BestChoice SRM : 전자 조달을 위한 단순하며 실질적인 공급사 관계 관리 시스템

BestChoice SRM: A Simple and Practical Supplier Relationship Management System for e-Procurement

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초 록

공급사 관계 관리 시스템은 기업 내 조달 프로세스의 효율화를 위해 중요하다. 이미 개발된 공급사 관계 관리 시스템이 있지만, 이들은 공급사 관계 관리 시스템을 도입하고자 하는 기업에게 구매 프로세스와 시스템의 변경을 요구하여 기업의 입장에서 이를 쉽게 수용하지 못하게 한다. 이를 해결하기 위해 본 논문에서는 기업의 구매 프로세스와 시스템의 변경을 최소화 할 수 있는 단순한 시스템 구조를 제안하고, 동시에 변경을 최소화하기 위하여 공급사 관계 관리 시스템의 필수 기능을 정의하고 이를 구현함을 보인다. 시장 변화에 따른 효율적 공급사 평가를 위해서 본 연구 수행에 앞선 연구 결과로 구매 과정에서 발생하는 공급사 평가를 위한 의사 결정 지원 시스템인 BestChoice가 가지는 공급사 평가 알고리즘과 공급사 평가에 대한 효율적 분석 지원을 위한 시각적 분석 방법을 도입하였다. 이와 함께 템플릿 기반 세분화 기법을 도입하여 시장 변화에 따른 공급사의 세분화를 쉽게 하여 공급사 평가 및 관리 정책의 변화를 자유롭게 하였다. 실제 구매 대행 기업에 본 연구 결과를 적용한 공급사 관계 관리 시스템을 구축함으로써 구매 프로세스나 시스템의 변경 없이 쉽게 시스템 도입이 이루어질 수 있음을 보였다.

ABSTRACT

Supplier relationship management (SRM) is an important contributor to a company's efficiency and credibility. Although several ways are used to provide SRM functionality, these are often not easily integrated with existing procurement systems. We designed and implemented a practical SRM system called BestChoice SRM and present its design and architecture. It has the core functionality of SRM with the simple adaptability of BestChoice which is a decision support system for evaluating suppliers with the aid of visualized analysis. It allows seamless integration with existing systems and permits flexible strategy changes as market conditions shift. The key to this flexibility is template-based segmentation. Ease of integration was demonstrated through the installation of BestChoice SRM at a major Korean commercial e-procurement agency.

키워드 : 공급사 관계 관리 시스템, 공급사 평가, 세분화, 의사 결정 지원 시스템
SRM, Supplier Evaluation, Segmentation, DSS

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1. Introduction

Supplier Relationship Management (SRM) is the process through which a business systematically keeps track of its vendors and suppliers, usually by using an information system that automates sourcing, purchasing, and the management of daily supplier relations. It is an essential part of supply chain management and considered to be a critical IT component of any enterprise. Many companies that provide enterprise solutions such as SAP, SAS, and i2 are introducing SRM into their product lines, having recognized the value of systematic supplier management [11, 12, 10].

A major hurdle in implementing SRM is that companies would have to change their existing procurement processes and systems. One way of avoiding this is to design and implement a SRM system that could be easily integrated with existing procurement processes and systems.

A widely adopted supplier relationship management technique is segmentation, a method in which suppliers are classified according to their value to the company and grouped into segments; each segment is then managed by a different strategy. The evaluation algorithm of our previous study was used to transform an abstract value into a numerical value to map suppliers onto a two-dimensional space [4]. To make segmentation easy and flexible so that management strategies can easily change with market conditions, we designed a template-based segmentation method and then implemented it. We call our SRM system the *BestChoice SRM*.

This paper focuses on the implementation of versatile system architecture and a segmentation method that facilitates flexible segmentation, rather than the effect obtained from a SRM system. Therefore, our main consideration here is the supplier segmentation process, the system architecture, and its implementation. More testing and validation of the *BestChoice SRM* remains to be done.

