Information integration in the functional areas "Supply Logistics" and "Production Logistics" in the management of engineering company

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Abstract: the article is devoted to the development of expert system for the management of material, financial and information flows in the functional areas "Supply Logistics" and "Production Logistics" within the product lifecycle management for engineering companies. A model of the product life cycle that characterizes the stage of procurement, production preparation and production of the product. Clarified the definition of "Integrated Logistics Support." Research in the field of logistics, presented in the article focused on the development of methods for building an integrated information space and operational management systems, enabling enterprises to coordinate the processes of participating life cycle in real time.

Key words – information integration, logistics, CALS-technologies, life cycle, integrated logistics support, procurement, production logistics

I. Introduction

Priority area of industrial policy of the Russian Federation – improving the competitiveness of the engineering enterprise and the effective promotion of industrial products in the domestic and foreign markets. The solution of these problems is not possible with the traditional approach, as it doesn't take into account the complexity and specificity of the processes in the modern high-tech industries. In connection with the transition of engineering companies in the pull system of production (just- in-time) are imposed temporary restrictions on the formation of material, financial and information flows within the system of planning and management of the enterprise, the approximate real time, which can't be achieved without the automation of these processes and accounting feedbacks. Analysis of modern integrated enterprise information management systems has shown that in the framework of these systems during the planning, procurement and production management system through simulation of material, financial and information flows assigned to a minor role. In this regard, the company with a geographically – distributed control system carries large losses associated with the unjustified overestimated time intervals moving products in the domestic and external levels, a high level of hidden losses, break down delivery times and, consequently, of the basic order, which leads to poor quality of products [4]. Necessary to solve the problems that improve the quality of management of material, financial and information flows. Comprehensive solution to these problems is a challenge.

II. An expert system for the management of material, financial and information flows in the functional areas "Supply Logistics" and "Production Logistics"

The implementation of a fully functional management system at different stages of the life cycle of a product has a very large amount of work in the framework of a unified information system, it is difficult from a technical and from a scientific point of view, because simultaneously involved in the process external suppliers, units of the company, part of which is geographically removed from each other, moreover, increases the size and complexity of data processing. The solution of this problem may be the creation of an expert system for the management of material, financial and information flows in the functional areas "Supply Logistics" and "Production Logistics" within the product lifecycle management.

For information integration stages of the life cycle of the product in the expert system must take into account modern approaches, such as, CALS- technologies which are based on the idea that all automated systems used at various stages of the life cycle, don't operate with traditional instruments and even with their electronic maps, and with formalized models of information [3]. The world market is completely reject the products not fitted with electronic documentation , and not having the means of integrated logistics support post-production stages of the life cycle. Already, many foreign customers make demands of domestic products, the satisfaction of which is impossible without the introduction of CALS-technologies. Stages of the life cycle of a product are the basis for the formation of a unified information space of an integrated system of management:

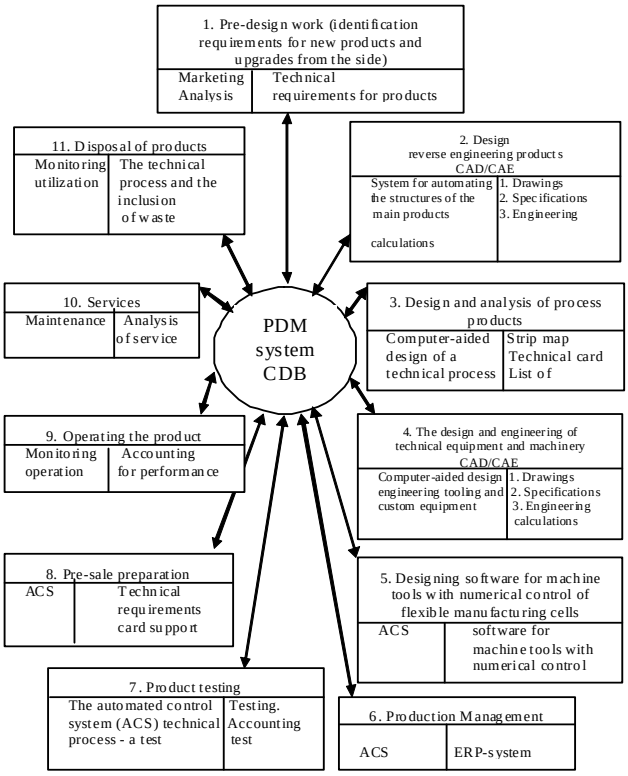

Fig. 1 The life cycle of a product with the use of CALS – technologies

Clients of the system are a set of elements (objects), they include, for example, any internal or external supplier. Although these objects have a different set of properties, they are combined with material, information and financial flows.

