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Research of Dynamic Alliance Collaborative Production Management System of Network Oriented

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Abstract: Collaboration among enterprises is needed to successfully fulfill a given task and goal. Network oriented System has been regarded as an efficient platform to support flexible interoperability among various enterprises by discovering, selecting and composing services. This study introduces the design and development of sword manufacture collaborative production management information system of the dynamic alliance network conditions, raise a solution method of the dynamic coalitions use of information technology integration of enterprise resources and optimize enterprise resource allocation, improve the market competitiveness of enterprises. It also provides a solution for enterprise alliance informatization approach for reference.

Key words: Dynamic alliance collaborative, network oriented, computer integrated manufacturing, sword manufacture

INTRODUCTION

Collaborative manufacturing is a kind of sustainable production mode that can respond market rapidly and it has been a necessary trend of manufacturing development in 21st century. Jinlong dragon sword is the design and production of the famous Longquan City in China sword entity enterprise. Nowadays, with the rapid development of science and technology, consumer demand diversified increasingly, if the value chain process of a product's service completes by an enterprise, it must be controlled by the company's brand awareness, the technological content of products, the resource capabilities and other factors. Therefore, in order to create century-old foundation and century-old brand, the enterprises have to form their own long-lasting competitive edge based on the value chain. Actually, traditional small and medium-sized single industries enterprises have the core problem that the resources are disperse and limited. In order to solve the problem, so as to promote the market competitiveness, exert their advantages and expand market share, Jinlong dragon sword joint several sword related upstream and downstream firms to set up Jinlong dragon sword collaboratively as the core of the alliance enterprise.

For constructing the industry alliance of collaborative work platform, it should cooperate and integrate the dispersive business organization (Lewoc *et al.*, 2011).

When management completed, it needs to construct collaborative work technical supporting platform for coordination process can be exactly, reasonably and efficient rapidly implemented (Agnew *et al.*, 1997; Boubekri *et al.*, 1995; Shirinzadeh, 1996).

The design and build of the collaborative production of information supporting platform for Dynamic Alliance of Enterprises (Xiao, 2012), which in support of the resource sharing and information integration of the alliance enterprises whose core is leading enterprises. Information supporting platform mainly covers: union portal site, union-management center, collaborative product data technology and resource capacity management, unified coordination production planning, cooperative business operations alliance, logistics management alliance, union collaboration quality and cost control and focus on collaborative supply (Jiang, 2013).

SYSTEM DESIGN REQUIREMENTS AND THE OVERALL STRUCTURE

Lucubrating industry's production process and according to the requirements of collaborative production sword industry alliance, research comprehensively on the theory which is about Dynamic Alliance Collaborative Production Management of Network Oriented and construct the Dynamic Alliance Collaborative Production Management System of Network Environment comprehensively.

Main functions of the system: The main functions of the system are as follows:

- Building the union dynamic management centre is to support union members for application, evaluation of being the union members, standard of maintaining business operation, specialization of operation procedure in the Internet environment, to support collaborative objects' dynamic change
- Establishing the union unitive collaborative production planning center is related to the union selling operation information, product process information, resource information which depends on the union resource rapidly analyzing, evaluating of accomplishment about the work and dynamic balance
- Using the way that procedure initiatively propels management is to make the remote operation by network. And it combined with project request and flow controlled request to establish the management platform based on the union intensification business process which under the Internet model
- Under the basement of the collaborative business process management, establishing the platform that depends on distribution of materials that synchronized with collaborative tasks and Transportation route optimization in the Internet environment. According to distribution of materials and principle of optimality (Zhang, 2011), it dynamic accomplishes the distribution of materials and transportation among the union
- Establishing collaborative cost control and quality process management platform is to build cost accounting and control system, quality inspection

system and evaluation standard. According to quality inspection controlling requirements and collaborative work object's the quality inspection result, it will do quality evaluation analysis and improvement

- Centralized supplying management platform is based on data needed information from collaborative plan and combining manufacturing tasks' collaborative distribution, doing rapid summary to the data need and then resolving to the each branch

System overall structure: The whole system using is based on each technique from J2EE, B/S model of three layers structure and using ORACLE for data base and the middleware uses RESIN.

The Web server is responsible for HTML processing; receiving user requests and returns a static page to the user. Application server is responsible for the application process, including application logic, development, maintenance and almost all the work and can dynamically access the database through the data interface. The database server is responsible for data storage and management of the comprehensive information platform, integrated information platform database through the database interface to establish connection with the business of database systems, make business data in the database can be published to the information system database, without having to consider the business database system platform and type.

