

INTEGRATED IT ENVIRONMENT BASED ON THE STRUCTURE OF THE ENTERPRISE MANAGEMENT SYSTEM AND IMPLEMENTED THROUGH INTERNET AND INTRANET

Assoc. Prof. Eng. P. Tomov, PhD;

Assoc. Prof. Eng. O. Andreev, PhD

Summary: In the paper, an approach is proposed and discussed for creating an integrated IT environment, based on the structure of the enterprise management system of the industrial enterprises with discrete production. The basic components and specifics of that environment are defined, as well as its realization through the external (Internet) and internal (Intranet) networks. Its interaction with other automated systems and the way of their functional participation are clarified, while the attention is focused on solving this problem by using modern information technologies. Conclusion is made for using this approach in the intranet and internet environment.

Key words: Management Information Systems, Integrated Systems, Automated Data Processing, Business Processes.

Structure of the Management Systems that Form Information Environment

The practical and theoretical experience gained in the development of management information systems in industrial enterprises both home and worldwide shows that their structure includes a certain group of systems. The latter, in turn, determine the scope and terms of the form of information needed to manage the activities of the Industrial Enterprise.

The correct structure of these systems and their effective functioning define the competitiveness and profits of enterprises.

In general, in the conditions of the integrated information

environment, an exemplary structure of information flows in industrial enterprise managing information systems includes:

- A system for managing material flows;
- A system for managing the flows of component parts;
- A system for managing end products;
- A system for managing processes (technological, manufacturing, financial and business ones);
- A logistic system, and
- A R&D system.

Graphically, the interaction between these systems, defining integrated information environment, is shown in Figure 1.

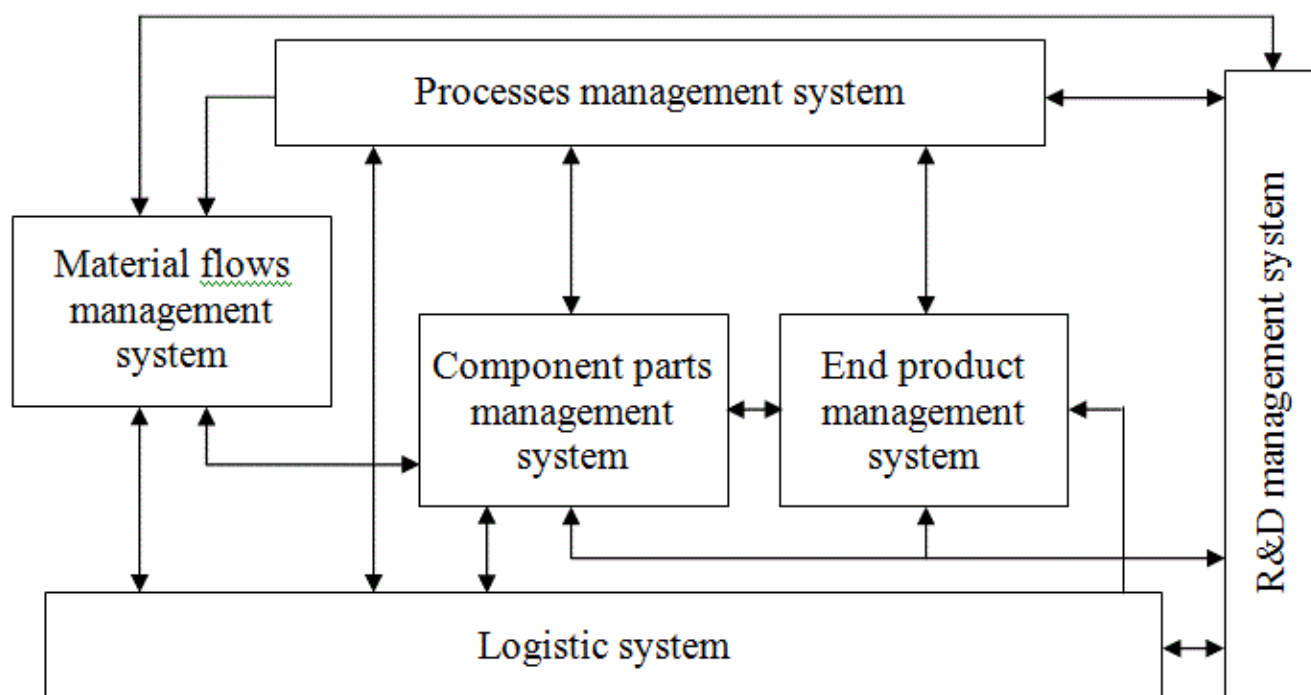


Figure 1

Ultimately, effective management of industrial enterprise depends on the accuracy and timeliness of the data assessed according to certain indicators, and incorporated into different information systems. For its part, the effectiveness of the activities of industrial enterprise is impossible without these systems, integrating the results of the activities of all enterprise divisions.