The remainder of this paper is organized as follows. In Section 2, we review the related work on supplier evaluation and segmentation. In Section 3, we discuss e-procurement and supplier relationship management issues. In Section 4, we present the supplier relationship management process using a segmentation technique. In Section 5, we describe the implementation of our *BestChoice SRM* and discuss the issues encountered. Section 6 concludes the paper.

2. Related Work

Numerous business articles and research papers have been published on the subject of SRM. Efficient supplier selection which is the most widely researched area is a complex problem that requires the consideration of several criteria. Since the 1960s, it has been a subject of great interest to researchers and

businesses. In 1966, based on the then current literature. Dickson extracted over 50factors for evaluating suppliers and their characteristics [2]. Weber et al. in their paper published in 1991, provided a review of 74 reports that appeared after Dickson's work [7]. The most widely referenced algorithm for evaluating suppliers is AHP, a branch of Multi-Attribute Utility Theory (MAUT) [8, 6, 1]. BestChoice is a decision support system for supplier selection in the e-marketplace that is based on MAUT and AHP [4].

Many research papers refer to segmentation as a way to master the SRM problem using the principle of divide and conquer. Dyer et al. showed the analysis of SRM based on segmentation at three different vehicle manufacturers in Korea, Japan, and the United States [3]. Moller et al. described the theories behind supplier segmentation and presented an interorganizational competence perspective from a case study [5].

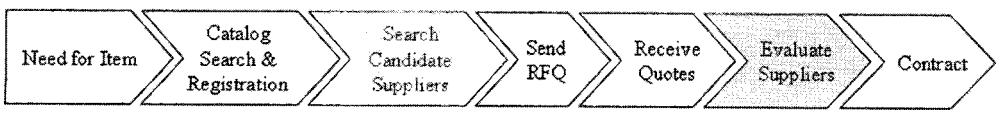
3. e-Procurement and Supplier Relationship Management

SRM involves not only purchasing product items but also managing the whole spectrum of relations between a company and its suppliers. A major hurdle in adopting SRM systems produced by SAP, i2, and SAS is that companies would have to change their existing procurement processes and systems. These systems that were designed in consultation with companies' procurement and Supply Managers (SMs) may actually enhance the process. However, due to the burden involved in changing existing processes or systems, companies may not be confident enough about the expected payoff to proceed with adopting a new SRM system.

Therefore, a real need exists for a SRM system that covers essential SRM functions while minimizing the requirement to change the procurement process and system. We examined in detail the design and implementation of a system that covers the essential functions.

Based on the literature and case studies, we first examined the essential SRM functions to better understand the real challenges that procurement managers face in managing the relationship with their suppliers. To do so, we concentrated on the processes of procurement process and supplier management.

With the advance of IT technologies, e-procurement systems are becoming widespread in business. The procurement process, the most



〈Fig. 1〉 Sourcing Process in e-Procurement

fundamental operation in a company, is illustrated in 〈Fig. 1〉.

Whenever an item is required, the sourcing manager searches for the item in an e-catalog from the e-catalog database. If no appropriate e-catalog is found, the sourcing manager registers the item in the catalog database. The manager then requests quotes from candidate suppliers. After receiving the quotes, the manager evaluates them and selects the best supplier. After contracting, the sourcing manager rates the supplier on delivery, quality, and other criteria according to company policies. Most companies' procurement processes are not much different from the one described above, which are those of an e-procurement agency we had previously studied. We have thus adopted this as our standard procurement process for developing our supplier management process.

Two supplier selections are required in purchasing: choosing the candidate suppliers to receive the RFQ and then selecting a supplier to contract. Our previous research had focused on supporting those selection processes. In this study, however, we focused on how to manage suppliers before purchasing and after contracting.

One method of SRM can be to maintain strategic relationships by giving priority to suppliers that have provided high quality items for a long time, or to those suppliers that provide strategic items. In addition, if only one supplier exists for a given part, the company must either find an alternative or be ready to prevent that supplier from facing bankruptcy.

Based on the case study, we discovered that companies generally group similar products into a sourcing group (SG), and suppliers are mapped to different SGs according to the items they supply. Sourcing managers handle the total sourcing process of items in a particular SG together, and manage supplier information and relations for those items along with them in parallel.