The whole systems of component elements are as follows and Fig. 1 show the relations between all of the subsystems:

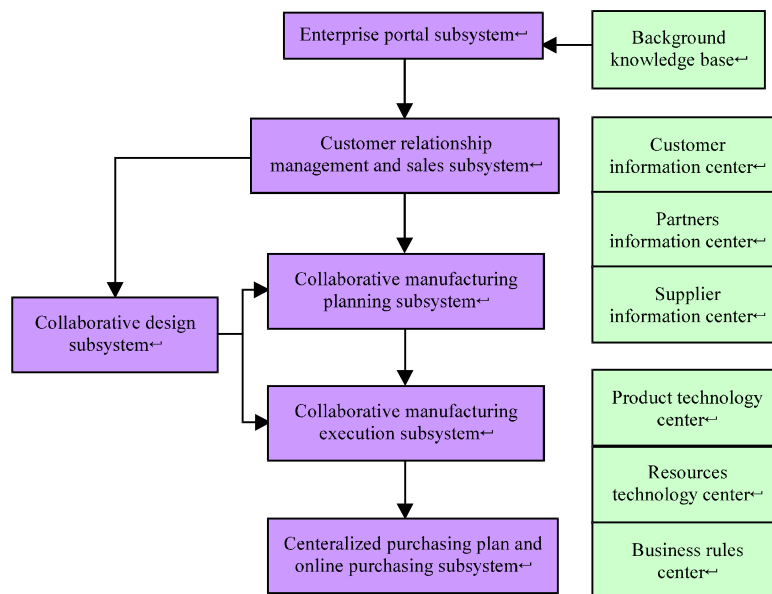


Fig. 1: Overall structure and operation of the system diagram

- **Union portal application subsystems:** It is including new member application, old member login authentication, product display, cultural exhibition, business to undertake and decomposition process display, alliance management introduction
- **Standard information management system (background):** Establish the basic information maintenance of union members, the standardized maintenance for various members of the products, technical standards, production technology, resource object; set up the business model and financial settlement rules between members at the same time
- **Customer relationship management and sales subsystem:** In the premise of customer certification, the customer according to the portal to display products, set free product demand and real-time place purchase orders for business, complete customer service to undertake and can according to customer requirements to channel collaborative design development subsystem at the same time
- **Collaborative design and development subsystem:** According to the design requirements covers by a preset member, decompose design requirements and membership information in time and set up collaborative design plan
- **Collaborative manufacturing planning subsystem:** According to the business that the leading enterprises undertake, according to the product demand of customer business and each member's undertake range
- **Collaborative manufacturing execution subsystem:** Decompose, publish and undertake confirm Collaborative manufacturing planning tasks information, complete positive business planning synergy and execute monitoring implementation schedule at the actual business in the process, form the supporting logistics planning and confirm distribution line, especially in plan changes when the system adjustment and Second release the task of confirmation adjustment
- **Centralized purchasing plan and online purchasing subsystem:** In collaborative manufacturing project link has formed corresponding to the material plan, overall materials procurement plans based on each member of the collaborative production task decomposition of the preparation of the corresponding material planning and material requirements for web publishing, suppliers can login and confirm their respective orders

The center of this system is main process of collaborative manufacturing, together with additional functions that accomplish this function, such as: client/partner identity assessment, product information/BOM maintenance, order settlement, the

transmission of information. The design of the system makes design manufacturers in the equal position and no primary or secondary, the defender of the system in these companies is an independent organization (at least a virtual independent body).

APPLICATION SUBSYSTEM DESIGNING AND MODELING

Alliance body portal: Portal design main clear the content of the show and each link business application mode, the situation is relatively simple, mainly show to customers through the website.

Portal design including: The customer, alliance body members, supplier identification; the demonstration zone of products, culture and service; customer business self-help area; collaborative planning application center; collaboration management center; basic information maintenance center; materials procurement business area; expert knowledge base area; collaborative product design district; warning message display area.

Alliance foundation information management subsystem: Basic information standard basically includes product technology level, member level and collaborative business rules, Described below for the main object of the basic information specification management subsystem.

