

# A Kind of Online Power Materials Supermarket System

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**Abstract -** With China's rapid economic development and improving the level of the socialist market economy and the deepening of economic reforms, the materials management and logistics management mode, which relied on state-owned capital and enterprise group support, are facing new challenges. By comparing the development status and trend of the related domestic and foreign power enterprises, new online supermarket system for power materials is proposed in this article, which is based on e-commerce transactions mode, and its system framework is designed, the effectiveness of the design program in reducing enterprise material distribution, transport, warehousing, actual operation cost is validated by actual project implementation. So, the online supermarket can improve circulation efficiency of power material, and the whole system efficiency.

**Key words:** Power Materials; Online Supermarket; Electronic Business; Online Transaction

## I. INTRODUCTION

In the recent years, with rapid development of Internet, it has become the best way to collect and share information, and been involved in the traditional logistics industry [1-3]. It is developing very rapidly, because the across geographic location and interoperability nature offer Internet with overwhelming technical advantages in the competition of traditional trade industry. With the gradual development of the electronic business in China, enterprises can adjust their product structure timely, and the dealers can get the product information by using the homepage of the enterprise. With no doubt, electronic business helps enterprise to change its management mechanism, establish modern enterprises system, and improve its management level and international competitiveness [4-5].

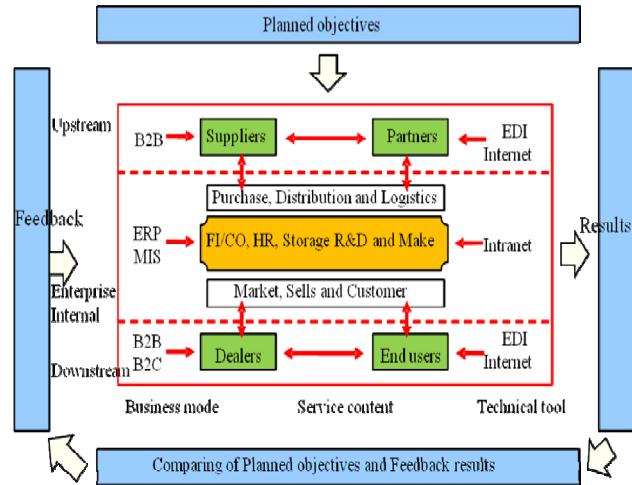
Today, the enterprise's information construction has transformed from their own information management to the information management among the enterprise and its suppliers and customers, and eventually win-win situation can be reached. The process is shown in Fig.1.

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At present, most domestic enterprises have IT system for financial management and invoicing management, such as ERP. But the traditional manual data exchange is still used for the communication with upstream suppliers and downstream customers, which are less maintainable and low timeliness, can't offer the convenience judgment tools, and bring disadvantages for the decision-making of the enterprise's management.



**Fig.1. Information management of among enterprises**

To enhance the coordination among the enterprise, its suppliers and customers, and the integrated electronic business information management platform should be build up to unite internal and external management for high management efficiency, low cost, enterprise competitiveness enhancement [6-7].

In the paper, based on the research of the power material distribution, the new electronic business [8] and the advanced software technology [9-10], a new online supermarket system for power materials is proposed, and its framework, main function and key technologies are described. And, the new online supermarket system for power materials is testified by actual businesses processing efficiency. This is important for stimulating the future research and application.

This paper is structured as follows: Section II introduces recent developments of power material distribution and electronic business. Section III analyzes the functional requirements and its software design of the new online power materials supermarket system. In Section IV, the feasibility and security perspectives of the system are analyzed. In Section V, the efficiency of the new system is testified by the actual transaction data, and the experimental result is analyzed. Finally, the conclusions are drawn out.

## II. THE DEVELOPMENTS OF E-BUSINESS

The concept of Electronic Business (E-Business) came about in 1990's when Internet arise in USA. In 1993, E-business came into China and the first online transaction happened in 1996. From B2C models to Internet auction and B2B mode in 1999, E-business grows up rapidly in China. The market volume of B2B reached 6 billion Yuan in 2005, and accounted for 95 percent of E-business market. The Fig.2 is the simplified model of E-business.