The most difficult tasks for sourcing managers are how to distinguish a valuable supplier from the others, and how to decide which suppliers require special attention. With this in mind, we came up with two core functions: to evaluate suppliers rationally and to determine what supply items are strategic to the company's success. Segmentation could be a way to address these, and the implementation of such a system to support it independently of existing systems is the main focus of our research.

To design and implement the system, we extracted common processes of companies' procurement and supplier management programs, and we structured them in discrete steps. The general procurement process was presented in 〈Fig. 1〉. The structured SRM process will be described in Section 4.

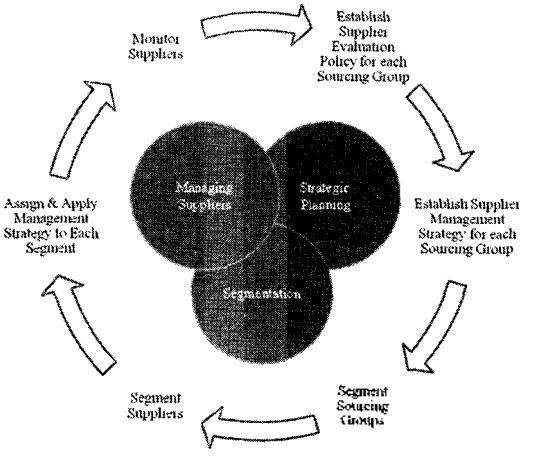
4. SRM Process with the *BestChoice SRM*

The fundamental principle in SRM is that suppliers must be managed differently according

to their strategic position determined by what they supply and how well they do it. Each item they supply may be of different strategic importance for the company. For example, in [3], items were segmented into two groups: one group contained the necessary but nonstrategic items, and the others were strategic items. A strategic item is a high value input that may be useful in differentiating the buying firm's product. In the auto industry, for example, strategic items are transmissions, engine parts, and air conditioners. These parts are customized to the model and help differentiate the model from a competitor's offerings. Nonstrategic parts, which are typically provided by independent suppliers, are those such as belts, tires, and batteries.

Strategic positioning is achieved by mapping suppliers onto a two-dimensional space so that their strategic position can be easily visualized and divided into segments each having different strategic importance. This is called segmentation. The strategic importance of the items they supply is measured by various criteria such as purchasing amount or ease of replacement. In addition, the performance of a supplier is measured by diverse criteria such as quality, lead-time, and possibility for growth. In our latest development, the measurement is based on the BestChoice evaluation algorithm. Thus, our *"BestChoice SRM"* is a combination of "SRM" and *"BestChoice."*

SRM includes planning and establishing policies on how to segment, evaluate, and manage suppliers. Segmentation may change as a company's management policy changes. Since segmenting based on many thousands of items is not trivial, we used the concept of SG described in Section 3 to segment items by group. Based on this foundation, we divided the SRM process into steps as illustrated in 〈Fig. 2〉.



〈Fig. 2〉 Supplier Relationship Management Process

Policies for evaluating and managing suppliers are established during the planning phase. Then SGs and suppliers are segmented. After that, managers assign management policies to suppliers and apply them in practice. After the continuous monitoring of supply performance, supplier evaluation policies and management policies are modified and improved to match market conditions. Our system was designed to perform these systemically and automatically with the aid of data warehousing (DW) in which transactional data of suppliers are aggregated.

4.1 Strategic Planning & Supplier Management Policy

Supplier relationship management starts with strategic planning. Before segmenting, managers must prepare detailed methods on how to segment and manage suppliers. They must consider the current market conditions and the position of their company, and then they choose suitable methods for managing suppliers. This is a principal management function that is outside the scope of our system design.

4.2 Evaluation Policy

Segmentation is based on evaluating suppliers and SGs. To assist in this, we created an Evaluation Policy (EP) by generalizing the Supplier Evaluation Policy (SEP) of our previous research Equation (1). Our previous work focused on a time evaluation of which suppliers should receive a RFQ or contract. In this study, however, we were able to generalize and extend the previous work using the principal concepts of SEP such as Evaluation Factor, Utility Function, weight assignment based on AHP, utility normalization, and a data structure to store it all in a database. The main differences between EP and SEP are the types and composition of the Evaluation Factor.

