ДОДАТОК А

Апробація результатів досліджень

SCI-CONF.COM.UA

MODERN PROBLEMS OF SCIENCE, EDUCATION AND SOCIETY

PROCEEDINGS OF X INTERNATIONAL SCIENTIFIC AND PRACTICAL CONFERENCE DECEMBER 4-6, 2023

KYIV
2023

MODERN PROBLEMS OF SCIENCE, EDUCATION AND SOCIETY

Proceedings of X International Scientific and Practical Conference

Kyiv, Ukraine

4-6 December 2023

Kyiv, Ukraine

2023

UDC 001.1

The 10th International scientific and practical conference "Modern problems of science, education and society" (December 4-6, 2023) SPC "Sciconf.com.ua", Kyiv, Ukraine. 2023. 2800 p.

ISBN 978-966-8219-87-0

The recommended citation for this publication is:
Ivanov I. Analysis of the phaunistic composition of Ukraine // Modern problems of science, education and society. Proceedings of the 10th International scientific and practical conference. SPC "Sci-conf.com.ua". Kyiv, Ukraine. 2023. Pp. 21-27. URL: https://sci-conf.com.ua/x-mizhnarodna-naukovo-praktichna-konferentsiya-modernproblems-of-science-education-and-society-4-6-12-2023-kiyiv-ukrayina-arhiv/.

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UNIFIED INFORMATION SPACE FOR TECHNOLOGICAL PREPARATION OF PRODUCTION

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Introduction. The functioning of an automated system of technological preparation of production as a single, integral system involves the functioning of all its components in a single information space of technological preparation of production [1]. A single information space means a single computer information environment that is realized by means of a PDM-systems and provides joint, coordinated work of designers, technologists and other specialists of the enterprise throughout the entire life cycle of the product.

Object-oriented data model. The large number of different types of data used in an automated manufacturing preparation system requires the definition of some common criteria that all of these data must meet. In other words, it is necessary to define a basic data model. Only then it will be possible to build unified and efficient mechanisms for storing and processing information. When choosing a basic data model, the following should be considered [2]:

– an automated system for technological preparation of production is created and used by a large number of specialists solving various tasks. Therefore, the data model must be organized in such a way that all specialists can effectively use each other's work results and, if necessary, make their own changes to the model;

– the process of creating an automated system for technological preparation of production is iterative, so the model must, on the one hand, allow for consistent

refinements, and on the other hand, be resistant to changes in the subject area. This means that when modifying the subject area, only a certain minimum required set of model elements should change.

The object-oriented approach meets these requirements. The object-oriented data model contains the following basic concepts: object; object characteristics; relationship between objects; relationship characteristics. The characteristics of an object can be any attributes that are necessary to represent this object when solving information processing tasks. For example, the information of the main document title can serve as a characteristic of this document.

Relationships are organized between objects and the characteristics of these relationships are determined. The characteristics of the links do not depend on the characteristics of the objects they link. For example, "Zone number", "Item number", and "Quantity" are characteristics of the hierarchical relationship of a part to an assembly unit. A given part can be associated with different assembly units, and these characteristics can be different. Without establishing the relationship, these characteristics are meaningless [2].

Thus, each product or document is represented as an independent object that can be interconnected by various types of links, and all information about the object should be "laid out" on four "shelves" of the object-oriented model: this is the object, these are the characteristics of the object, this is the connection of the object with other objects; these are the characteristics of the connection.

The first and at the same time one of the most important and crucial steps in building a unified information space is to develop a system for classifying information objects. The main requirement for the classification system is compliance with the target functions of technological preparation of the enterprise's production. The definition of classes of objects and their characteristics is formed sequentially as the automated system of technological preparation of production is created.

A class is a set of objects that have common attributes, and among these attributes there is at least one that distinguishes objects of this class from objects of other classes in the modeled subject area. For example, in the classification of

products, part objects (forming the "Part" class) have the "Material" characteristic, which distinguishes these objects from all other types of products under a single system of design documentation - assembly units, complexes, standard products, etc.