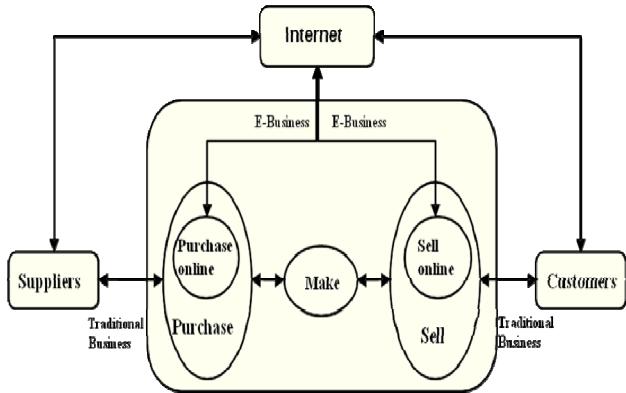


Fig. 2. The simplified model of electronic business

B2B is the main way for companies to survive and develop. With the help of the E-business, both purchasers and sellers can complete their whole business process online. B2B reduces a number of transactional work flow and the business cost, accelerates the information sharing, improves the management efficiency, brings more business, and finally increases the profit margins.

B2B is the direct commercial activity between buyers and sellers, which open new marketing channel, cancel intermediate links, reduce costs and risks, meanwhile, and offer a cheaper way of shopping. The

typical win-win pattern becoming flourishing in the western markets. There are two sources for value and benefits of B2B, the first one is the cost reduction of internal trading, and the other one is the collaboration enhancement among suppliers and customers.

At present, over 80 percent of E-businesses happen among Corporations, its proportion keeps high, and it will still be in the dominant position. Because of the increasing number of the computer, Internet users and sites on China, E-business increase rapidly. In China, the total turnover of E-business rose from the 180.9 billion Yuan in 2002 to 440 billion Yuan in 2004.

There are some famous E-commerce sites in China, such as Taobao, Alibaba, Dangdang, Joyo, Ebay, HC360 etc. Especially, Alibaba and HC360 is the best ones.

## III. THE BUILD OF THE NEW ONLINE POWER MATERIALS SUPERMARKET SYSTEM

### A. Basic Functions

Since more and more of companies have invested on E-business, resulting in the rapid merging of E-business websites. However, the quality of these websites varies, and among which we find certain problems:

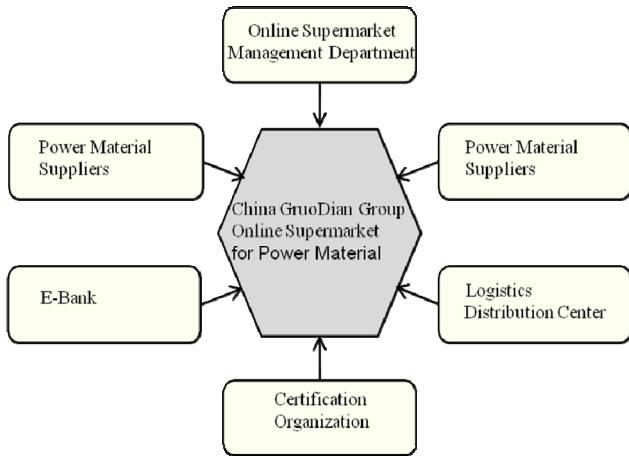
- 1) Dull web functions: Many websites only display the products or has simply purchase function, many necessary functions, like online payment, are missing.
- 2) Simple product information and very few updates.
- 3) Many safety accidents because the security absence.
- 4) Lack of human oriented websites design: Customer satisfaction keeps low.

To avoiding the problems mentioned above, the following suggestions are given for designing a new kind of Online Power Materials Supermarket System:

- 1) Keep enough personnel for managing the supermarket system and processing orders by establishing an effective and convenient role management.
- 2) Maintains the management of product inventories.
- 3) Provides comprehensive shopping guides to customers, facilitates them for website navigating the.

- 4) Synchronize product information with the entire website, and successfully control and update a large volume of product data.
- 5) The higher value of a product, the safer requirement for website.
- 6) It is not likely that the customers remember all product names and their parameters, and compare them with similar products. Hence, similar items or categories should be shown on the same page for the customers to choose and compare.