Because EP can easily be changed, managers can quickly modify the policy to evaluate suppliers or SGs, which helps us design a flexible segmentation process. Moreover, all the simulation techniques of BestChoice were included in the segmentation process and EP management process.

$$EP = (SG, (x_i, u_i, w_i) \quad (1)$$

SG : Sourcing Group

x_i : Factor

u_i : Utility Function

w_i : Weight

4.3 Data Preparation

To evaluate suppliers, the raw data about suppliers and SGs must be aggregated in a database. Quantitative and qualitative factors are involved. Quantitative data can be aggregated from a transactional database but this method does not work for qualitative data. The evaluation of qualitative factors was based

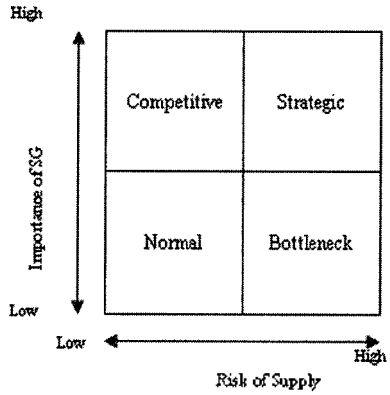
on personal opinion gathered through a survey. Data from surveys were averaged and converted to numeric values just like the quantitative data.

As this operation is one of the main concerns of OLAP, instead of focusing on this operation, we considered the interface to exchange raw data between the DW and SRM systems. Just using the interface with DW made it possible to integrate SRM with the existing system simply and easily. If a DW already exists when the SRM is created, then this interface design is even easier.

4.4 SG Segmentation

SG segmentation must be completed before supplier segmentation can take place. Details of SG segmentation may differ depending on companies' strategies. Our segmentation method, which was performed in two-dimensional space, allows for various segmentation strategies. By changing the evaluation policy that controls each axis, strategic aspects can be applied to segmentation space. For example, in 〈Fig. 3〉 SGs are segmented by Risk of Supply (RoS) and Importance of SG (IoSG). By changing the position of the line that divides segments, the determination of what is in fact strategic can be changed.

In 〈Fig. 3〉 RoS is calculated from the summation of Easiness of Supplier Replacement (EoSR) and Easiness of Item Replacement

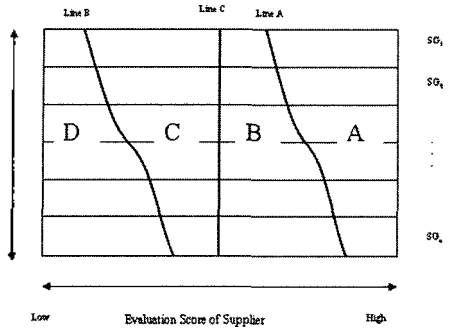


〈Fig. 3〉 Sourcing Group Segmentation

(EoIR). RoS is an index indicating the risk of the supply market. For the SG indicating high RoS, managers have to work to keep existing suppliers. IoSG indicates the strategic position of SG in companies. For the SG indicating high IoSG, managers must focus more effort on the suppliers of the parts in those groups than for the SG with low IoSG. IoSG is calculated by summing the unit procurement size and the profit growth scale. Although these are very important factors for determining management strategy, we do not consider these with the strategic view. Rather, we focused on the design of structure of the Segmentation Template (ST) to allow easy modification of the index by changing the Evaluation Policy.

4.5 Supplier Segmentation

Suppliers are segmented depending on the SG they provide. The example illustrated in 〈Fig. 4〉



〈Fig. 4〉 Supplier Segmentation

shows that suppliers are segmented differently by SG. The vertical axis indicates the order of SG determined by adding RoS and IoSG.