Information objects can be classified in different ways. When building a class system, one should strive to:

– avoid duplication of information as much as possible

– simplify the user's work with data;

– take into account the distribution of access rights;

– speed up data search when performing queries.

Description of the structure and composition of technological processes for manufacturing products. The placement of specific data in a single information space and their processing are carried out in the process of direct functioning of the subsystems of the automated system of technological preparation of production. An important part of the content of the unified information space is a description of the composition, structure, geometry and materials of products in the form of the following components:

– composition – in the form of a project tree;

– structure – in the form of assembly files of CAD-systems;

– geometry – in the form of three-dimensional models and drawings;

– materials – in the form of databases of material designations and properties.

An important part of the content of the unified information space is a description of the structure and composition of technological processes for manufacturing products. The description of the technological process is presented in the form of a tree of performed technological operations and transitions, as well as the corresponding technological documentation, which is generated automatically in the required document formats.

The information obtained at the stages of technological preparation of production is stored, along with information from other stages of the product life cycle, in a single database and is used by both the PDM-systems and other systems.

All these systems and their components that work with information can be classified according to the so-called software "contours" (Fig. 1), which include:

– intra-system outline;

– technological outline;

– project outline;

– external outline.

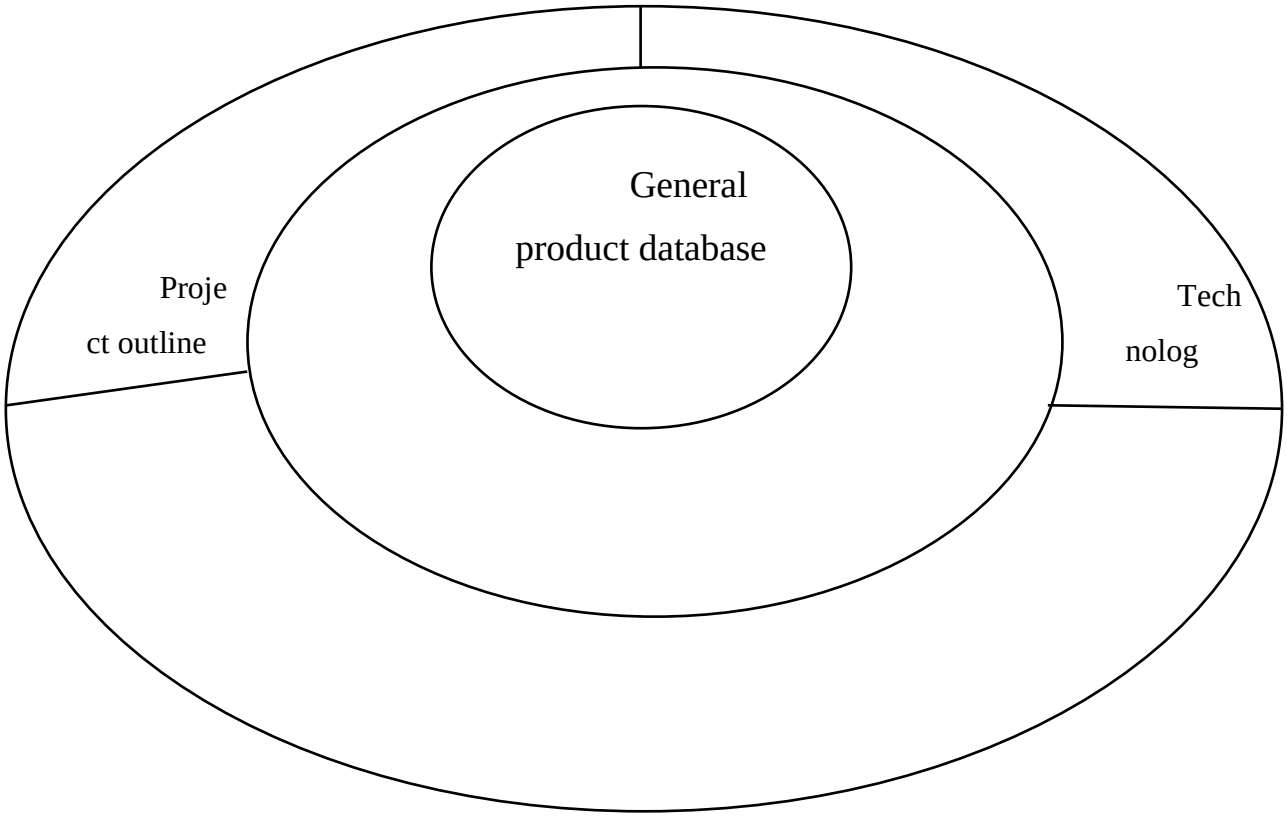

Fig. 1. Programmatic outlines and a single product database

The Intra-system outline is software that performs the following basic functions:

– editing the database structure and screen forms;

– entering information about objects into the database, hierarchical and logical relationships between objects;

– maintaining the project composition:

– classification of objects and inheritance of information according to the class hierarchy;

– maintaining the life cycle of documents;

– automatic maintenance of document versions;

– search for documents by accounting information and logical links;

– automatic extension of document and object designations;

– regulation of access rights to information;

– export and import of information;

– scheduling of production tasks and tracking their implementation.

The technological outline is a set of application programs (subsystems, modules) developed using a high-level programming language and API tools. The created application programs solve a variety of design, management, and documentation tasks in an automated system of technological preparation of production [3]. These tasks include:

– design of technological processes;

– product bifurcation;

– calculation of the need for materials and standard products;

– formation of assembly cyclograms;

– preparation of consolidated design and technological documents.

The project outline is a set of CAD/CAM and CAE-systems used. To solve their tasks, designers use a CAD/CAM-systems and appropriate interface (integration) tools with the intra-system loop PDM [3]. The simplest example of integration is the exchange of document identification data. CAD-systems have the function of entering identification data (for example, in the main drawing label), and the PDM-systems has the function of entering identification data in the drawing passports stored in the database.

Another example of integration is the exchange of 3D-models. Models created in the CAD-system should be transferred to the PDM-systems for storage, and models stored in the PDM-systems (for example, models of standard products or borrowed parts) should be transferred to the CAD-systems when creating models of assembly units [3].

The outer outline is information to consumers created at the stage of technological preparation of production that serves other stages of the product life

cycle (marketing, supply, production, control, packaging, sales, installation, maintenance, and disposal).

Conclusions. Thus, the unified information space creates the basis for the successful integrated functioning of the automated system of technological preparation of production, for the effective organization of joint, coordinated work of designers, technologists and other specialists in technological preparation of production of the enterprise.

As a result, the following are ensured:

– acceleration of the processes of technological preparation of production through parallel work and electronic data exchange between specialists;

– improving the quality and reliability of information due to the transparency of the system and mutual control of participants in the design process;

– accumulation and storage of information in electronic form;

– absence of unnecessary duplication of information;

– flexibility of the created automated system of technological preparation of production, ease of its development and adaptation to changing production conditions.

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ДОДАТОК Б

Демонстраційний матеріал

№	Позначення	Найменування	Дод. відомості
		Текстові документи	
1	ГЮИК. 406200.013 ПЗ	Пояснювальна записка	83 с
		Інші документи	
2		Демонстраційний матеріал	14 с

Змін.	Арк.	№ документа	Підп.	Дата	ГЮИК. 406200.013 ВД			
Розробив		Шмига Р.В.			Розроблення програмного забезпечення для автоматизованого обліку конструкторсько–технологічної документації комп'ютерно–інтегрованого виробництва	Літера	Аркуш	Аркушів
Перевірив		Аллахверанов Р.Ю.						
Н. контр.		Демська Н.П.				ХНУРЕ Кафедра КІТАР		
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