- **Customer information maintenance:** It mainly used to set the archives information, to facilitate customer information management and operational data collection, statistics, analysis, establishes the customer complete information files, according to the need of establishing customer credit system and credit control mode, compile customer login identity and the corresponding verification code (Boubekri *et al.*, 1995)
- **Supplier information maintenance:** Using Supplier information maintenance can manage suppliers' information and entry, statistics, analysis business data. The main purpose is through the establishment of a complete supplier file, establish a correspondence between Each supplier and the corresponding supply of materials, after the formation of the centralized purchasing program, according to the Comparison relationship to prepare the procurement and distribution and order online orders, Each supplier used their identity and identification verification code logging and querying
- **Industry alliance member information maintenance:** Industry alliance information file planning is mainly locating by Jinlong sword for leading enterprises, for example, some members are suppliers of semi-finished products of the Jinlong

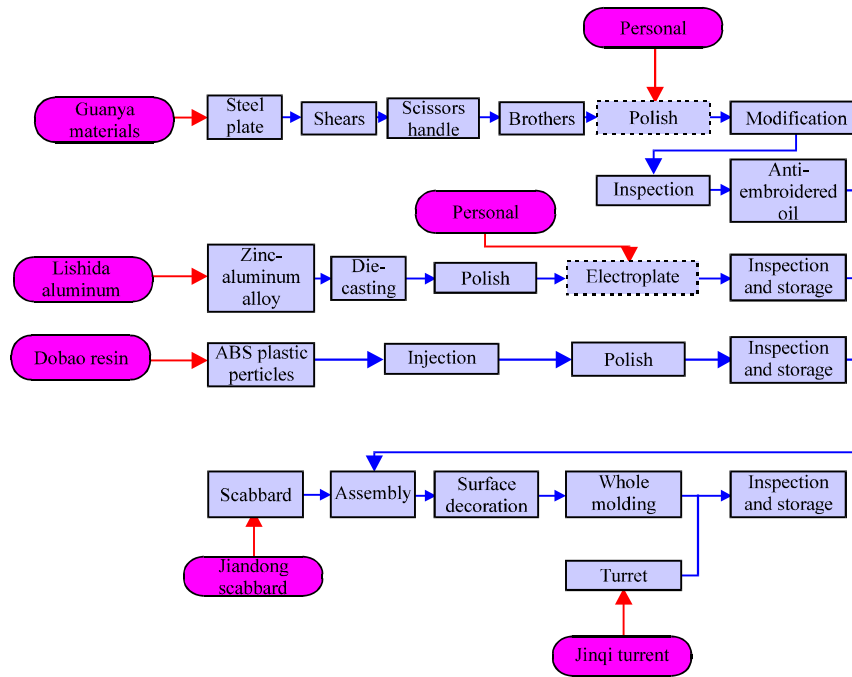


Fig. 2: Resources and process information maintenance of alliance collaboration diagram

sword and some members are the process or semi-finished products commissioned processors of Jinlong sword, relative to the supplier file, there are many common content, also some obvious difference

Combined with the product composition, process route, the cooperation properties and of partner division of labor, Fig. 2 show the details of sword manufacturing over Alliance collaboration.

Customer relationship management and sales subsystem:

- **Customer relationship management application design:** Customer relationship management subsystem is shown in Fig. 3, refers to domestic and foreign advanced management concept and management experience (Shirinzadeh, 1996), in order to improve the relationship between enterprises and customers of the new management software. System throughout the pre-sale, sale and after-sales service, it can manage the complete business process start from the expression of the intention that the customer to the enterprise, to business opportunities in mining, tracking the sales process, the deal until management decisions
- **Sales business application design:** Sales is the enterprise production operation results of the

implementation process, is the center of business activities. It provide quotation, order, delivery, invoices complete sales process and real-time monitoring the sales price and credit. Through the industrial alliance gateway show sales process and be able to allow customers to place an order for remote online

Collaborative subsystem designing and modeling: The enterprises who organize the virtual enterprises are known as the dominant enterprise, the enterprises who participate in the virtual enterprises are called leaguer enterprises. In the agile manufacturing environment for collaborative design of virtual products, it can improve design level and efficiency of the members in the virtual enterprise rapidly, so as to shorten product time to market, enhance the enterprise competitive ability and survival ability.