In 〈Fig. 4〉, the dividing points of each segment show a decreasing tendency (RoS + IoSG). Areas A, B, C, and D denote the strategic position levels of the company's suppliers, indicating that more suppliers are needed in strategic segments for the more important SGs. In this example, A is a strategic segment while suppliers are being lost in segment D. In this example, the segment dividing lines A, B, and C, is simulated by moving it to the predetermined proper position.

4.6 Application of Supplier Management Strategy and Its Monitoring

After the segmentation, supplier management strategies are assigned to suppliers based on the segment into which they fall. SMs apply each strategy and monitor its results. These results are fed back to the SRM system, affecting the determination of new management strategy and the establishment of evaluation policies. Eventually, the circular supplier relationship management process described in this section will elevate the supplier value chain. Another important issue is how to design and implement the SRM system to make this supplier relationship management process actually work.

5. Implementation of our *BestChoice SRM*

The main qualities of the supplier relationship management process described in Section 4 are dynamic segmentation and easy integration. To support dynamic segmentation, we used template-based segmentation. To facilitate easy integration, we designed and implemented a means of synchronizing independent systems.

5.1 Template-based Segmentation

Template-based segmentation is divided into two phases: definition of the segmentation template and applying it to actual segmentation.

5.1.1 Segmentation Template

A STis a description of how to segment SGs and suppliers. SG segmentation is determined by evaluation policies in two dimensions and

dividing the points on the vertical and horizontal axes as shown in 〈Fig. 3〉. Supplier segmentation is determined by evaluation policies and segment dividing lines such as Line A and Line B in 〈Fig. 4〉. Before segmenting, a set of evaluation policies are defined in the ST, but dividing points are determined at the time of application. Because an evaluation policy is a detailed description about how to organize evaluation factors, its weighting, and utility function, determining evaluation policies at every segmentation time is not only very time-consuming but also inefficient. But once the template is defined, it can be easily extended and reused just like the SEP of BestChoice. The ST describing the segmentation process suggested in Section 4 can be expressed as Equation (2):

$$ST = (EP_X, EP_Y, EP_{SGi}) \quad (2)$$

EP_X : EP for RoS

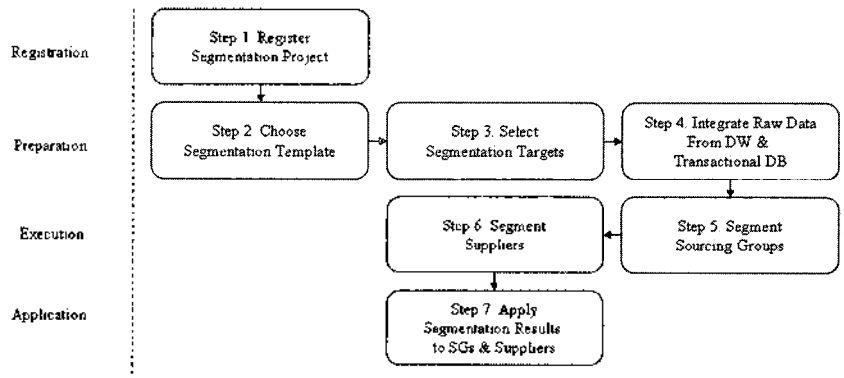
EP_Y : EP for IoSG

EP_{SGi} : EP for evaluating suppliers belonging to SG_i

5.1.2 Segmentation Project Manager

Segmentation is registered as a segmentation project in the Segmentation Project Manager (SPM). SPM is a module that helps manage the whole segmentation process, including the definition of the ST. Managers can simulate segmentation and the evaluation policies used to evaluate and segment suppliers and SGs.

The sequential process that occurs in the SPM is illustrated in 〈Fig. 5〉. Assuming the template is defined before segmentation, and to implement BestChoice SRM as a Web solution, we divided the segmentation process into four stages: registration, preparation, execution, and application. The segmentation process involves very large volumes of data. Storing these at every click or change would entail ahuge overhead to the database. Therefore, intermediate results are stored in the database at every step of segmentation, while the simulation results are not. Simulations occur in the session area of the application server. In a Web environment, this structure helps



〈Fig. 5〉 Segmentation Process using the Segmentation Template

managers conduct simulations easily without any special tool or application other than a Web browser.

