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ABSTRACT

Supply chain management refers to all the management functions related to the flow of materials from the company's direct suppliers to its direct customers. In this paper, we will propose a generic supply chain management system, and describe how the system works in terms of information exchange, workflow coordination and flexible logistic route. We will introduce two data models, which are called PDM and WfMS, and explain how to classify the proposed system into them. And then, we will further describe how the back-end three-layered architecture stores the dynamic data type into the database.

Keywords: Logistic, Supply Chain Management, SCM, E-Business, Database

1. INTRODUCTION

This paper proposed a layered-architecture of database in supply chain management applications. Over the past decade, the rapid advancement in information technology, especially the Internet, has led to the impact of many industries. The Internet environment offers the large flexibility, paperless and 24 hours service to users. As the world-wide-web becomes a popular medium in the human life, people are familiar with the web-based application interface without long time training. While the Internet delivers the large power of coverage, it also provides web tools with the multi-media features.

Supply chain management refers to all the management functions related to the flow of materials from the company's direct suppliers to its direct customers [1,2]. These include ordering, production planning, warehousing, inventory control, packaging and delivery. For example, manufacturing garments will start from purchasing materials from the material supplier, the factory will plan the production material they need. The garments are then shipped to the distributor and finally reach the retailers [3]. The supply chain management involves the collaboration of all members in the entire process.

There are three main scopes that have been considered in our system: information exchange, workflow coordination and flexible logistic routing [4]. The information exchange refers to the information sharing among the supply chain members. The information includes any type of data that could affect other members, such as inventory status, product details and shipping schedules. The workflow coordination refers to the streamlined and automated workflow activities between supply chain members. For example, the manufacture workflow steps involve multiple companies. The time schedule between each step can be tightly coupled, so that collaboration in terms of time, cost and accuracy can be achieved [5]. The flexible logistic routing refers to find an adaptable and extensible route of the logistic flow of new products. It allows re-structuring the supply chain, such as roles and responsibilities of members, to improve the overall performance. For example, it can be achieved by joining a new partner, inventing a new route of delivery with lower cost or shorter business cycle. These requirements consequently seek for a very generic database schema design, which permits any kind of product data, and logistic information can be stored in the system.

In this paper, we will present our generic supply chain management system, and describe how the system works in terms of information exchange, workflow coordination and flexible logistic route. In Section 2, we introduce the two proposed data models and explain how to classify the proposed system into them. In Section 3, we will describe the design of three-layered database architecture. We will conclude and discuss some current limitations of our approach in Section 4.

2. DATA MODEL CLASSIFICATION

In our proposed system, we classify two kind of data model in the supply chain management: Product Data Management (PDM), and Workflow Management System (WfMS) [6]. This two data model can provide the best solution of the information exchange and workflow coordination in the supply chain management. The PDM is used to control access to documented versions of product designs, which include the traditional single data record such as product details, company contact details. It plays an important role of storage and access of the data and documents throughout the process. Conversely WfMS allow managers to coordinate and schedule the activities of supply chain to optimise the flow of information between the resources and the partners. It is used to coordinate the more complex and repeatable work processes of production.

2.1 PDM (Product Data Management)

Based on this two data model, the system will prepare a data input and retrieval interface for the access of the logistic information online. Since the PDM is an ideal model to control product and contact information, which involve two kind of database structure design: One entry of table storage and multiple entries of table storage. The one entry of table storage satisfy the table schema which have only one-to-one relation with other tables, and the purpose of this table is only used for storing & accessing the record later. For example, the contact management of the supply chain members, it will normally only have one single table called 'member' to store and access the record. However, the multiple entries of table storage have to handle when one table has been normalized by 3-N rules, resulted in splitting into one-to-many relationship with another table. For example, one invoice will have multiple purchased items details, which establish one-to-many relationship with the entry. Hence the sales management in the retailers or the ordering system from the distributors are belonging to this kind of data input.

2.2 WfMS (Workflow Management System)

Conversely, the WfMS category will be more about the time-related task, which can handle any re-structuring, such as roles and responsibilities of all the partners, in the supply chain logistic route. The system can automatically detect the time conflict between partners in the existing route. When the manager arrange for a workflow, which may require the member A, the system will check for the availability of the member A, and wait for guarantee from member A about the delivery in real time. If it has the resource conflicts, the system will inform the user about the next decision.

3. THREE-LAYERED ARCHITECTURE

As shown in the data model above, the application database is required to be able to change the internal storage structure and the access medium. For example, most of the permanent storage medium of the Internet application are the tradition RDBMs, by using the forth generation language to access the database. Alternatively the XML file is used as the storage medium, and it is because of the temporary characteristic of the data or the security risk to store the information into holder's database. On the other hand, the fast growing business activities may require the changing of the database structure, like having additional attribute for customer record. The traditional alternation of the database structure will require large processing time to update the database schema. Consequently, we are seeking a system database model to allow the changing of the storage medium, and also change of the database structure. Three-layered model is to aim for this goal, and to provide the adaptability, extensibility and reusability of the business database structure. The database connection layer maintains the connection between the system program and the database. It also provides the user interface for the access and manipulation. Secondly, the database structure layer is a run time object layer. It is responsible to manage the table schema in the database. Finally, the physical layer handles the traditional storage medium such as the RDBM database and the XML files. With the integrated power of the dynamic structure database in the back-end, it can allow the user to define corresponding functions to access the data in the database. Hence the system can be platform independent, back-end database independent and also structure independent. Besides of the flexibility, it can also support the multi-media data files, as the user can retrieve the data by content. In addition to the collected data, it also can provide a visualization of the information in graphical vision. With the help of the data visualization technique, the user can understand the current large set in a second.

4. CONCLUSION

In this paper, we have described our approach to supply chain management system based on the two data model, the PDM and WfMS, and the three layered architecture of the database design. We have successfully introduces a supply chain management system in terms of information exchange, workflow co-ordination and flexible logistic route.

Currently, the proposed system is limited by the access time of the database in the structure layer. It is due to every database operation require access of the database structure before the page is loaded. However, the database structure could be possible to store in the run time object, and which can write back to the database when the object is terminated.

In conclusion, the performance of generic supply chain management is an excellent solution in the supply chain management.

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