system is defined as a strategic significance, main effect is through the use of information technology to support the current business, thus reducing operating costs, improve the work efficiency and quality, to realize the local scope is based on the organization structure of the function of the application of combination. Information systems from planning and construction to implement restrictions in the operating level, the implementation of information systems tend not to bring the change of business process and organization structure, its function is limited at the technical level. Information system evaluation, therefore, relatively clear. Look from the main body of evaluation, information systems often by the operating unit to evaluate our business information system, but in some cases may be organized exclusively by the colleges and universities information system for each business unit to carry on the comparative evaluation. There are generally two kinds of evaluation target, is a kind of existing operation effect and based on the information system of department prior to the implementation of information system of department of operational effectiveness evaluation; Another was to compare the performance of the various business information systems in the organization. Based on the purpose of the business application information system, information system evaluation focuses on the system construction,

system performance and system application of these three aspects, in the evaluation of information system, will enable the corresponding index system is established. According to the evaluation target and evaluation content, DEA obviously more applicable than analytic hierarchy process (ahp).

Data envelopment analysis (DEA) DataEnvelopmentAnalysis, was founded in 1978 by famous chane the house of operational research, cooper and rhodes first proposed a new method of nonparametric statistical analysis, applies to have more input, especially the output unit of the same type evaluation effectively. This is the first time to deal with input and output indicators of non-parametric production frontier approach [6]. Suppose N a department or unit, called Decision making units (Decision MaringUnit, DMU), each department has M types of input and S types of output, x_{ij} for the first j a decision-making unit total investment in the case of type I input; Y_{ij} for the j a decision making unit for the r type input into total; V_i for the weight of the ith type input; U_r for the weight of the output of the first r types. X_{ij} and y_{rj} according to historical data or prediction data acquisition; V_i and u_r as variables, corresponding to the weight coefficient:

$$v = (v_1, v_2, \dots, v_m)^T, u = (u_1, u_2, \dots, u_r)^T$$

Each decision-making unit has the corresponding efficiency, namely the total factor relative productivity index:

$$h_j = \frac{\sum_{r=1}^S u_r y_{rj}}{\sum_{i=1}^m v_i x_{ij}} \quad (1)$$

$$j = 1, 2, \dots, n$$

$$\begin{cases} \max u^T y_0 / v^T x_0 = v_p \\ st u^T y_j / v^T x_j \leq 1 \quad j = 1, 2, \dots, n \\ u \geq 0 \\ v \geq 0 \end{cases} \quad (2)$$

$$x_j = (x_{1j}, x_{2j}, \dots, x_{mj})^T, y_j = (y_{1j}, y_{2j}, \dots, y_{sj})^T, j = 1, 2, \dots, n,$$

THE PREFERENCE DEA MODEL

In terms of the characteristics of the DEA model itself, the weight of each vector corresponding to the input and output is defined by optimize the efficiency index, that on the one hand, help us to deal with the weights between input and output information not clear problem, on the other hand can also help us out on the weight of certain subjective capriciousness, however, its in the practical application of the following is true: (1) evaluator of the weights between input and output information has certain understanding;(2) according to the actual needs, to the weights to certain constraints. Because, the information system to achieve the purpose of relatively clear, the result is easy to measure, so the evaluator can make relatively clear about the weight of each evaluation index;(3) a simple DEA model to get the weight of the lack of rationality, so need to modify. So, in this article, to modify the model, the weight by preference sequence constraints, the modified C2R model as shown below:

$$\begin{cases} \max u^T y_0 / v^T x_0 = v_p \\ st u^T y_j / v^T x_j \leq 1 \quad j = 1, 2, \dots, n \\ u_g - u_{g+1} \geq 0 \quad g = 1, 2, \dots, s-1 \\ v_n - v_{n+1} \geq 0 \quad h = 1, 2, \dots, m-1 \\ u \geq 0 \\ v \geq 0 \end{cases} \quad (3)$$

$$\begin{cases} \max u'^T y'_0 / v'^T x'_0 = v_p \\ st u'^T y'_j / v'^T x'_j \leq 1 \quad j = 1, 2, \dots, n \\ u' \geq 0 \\ v' \geq 0 \end{cases} \quad (4)$$

$$T = 1/v'^T x'_0, w = tv', u = tu'$$

$$\begin{cases} \max \mu^T y'_0 / V_p \\ \text{st } \omega^T x'_j / \mu^T y'_j \geq 0 \\ \omega^T x'_0 \geq 1 \\ \omega \geq 0, \mu \geq 0, \end{cases} \quad (5)$$

$$V_p = u^T y_0 = 1, \dots, \omega \geq 0, \mu \geq 0, V_p = u^T y_0 = 1, j_0 \text{ is the C2R DEA.}$$

Due to the sufficient and necessary conditions for the DEA effective decision making units is relatively efficient value of 1 and no input and output slack variables, if the input, output, at the same output may be concentrated, who can't distinguish between effective unit actor who bad. Therefore, this article from another perspective, is not the most beneficial to the weight of the decision units

decision making units, but also calculate the efficiency of the rest of the decision-making unit under the weight value and listed in table 1, the table left diagonal called simple efficiency and efficiency of the rest of crosscutting, E_j for the first j a decision-making unit in the

simple efficiency E_{ij} , $i = 1, 2, 3, \dots, n$, i indicates the first j j is a decision-making unit weight to take the most beneficial to the first j a unit under the condition of the efficiency of the value. Define indicators as follows:

$$E_j = \sum_{\substack{i=1 \\ j \neq i}}^n E_{ij} / (n-1) \quad j = 1, 2, \dots, n \quad (6)$$

The subjective preference for information system of comprehensive evaluation has a great influence. Due to the preference sequence with the preference DEA model, for example for output indicators, planning goal realization degree of index is much more important relative to other output indicators, and information system 1 indicators on this poor performance. The greater the value of information system, means that the restrictions in certain weight and decision-makers preference under the constraint condition of the higher value. In the process of practical application, the decision makers can according to their preferences choose a different sequence of comprehensive evaluation of information systems with different characteristics analysis. Based on the traditional DEA model was improved, making it can reflect the subjective preference sequence DEA model, and put forward to solve with the average rate of crosscutting comparison with effective unit. Due to the policy makers can clear of information system evaluation index, and the weight of each index for sorting, therefore the DEA model based on preference order is better than traditional DEA model on the evaluation can reflect the will of policy makers, and the application case also shows that the model is feasible in the method.

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