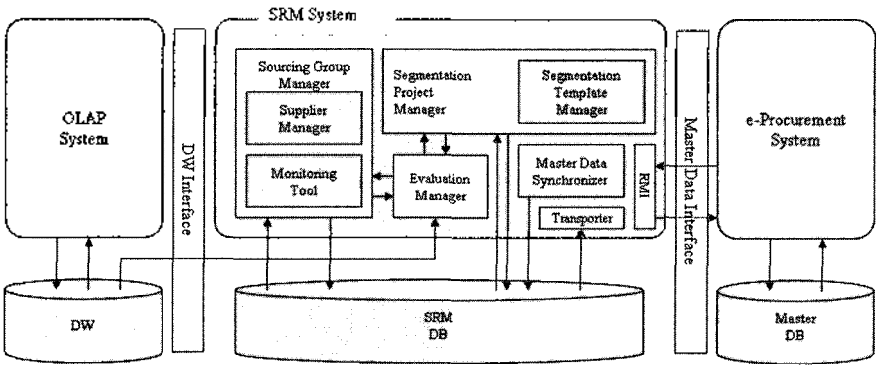
In Step 1, managers register the Segmentation Project (SP) to be stored in permanent database, and the SPM creates a SP ID. After Step 1, all data to be stored in the permanent database use the SP ID as foreign key. In Step 2, templates are selected and the entire evaluation policies of the template are stored in the permanent database. In Step 3, the raw data aggregated from the DW are integrated and stored in an independent BestChoice SRM database. After these steps, the conditions are satisfied for segmenting suppliers and SGs, which takes place in Steps 5 and 6. After segmenting SGs and suppliers, managers apply the result and assign appropriate management methods to them.

5.2 System Architecture

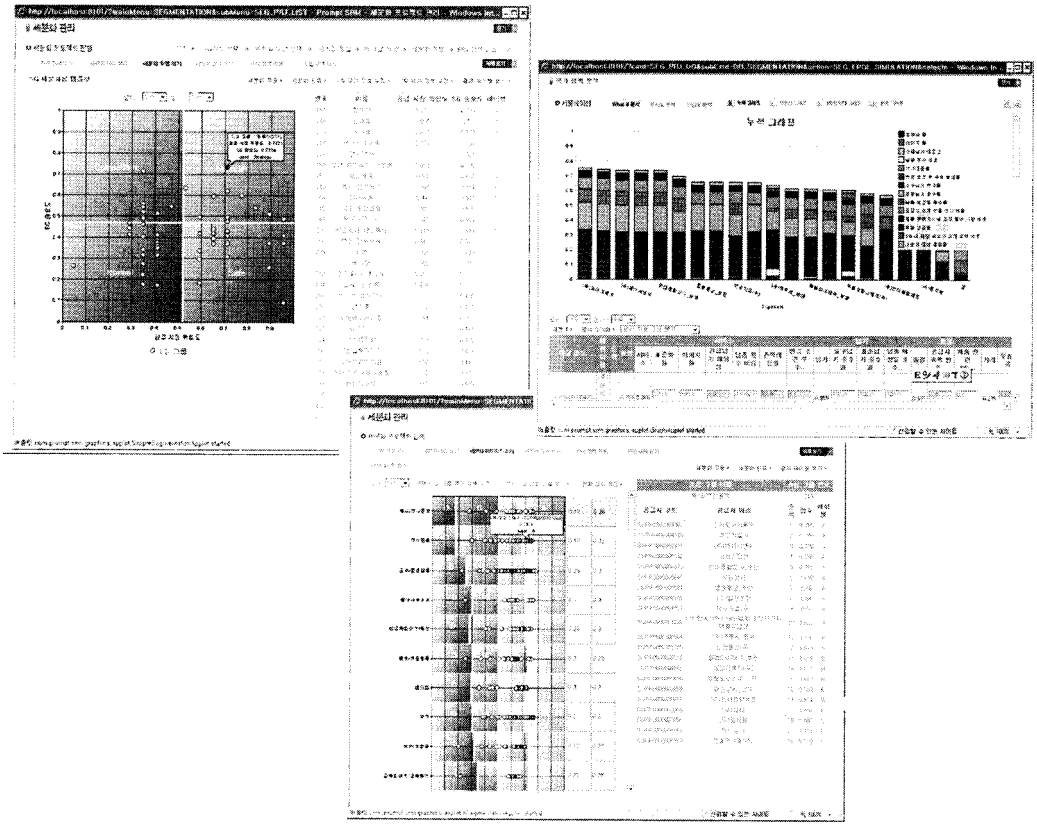
The BestChoice SRM was designed to have an independent database from the e-procurement system or data warehouse. The system architecture of BestChoice is illustrated in 〈Fig. 6〉. It keeps essential parts of the procurement system data, such as id and name of products, SGs, and suppliers.