CALS-technologies used in the creation of flexible manufacturing systems testing.

The most important are the following:

1) the creation of a unified system of planningproduction, based on survey procedures related to the stages of the life cycle;

2) implementation of operational accounting procedures in all divisions, optimization of logistics procedures, decision support and knowledge creation at the stage of technological preparation of production;

3) improve the collection and processing of information and its use in manufacture;

4) construction of a full-scale enterprise management system with the use of modern information technology.

III. Integrated logistics support as a means of product lifecycle management

The use of shared information models, which are the only source of information and standardized methods of data access – the basis of the effective cooperation of all participants in the information life cycle. Means for controlling the life cycle of products to be integrated logistics support – is the basic concept of an invariant concept CALS (Computer Aided Logistic Support – Computer support supplies ; Continuous Acquisition and Life cycle Support - continuous information support of the product life cycle).

None of the information system can't be attributed to the class of CALS, if it isn't implemented component of integrated logistics support.

In recent years the concept of integrated logistics support of the product life cycle and is actively developing a methodology to optimize the cost of the product life cycle, which provides support for use of the product and is based on the construction of an integrated logistics system.

According to state standard 53394 – 2009 "Integrated Logistics Support of industrial products – a set of types of engineering activities to be implemented by management, engineering and information technologies to ensure high availability of products (including the indicators that determine readiness – reliability, durability, maintainability, operational and repair technology and others) while reducing the costs associated with their operation and maintenance."

The standard JSP 886 provides the following definition: "Integrated Logistics Support provides activities (in the original – disciplines) to ensure that at the design stage equipment identified (identified - auth.) and examine factors "maintainability" and the cost of influencing the design in order to optimize WLC (original – Whole Life Cost).These quotations show that the mention of logistics in the definitions of Integrated Logistics Support is missing.

The standard 00-600 (England) says: "The Integrated Logistic Support is an organized approach that influences the design of products and develops solutions to support the [product] that optimize the "maintainability" and the life cycle cost of the product; forms "initial support package" and ensures continuous optimization solutions to support in light of modifications of the product and the changes in its intended use, and the claimant".

And further (ibid.): "Integrated Logistics Support should be used as a guarantee that the equipment is designed to "support" that the necessary infrastructure support and the cost of the life cycle is optimized".

Current definitions of Integrated Logistics Support did not disclose its core, which leads to serious problems related to the provision of information transparency and synchronization of information flow within a single information environment. The role of logistics is of paramount importance and this is due primarily to the increase in the number of participants in the product life cycle, as well as the expansion and extension of the supply chain (especially when it comes to virtual enterprises). Logistical support is designed to provide the rhythm and continuity of processes at all stages of the life cycle of the product.

The authors gives the following definition of the Integrated Logistics Support, "Integrated Logistics Support – the union of engineering, logistics and administrative processes that affect product design in order to optimize costs at all stages of its life cycle in a single information environment."

There are various models of representation of life cycle products: regulated in the standards of design and staging products and other regulations, as well as models with a methodological character. We propose to use a model comprising the following steps (Fig. 2):

- supply (including procurement and supplier management);
- preparation of production (including technological preparation of production);
- production.

Parameter of any particular consumer product is the value of the cost of supporting the life cycle. They include the costs of development and production of products, the entry and operation of the product, keeping it in good working condition and utilization.

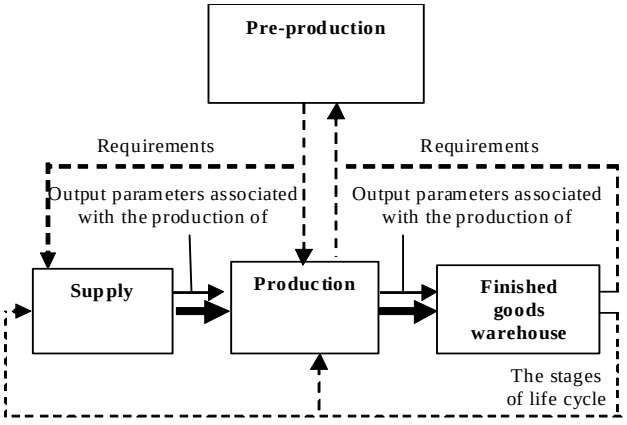

Fig.2 Model life cycle of products, characterizing the stage of procurement, production preparation and production of the product

The main stages in the model are the "supply" and "production". The activity of any enterprise depends on the availability of raw materials and other supplies that it provides an external organization. Strategic supply side -

it's all the processes of procurement and suppliers, the interaction between the departments of the company, the requirements of customers, etc.