While the description of all systems and subsystems of the industrial enterprise is a subject of another study, this publication is focused on those elements of integrated information environment only that have the highest weighting in the operations and management of the industrial enterprise. So is the information system that contains products data, as well as ensures the integrity, timeliness and accessibility to the products throughout their life cycle. It must be so structured that it could perform following functions:

- Ability to interact with the other enterprise information systems;
- Managing different sections of normative-and-reference database (classification systems);
- Managing product mix (master data, end item configuration, product options, features etc.);
- Carrying out management and storage of items updates;
- Managing coordination of contractors activities and role;
- Managing technical and technological data;
- Managing work flow;
- Managing distinct access to the database objects;
- Managing results generation.

Doing so, one can use various information systems complying with the requirement for a general information

compatibility. The most suitable and already approved one is "Product Data Management" (PDM). To use it, it is necessary to be maintained a permanent products data set. To serve as such, the following can be used: CALS – ISO 10303 Standard, and STEP (ISO 10303-21/22). PDM is considered as a way of interaction with the data base. A distinctive feature of the standard is the availability of a methodology for an extended dataset, which allows adjusting the standard massif (structured as an extended database) for the purposes of the PDM system.

Other PDM specifics include:

- It is object oriented, securing system flexibility;
- Open data massif, which means that the structure of the database can be constantly updated and supplemented;
- Compliance with international CALS-standard, which not only helps build an integrated information environment, but also allows for successful interaction with the other partners of the enterprise;

- The system is designed and oriented to be a so-called "open system";
- It has an efficient architecture that enables efficient distribution of information processing and simultaneous work with multiple users. Along with that it offers high performance and complete satisfaction of customer requirements;

Dealing with above system, the following sequence should be kept:

- 1) Product description;
- 2) Developing product options and selection;
- 3) Product configuration;
- 4) Formal description of technological processes;
- 5) Managing operations;

This process can also be represented graphically as algorithmic sequence (Figure 2).

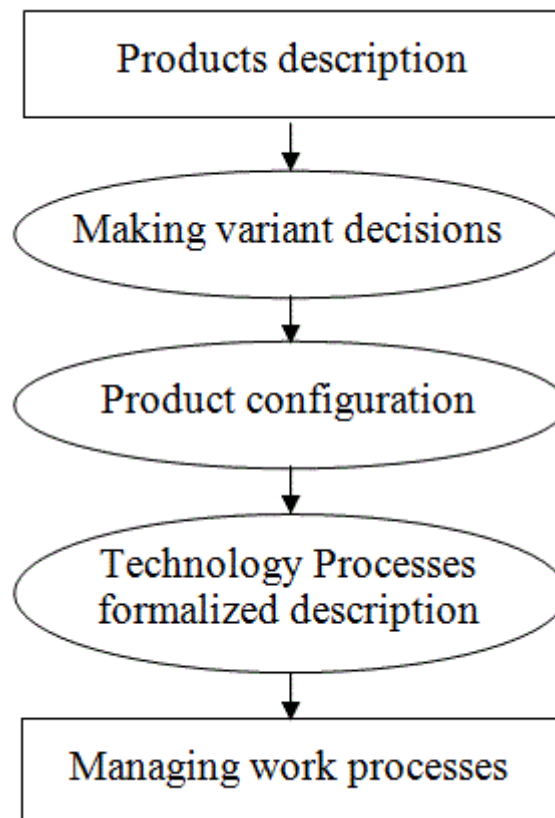


Figure 2

Systems for Design, Production Preparation and Manufacturing of Industrial Products

The need for comprehensive information about products throughout their life cycle and development of information technology in general, leads to the creation of PDM, as well as PLM (Product Lifecycle Management). The latter is a technology that is designed to meet the ever increasing demands of consumers and allows for greater integration of information systems. PLM is build up on the basis of the CAD/CAM/CAE systems, and they in turn are the basis for the creation of the information model of the new product. It is implemented as a system that manages all resources throughout the product lifecycle. Therefore it can be seen as one,

related also to the other enterprise information systems. In this case it performs following functions:

- 1) It is a complete database on the structural and technological documentation of the product;
- 2) Designing the product (Concurrent Engineering);
- 3) Executing the preparation for production;
- 4) Producing the products (real/virtual/simulation etc.);
- 5) Diagnosing and repairing;
- 6) Training staff (qualification during the product life cycle stages);

In general, these functions are represented in Figure 3.