Facing agile manufacturing enterprise open collaborative design environment, is the inevitable requirement of the enterprise to adapt to the individual needs of products, the basic purpose of collaborative design is intelligence sharing, resources sharing, aimed at sharing of material resources as the basis, such as software resources sharing, equipment resources sharing and so on; Through the network it will be distributed in different regions, different industry or different professional expertise of intellectual resources organically

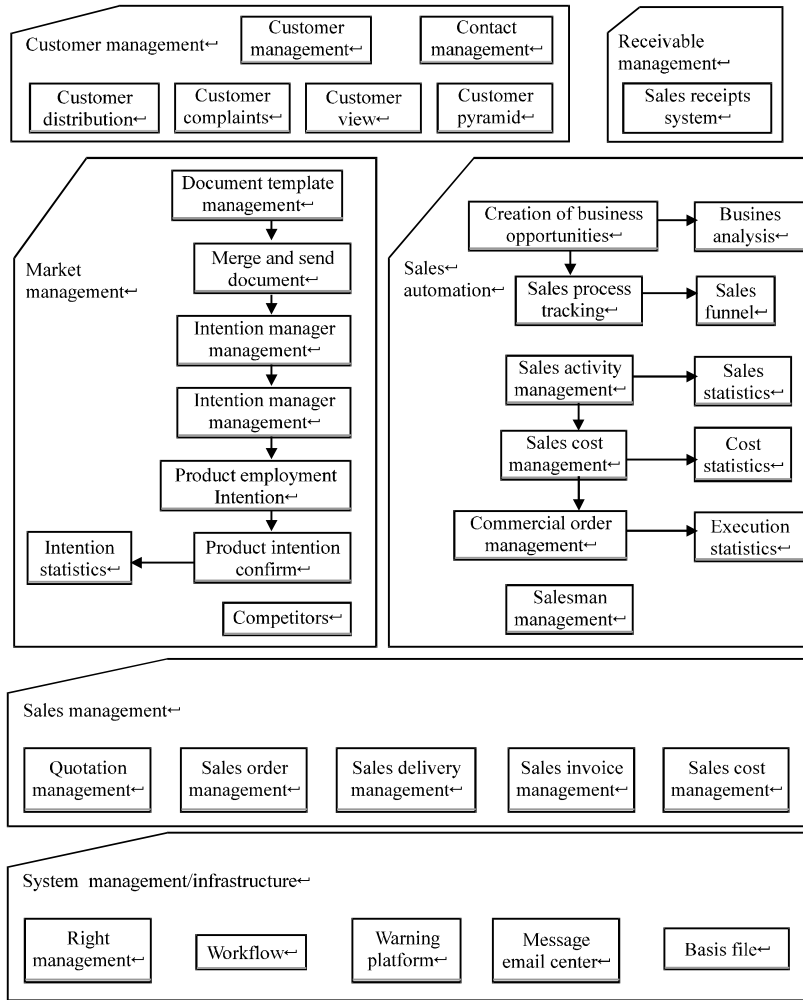


Fig. 3: Customer relationship management function diagram

organized, integrated advantages from all aspects, to improve the overall design of the products.

Product development based on customer demand can aim at user needs to determine the company's product development strategy, the product's features and performance can be changed according to user's specific requirements, product design, manufacture and service the whole user-oriented; Through the product model of virtual design method, the application of the Web technology and virtual reality technology development prototype system design, can let users in the remote involvement in the definition of product size, style, color and other properties.

Collaborative design of trigger factors mainly include the needs of business customers temporary trigger and new strategic trigger aim at the market demand, in the first trigger elements, the customer's design requirements document should be decomposed According to the union

internal undertake object and send to each of the sub company through the network, launched a collaborative design work.

Therefore Collaborative design application model of sword manufacturing have to be setup is shown in Fig. 4. The decomposition of the design documentation, including comprehensive description of the whole supporting products, such as the whole design of appearance, size, color, design, quality standards, test environment and so on; at the same time, in accordance with the components of the object or process, decompose details for each customer, which including the detailed design requirements of the corresponding components or processes, time requirements, quality requirements, outstanding material requirements, each link in the process of designing according to the need for real-time network communication, ensures consistency.