As the common platform for power materials, online power materials supermarket should have good material management function, a concise purchasing procedure, a complete order analysis and an efficient inventory control. The key components of power materials supermarket system are shown in Fig.3, and described as below:



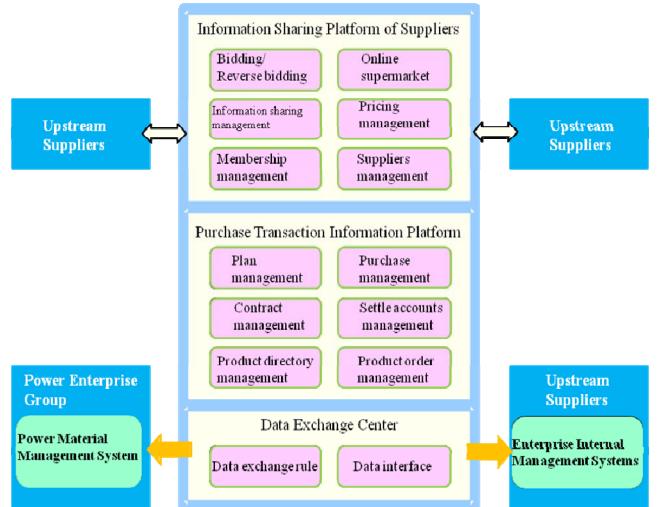
**Fig.3. Key components of power materials supermarket system**

- 1) Demand side of the power materials. By using computer browser or PDA, internal users can login the online supermarket.
- 2) Suppliers of the power materials. After their qualification certificate of the suppliers is checked, and an agreement is signed, external suppliers can login the online supermarket, where the product advertisement can be released and product can be sold.
- 3) Management department of the power materials supermarket system. Its main responsibility is to manage the trade units (customers and suppliers of power materials), and supervision or specification works. It should ensure the safety of user information online, and offer the safe transaction. The department should also ensure the seamless and safe connection between the

online supermarket and the internal materials management system.

- 4) E-bank (3<sup>rd</sup> party payment platform). E-bank provides buyers and sellers with cheaper finance services, which are different from the traditional banking business, for example it offers the secure online service around the clock. Besides the online payment, there are other payment ways, like COD (cash on delivery), bank transfer, post office remittance, and mobile-phone payment services etc.
- 5) Certificate authority. The main responsibility of the certificate authority is to keep the integrity of transmission information and identify the users by digital certificate. Digital certificate is a new kind of digital files issued by specific authorities and always be the individual identity in the E-commercial affairs. It includes personal information, public key, certificate serial number and E-signature of certificate authority.
- 6) Distribution center. The distribution center accepts the delivery application, track the delivery process, and assure its integrity. According to the different destinations, it can be divided into domestic distributions and international distributions. According to the different payment ways, it can be divided into COD and delivery after online paid.

## B. Frame Design



**Fig.4. The frame design of online supermarket**

The overall development plan of online supermarket is to build the platform with those functions like planning, ordering, purchasing and settlement for

suppliers and manufacturers, to consider the internal subsidiaries plants as main customers, to offer external users (registered suppliers) the relevant information services, and to realize its application integration with internal systems. Finally, a complete platform (Fig.4.) is built up for connecting the upstream enterprises and downstream enterprises, which includes three parts:

The first part is the supplier information system which provides the member registration and authorization, supplier management, supply and demand information broadcasting, pricing service, online consulting and communication, online sell, and other related services like the integration with the internal materials management system.

The second part is the purchase trading information system. It provides the integrated online trade services for power enterprise group and its upstream manufacturers, such as purchasing plans, cooperation plans, e-procurements, contract managements, order managements, and settlements etc. After fully developed, it would be used as the comprehensive electronic business platform to offer trading servers for power enterprise group and its upstream manufacturers, its upstream manufacturers and their suppliers [5].

The third part is the data exchange center. It provides the data exchange services for the electronic business participants, including the data exchanges between E-business system and the internal management system, and the data exchanges between E-business system and the external systems of power materials suppliers.