The problem transparency relations processes in their product life cycle and increase management efficiency through the integration of logistics and information systems is highly relevant in the modern world. To create such an environment is necessary to build a functional model of the interaction of the actuators, the formation and change of flow with the control actions and restrictions imposed by the external and internal environment.

Let us consider the formalization of the process control phase of the example of procurement management in a typical environment logistics system. It defines the basic characteristics of the environment and functioning of any system, including logistics. For the formal representation of the process of procurement management developed a functional model in the form of IDIEF, the use of which allows you to structure noted above objects in nature has an impact on the process under consideration [1]. Formalized exemplary environment logistics system is shown in Fig.3.

In the formation of functional and information models of the process of procurement into account a number of factors: the presence of a large selection of inventory to purchase, purchase a variety of conditions, the significance of the required funding; determining influence on the functions of procurement of progress, as the processes of production and sales in whole.

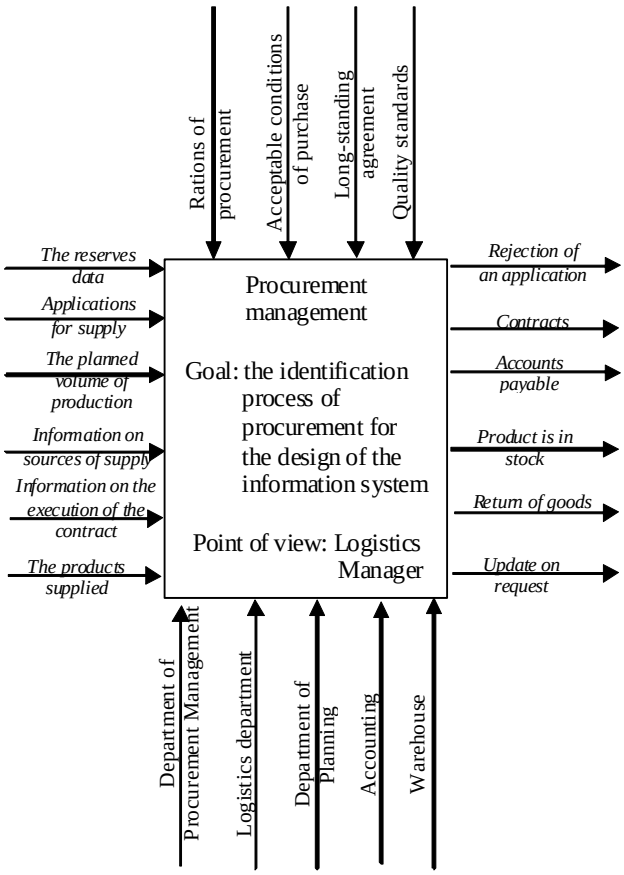

Fig. 3. formalized an exemplary environment logistics system at the stage of procurement management

For an objective consideration of all factors and to ensure the necessary quality of the procurement requires a comprehensive optimization of the procurement process and increase the efficiency of the control system. Should be the basis for optimizing the components of a comprehensive analysis of processes, structures and functions of procurement, as well as their surroundings, conducted on the basis of objective formalization. However, recent theoretical studies are extremely rare constructive methodological approaches to the formalization of the logistics system, as well as detailed descriptions of the specific subject area of logistics processes.

Held decomposition process of procurement management, taking into account the order of formation of "outputs" under the influence "control" and with the participation of "mechanisms" and "performers". The decomposition process of procurement management conventionally depicted as a functional model to determine the need for materials and components, shown in Fig.4.