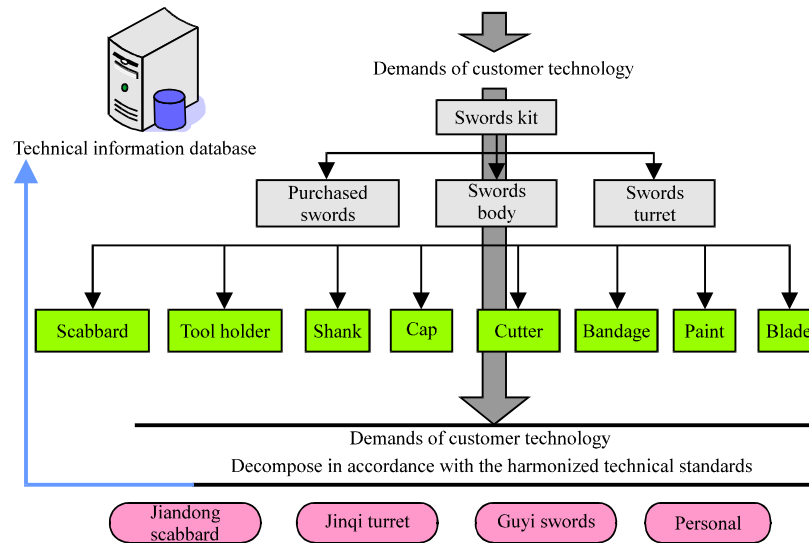


Fig. 4: Collaborative design application model diagram

Collaborative project management subsystem: The design idea and the traditional ERP production plan scheduling thought basically similar, the main difference is that the main part of enterprise undertake production tasks is the factory workshop, while the object of union undertake production tasks is each member companies:

- **The Lord collaborative plan application design:** Master Production Schedule: Key parts or product (For a great influence on the interests of the company or consume key resources of materials) production plan. MPS is the basis for the production and marketing coordination, also is the root of all work plan. The details of agenda of Manufacturing, outsourcing and purchasing are all calculated by the schedule of MPS. If the MPS schedule is not stable enough, or feasibility is not high, so it will force all supply activities wavering, causing great waste (Xiao, 2012)

The system through the independent source of demand (customer order), consider the union members existing stock and executing orders and generate Master Production Schedule: Key parts or product (For a great influence on the interests of the company or consume key resources of materials) production plan. As to the whole union, it should ensure the main constraints of the production process according to the actual situation of each company, with these objects for the balance of the main basis, the results of each calculation first passes through the balance of the principal company of the

dragon sword, the balance after the information to the various union members (and restricting factors related) information dissemination and consult the executive opinion, two-way overall adjustment, ensure its viability plan.

- **Collaborative detail issued decomposition:** Collaborative planning detail, witch employs ERP MRP (material requirements planning) principle (Min, 2013). carry out the detailed plan through collaborative master plan balance reasonable premise. Master plan considers the key bottleneck factors of collaborative planning and ensure the balance of efficiency and accuracy, while collaborative detail plans to ensure the integrity of the system plan

The process of requirements planning and material requirements planning as fallows: According to the master production schedule or customer orders and demand forecasts, it calculates the material net demand and put forward the new supply plan. At the same time, it used the bill of materiel data, the current inventory information and effective orders (such as purchase requisition, purchase orders, production orders, outsourcing orders, etc.) and supplies.

Centralized purchasing plan and online purchasing system: Centralized purchasing plan main purpose is to form a batch of material purchasing and supply timeliness Jiang (2013), collaborative production plan according to the exhibition material needs and clearly each material corresponding to the supplier, the amount of demand,

dates, destinations and other factors, at the same time, confirm the relevant material corresponding to the needs of members. It helps each member of the union on the procurement business process management; provide purchase, order, delivery, warehousing, billing, procurement and settlement of complete purchasing process, the user can customize the purchasing process according to the actual situation.

All certified suppliers use their identity confirmation code to login, for the corresponding purchasing business inquiries and according to the actual situation of the feedback and can confirm the distribution corresponding to the receivable information and settlement object.

CONCLUSION

“Collaborative manufacturing” management refers to the integration of the alliance system integration plan, coordination, control and optimization of a variety of activities and processes. On the one hand, “Collaborative manufacturing” management can broaden the range of actual available resources. On the other hand, it makes the enterprise can keep the low-end market competitive at the same time, will be used to belong to enterprise distributed brand, market, clients focus on the rapid formation of the Union, the unified brand, have greater competitive advantages and development capacity at lower cost (Aarabi *et al.*, 2012). In addition, environmental risk is also a corresponding share, which helps enterprises to reduce costs and the full utilization of available capacity. For the subordinate enterprises, “collaborative manufacturing” first of all contribute to the enhancement of their ability to resist risks but also bring more strategic adjustment opportunities for them: can walk into a step to the path of specialization but also more to the partnership of learning, thus to obtain more extensive knowledge, sharing related technology ability and so on. In short, through the analysis, collaborative manufacturing management is bound to be a small business alliance management evolution direction.

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