### *C. The Development of Online Supermarket*

By analyzing its demands, there are mainly three parts of online power material supermarket system according to the specific functions. The power material supplier information system, the purchase information system and the data exchange centre have their own specific functions, and they can be briefed as follows:

1) The power material supplier information system: Its main responsibility is to offer the purchasing services with temporary purchase agreement for those enterprises and their subsidiaries which demand power materials. After fully developed, it can be used as power material information platform, provide member services, supplier

managements, pricing services, information publishing, products and services, online mart etc.

2) The power material purchase information system: Its main responsibility is to offer the purchasing services with long term agreement for those enterprises which demand power materials, like the major power plants. After fully developed, it also provides the services for the upstream power materials suppliers. Its functions include system support, task scheduling service, online shop, order management, settlement, etc.

3) The data exchange centre of the power materials supermarket system. Its main responsibility is to build the connection between the internal material management system and those external material management systems of suppliers with agreement, and keep the barrier-free communication between upstream and downstream suppliers. It is a data exchanging bus among the enterprise group, the group subsidiaries plants and power material suppliers. The data exchange centre realizes the data exchange among different Corporations, which is very important part of supply chain management for power materials supermarket system. Various data security mechanism (SSL, MD5) can be applied in the data exchange centre to ensure the reliability and privacy of data transmission, and many message oriented middle wares (OpenJMS, JBOSS, MQ of Websphere) can be applied to realize the transfer and interaction of those data from different partners. At the same time, to adapt for the requirements of different environments, synchronous, asynchronous, peer-to-peer and information push are also applied in the data exchange centre.

### *D. Technical Architecture of Online Supermarket*

As the internal material management system for China GuoDian Corporation was developed with J2EE application server technology in three tiers of B/S architecture, so power materials supermarket system also chooses J2EE application server technology in three tiers of B/S architecture to make the two programs' compatibility well. The power materials supermarket system is divided into five layers, including database layer, middleware layer, basic service layer, application service layer and application interface layer. And the

system interface of each layer is clearly defined and built up with module component. Layer design and module component program idea assure power material supermarket system become more flexible and extensible which can follow the demand change more easily. Fig.4. shows the multilayer technical architecture for the internal material management system for China GuoDian Corporations.

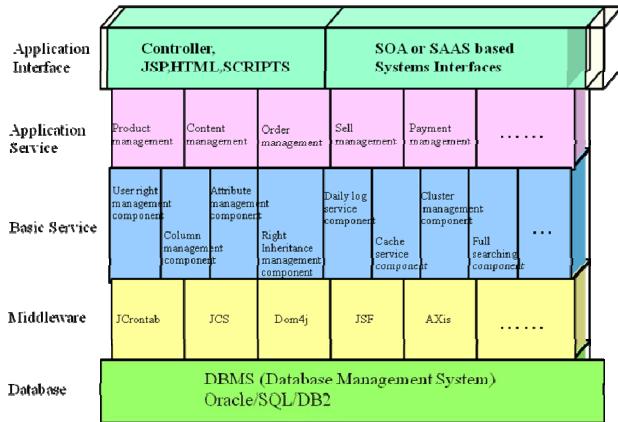


Fig.5. The multilayer technical architecture

The target system (Fig.5) is constructed with the multilayer structure, starting from the bottom database layer; every layer provides the interface service for the upper layer. Finally, the visible business interface can be realized for end users. The multilayer structure focuses on the interface realization of each layer; the structure maintains its relative stability. Because of the flexibility of the multilayer structure, the system can adapt for the rapid changing and development by optimizing the layers and components, without changing interface a lot.

#### IV. FEASIBILITY ANALYSIS

Under the current situation, the new kind of online power materials supermarket system has following external feasible factors:

1) A stable access to Internet: Internet access has been installed widely for public and private uses. Internet access for conducting e-business and coordination would not be a problem for ISP (Internet Service Provider), sub-contractors, retailers and clients.

2) Information technology has grown into its mature stage. E-business, company portal website, application integration technology and products, all have reached their mature stage; so, the implementation of this project

would not be a problem.