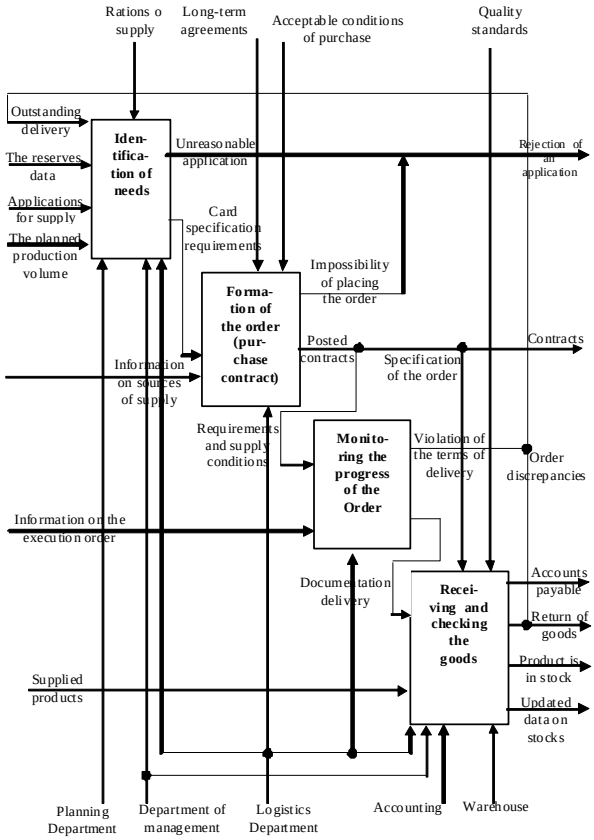

Fig. 4. Functional Model to determine the need

When dealing with inventory, there are two very important questions:

1) count of placing your order for the product;

2) the intermediate level for replenishment.

Decrease in inventories of materials, components, apart from the obvious relief warehouses and reduce storage costs, provides a number of advantages, the main one of which - the minimization of frozen funds invested in the purchase of materials which are not immediately going to the conveyor, and the long wait for their turn.

Input elements of the module material requirements planning are:

1) description of the materials (information about all types of raw materials, components required for the production of the final product, for each material status, which determines the location and status of an order, a description of its inventory, pricing, delivery delays possible, details of suppliers);

2) the program of production (the production schedule for the planned period or range of periods);

3) list the components of the final product (a list of materials and the amount needed to produce the final product, complete information on the manufacturing process).

It is essential to maintain the accuracy of all entries in this element and adjust their every time you make changes to the structure and/or the production technology of the final product.

The presented formalization is fairly generalized character in a number of specific practical cases may require additional decomposition and refinement. Recognized procedures and operations as part of procurement management can be used for modeling business processes and information systems development not only in machine-building enterprises, but also in organizations of any type.

Development of an information system for planning, management and reporting of material resources production plant reduces the amount of inventory and manage the progress of the process. Depending on the final set of targets (in this stage, iteration) formed manipulated factors.

Supply logistics must be considered in order to achieve management objectives added value in the supply chain, with the effective interaction of all participants in the processes of life cycle of the product. To optimize the value added to its integration with the production, marketing, financial and other activities of the business organization.

Rationally established economic relations determine the commercial success of the enterprise. All communication in the logistics system is associated with losses and expenses that should be considered as a separate economic category. The cost of the interaction processes in their product life cycle, referred to as transaction, account for a significant share of the logistics costs, as well as the total costs of the enterprise, and therefore is not always achieved the rationality of economic relations [2, 5].

Malfunction supply, lack of attention to the establishment of economic relations have a negative impact in the first place, at the production stage. An equally important role in the life cycle stage of the product plays a "production".

A necessary condition for the survival of the enterprise market in the present conditions is to increase the efficiency of production with the changing market conditions. Current approaches to the management of industrial production is based on the concept of Supply Chain Management, and the development of the logistics enterprise, according to this concept, incorporates the principles of strategic cooperation with suppliers, logistics intermediaries , operators and other actors in the life cycle of products.

Development of an integrated information environment with intellectual superstructure for material management production company to reduce the amount of inventory and manage the progress of the process. Depending on the final set of targets (in this stage, iteration) formed manipulated factors. Development and implementation of databases of precedents in the expert system and the use of experience and knowledge within a specific engineering enterprise will improve the efficiency of decision-making will lead to a reduction in costs, will enable the company meet the approach of "just-in- time" in terms of materials management, ensuring "transparency" in forming streams [4].

Conclusion

Combining logistics and information technology has created a framework for the integration of material, information and financial flows in the logistics information system that provides a rapid response to changes in the external environment.

This means moving from the local logistics (at the level of individual enterprises) to global, including tasks optimal temporal and spatial organization of the processes of the participating enterprises of the supply chain, based on a common information space.

Advantages of logistic support systems are defined by the quality of the product life cycle of the organization and management of information flow from the point of origin of the product needs through all stages and phases of the systems life cycle management.

At the moment, our research in the field of logistics focused on developing methods for building an integrated information space and operational management systems, enabling enterprises to coordinate the processes of participating life cycle in real time.

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