The Sourcing Group Manager (SGM) handles the suppliers and the evaluation policies for them. The SGM includes the SM and monitoring tools for managing the results after segmentation. The Evaluation Manager (EM), an extension of our previous work, is a module to calculate and simulate the evaluation of suppliers or SGs. Both SPM and SGM use EM for evaluation and simulation. EM includes visual simulation modules and graphics modules. With it, managers can carry out a "what if" analysis, similarity analysis, and sensitivity analysis.

Master data are synchronized with the procurement system by the synchronizer. Data transfer follows the standard structure defined in interfaces with the procurement system and



〈Fig. 6〉 System Architecture of our BestChoice SRM



〈Fig. 7〉 BestChoice SRM

DW. In addition, segmentation results or management results in the SRM system can be transferred to the procurement system. Although various alternatives exist, we chose the Remote Method Invocation (RMI) technique.

5.3 Implementation and Application

Our BestChoice SRM was installed at eNtoB [9], one of the major commercial e-procurement agencies in Korea. For easy integration with existing e-procurement and OLAP systems, it was implemented as a Java application following the J2EE architecture and the system architecture illustrated in 〈Fig. 6〉.

〈Fig. 7〉 illustrates some parts of the BestChoice SRM user interface.

A shows the interface for sourcing group segmentation. Points which indicate SGs in the grid rectangle of **A** are positioned by utilities. Vertical and horizontal white lines on the rectangle segment SGs to four parts - strategic, competitive, normal, and bottleneck. Each line can be moved by the manager. **B** shows the interface for supplier segmentation. White lines in the rectangle segment suppliers to four parts -

A, B, C, and D. These lines can be moved. Each segment distinguished by different colors will be managed by different strategies. C shows the simulation of supplier evaluation. These graphical interfaces make it easy for the user to segment suppliers and SGs, or choose reasonable segmenting points with the pointing device.

6. Conclusion

It is not easy to build an efficient and cohesive SRM system. In this paper, we have described the *BestChoice SRM*, which is a practical approach to solving the problem of integration with existing company systems. We focused on implementing segmentation and designing the system architecture to enable easy integration with the existing procurement system and data warehouse. We suggested a simple and reasonable segmentation strategy and process. Adopting and extending our previous work with *BestChoice*, we generalized the Evaluation Policy to apply to suppliers and SGs. This makes it possible for easy and dynamic segmentation based on segmentation templates. We designed and implemented the *BestChoice SRM* based on J2EE architecture. It was easily integrated with the procurement and OLAP systems at one of the major commercial e-procurement agencies in Korea.

Although we do not yet have hard quantitative results for *BestChoice SRM* performance, a survey of sourcing managers indicated that the system is useful in evaluating and segmenting SGs and suppliers. After a few more months of testing, we will perform an in-depth evaluation to validate the practicality and effectiveness of our *BestChoice SRM* based on the installation at eNtoB.

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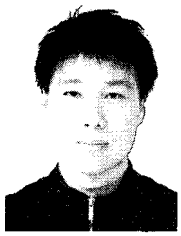

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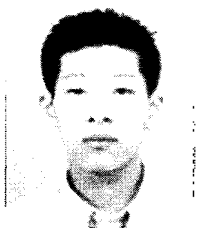

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