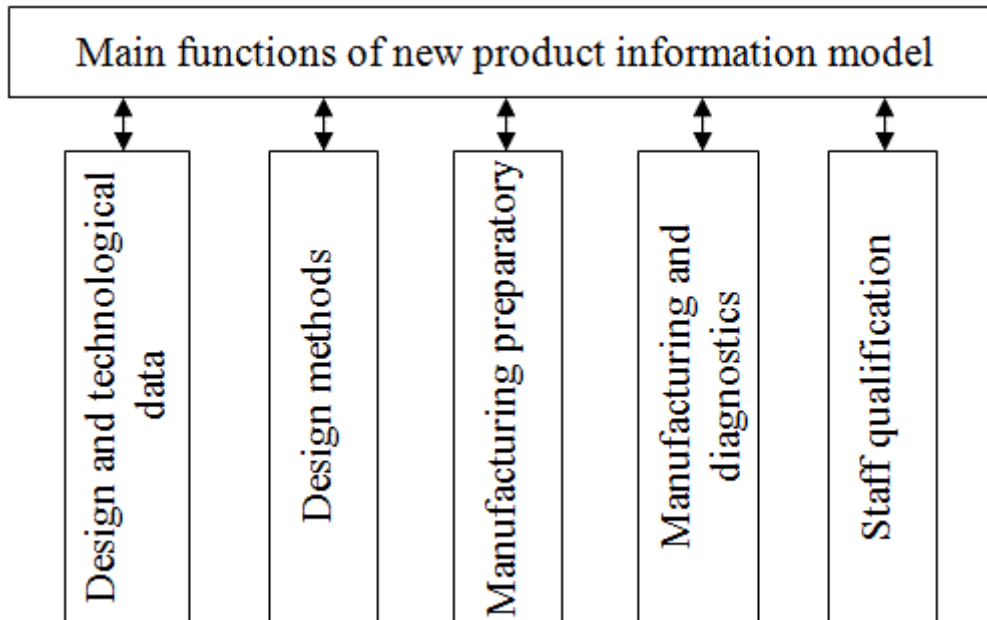


Figure 3

It is essential to take into account the role of Concurrent Engineering (CE) in the integrated information environment as part of the system PLM. Below, a mathematical expression is given of the design model with the methods of CE in the conditions of an integrated information environment.

Optimization problem of the organizational stages of CE includes a number of manageable objects, which are characterized by parameters conventionally called input ones – X and output ones – Y. The mathematical model of the object connects these parameters through the equations system:

$$y_j = f_j(x^n) \quad j=1,2,3,...G.$$

Parameters X и Y can be functions of time. In the structure of the model can also be included: material balance equations, equations that describe processes in the facility or system, different ratios related to design conditions and available resources.

The model should contain all information necessary for an optimal design. The criterion for the function optimality concerning input and output parameters is:

$$Q^n = Q(x^n, y);$$

This means that the function only changes through the input (managing) parameters:

$$Q = Q(x), Q(x_1, x_2...x_2)$$

In practical tasks the multitude of control parameters is limited by technological or other indication, and may change only in the so-called "control parameters allowable space":

$$x_{min} \leq x_i \leq x_{max}$$

There may be constraints by other functions (f, ψ), called "functional limitations".

The next step is to create three-dimensional models and specifications in CAD/CAM/CAE with all the documentation necessary for the next stage of the product life cycle. All this is included in the Common Source Data Base.

Internet/Intranet

The connection is performed according to the product model and the interaction with the COBRA software, combined with the COBRA language for describing database EXSPRES that is used in the STEP-standard architecture.

Realizing the Integrated Information Environment

Exchanging data with other systems files is done through the following ways:

- Interchange STEP files;
- Direct integration by full information interface with data access (API);
- Creation of a Change Management System.

Conclusion

In the publication, an approach is offered and discussed for building an integrated information environment based on the structure of the enterprise management systems.

Bibliography:

1. Product Data Management (PDM) software.
2. Product Lifecycle Management (PLM) software.
3. CALS – Standard ISO 10303, STEP (ISO 10303-21/22).
4. Новиков, Д. Модели и методы организационного управления инновационным развитием фирмы, изд. URSS-Москва, 2006, ISBN 978-5-9710-0080-8.