3) Internal integration of China GuoDian Corporation has been widely acknowledged. In recent years, GuoDian Group has conducted internal information integration project, which helps the improvement of the computerization awareness that IT systems can boost the enterprise management efficiency. Meanwhile, the development of IT systems has cultivated a group of talents that specialize both in information technology and business conduct. Through the implementation of this project, the benefits can be expected: (1). It helps to boost the company's social famous image, which makes the public become more aware of the image and the corporate culture of GuoDian Group. The use of information technology would be helpful to present the corporate governance, culture, and brand of the group more effectively and efficiently.(2). It accelerates the coordination among the internal subsidies and external partners, strengthens the cooperation between GuoDian Group, its subordinate power plants and its suppliers. As a result, E-business would run more effectively and management costs can be reduced.

Meanwhile, the new kind of online power materials supermarket system can be applied for electric logistics transaction services for Chinese power industry. In the beginning, the system provides the services for GuoDian Group; later the system will extend its services to all business areas of power industry chain. In the beginning, its revenue comes mainly from membership fees, rental fees, transaction fees, advertisement fees provide by the supplier payment system, and gradually make its own management decisions and take full responsibility for its own profits and losses. It has huge potential business value.

#### V. PERFORMANCE EVALUATION EXPERIMENTS

To comparing the difference between the new online power materials supermarket system and the previous power materials supermarket system, two main functions was chose from them in order to test the response time for the systems' business transaction. Y-axis shows the average response time of the two main functions for the system businesses (millisecond), X-axis shows the number of experiment (to reduce random error, the results were means of 100 tests). The experimental

results are as follows: By analyzing the data in Fig.6 and Fig.7, compared with the previous power materials supermarket system, the new online power materials supermarket system can reduce the response time for the system's business transaction effectively, and improve the efficiency of the business.

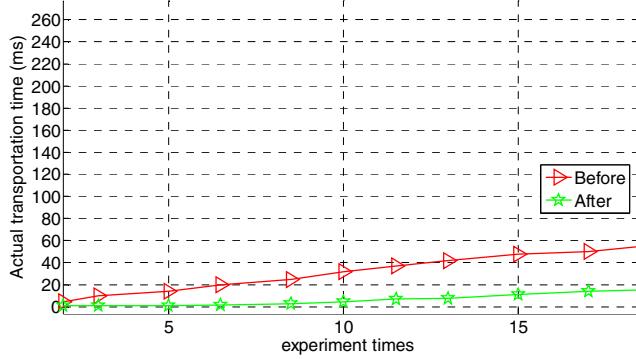


Fig. 6. The experimental results 1

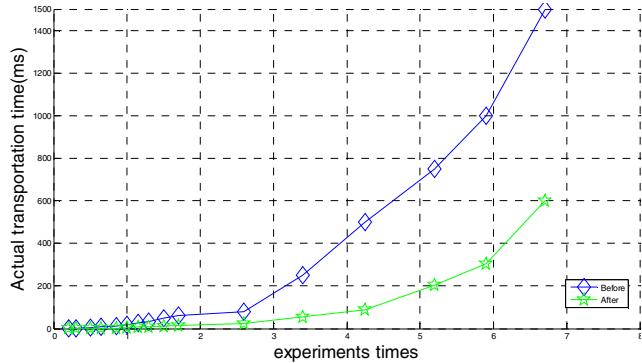


Fig. 7. The experimental results 2

## VI. CONCLUSIONS

To improve the power material distribution efficiency, a new online power materials supermarket system is proposed and constructed on new E-business and advanced software technology, and its framework is designed, the main functions and key supporting technologies are analyzed. And, the actual businesses processing efficiency of new online power materials supermarket system was testified. Those achievements are significant to stimulate the future research and practical application.

The further work is summarized as the following:

1). the influence of the big volume data of power materials business on response time of the target system will be testified more widely. The analysis result of the

statistical data will improve the system's efficiency, the structure of background cluster server will be modified, and the performance of the whole system can be improved further.

2). We will focus on the improvement of the system with new technology, for example mobile version of the system will be developed, which will make the system more flexible and convenient in most places.

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