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Scientific - Industrial Aspects of Integration Product Lifecycle Management and Enterprise Resource Planning Systems

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Abstract: The developed module will provide a dynamic implementation of the integration information systems such as product lifecycle management (PLM), enterprise resource planning (ERP) and others of the enterprise through the use of intelligent agents and knowledge based on experience and rules. Integration module is independent of the software architecture of information systems, because it uses with the embedded integration solutions of different systems. It can work with two or more information systems using bidirectional data transmission scheme. The result will be to minimize errors by eliminating the human factor, the exclusion of manual labor and increase efficiency of decision making.

Key words: Information systems (IS) · Enterprise resource planning (ERP) · Product lifecycle management (PLM) · Integration · Efficiency · Intelligent agents

INTRODUCTION

Today, there are a large number of automated information systems implemented in enterprises that are usually solved some of the tasks associated with the production, finance, logistics, etc. These information systems are usually not integrated within the corporate information system. Because they do not support the integration of various information systems, there is no single standard integration, developers are not interested in the integration of information systems, usually proprietary software. All existing information systems interact with each other like formation of redundant links, there is a duplication of information, there is no single software instrument to display information about the links, etc. The redundancy of connections in the fact that the same integration mechanism is used separately to each information resource, but it has a single platform, so protocols. In this regard, the company faces certain costs associated with the inefficient use of IT staff, has a high level of hidden losses and has a lot of bugs in the system due to the use of manual counting and data entry [1].

The implementation of information systems integration module involves the transition from the classic strategy of building a unified information space to a more perfect, which means getting rid of the parallel operation of information systems, which require large computational resources and staff and that significant cost in the long term. Major role in the integration of competent comparison of the corresponding attributes between information systems for the exchange of data generated [1].

Currently many modern businesses that use different levels of information systems such as ERP, PLM, MES, CRM, SCM, HRM, etc., interest in the integration of automated information systems. The task of integration is the consolidation all levels of company management in a single chain. These levels can be used in combination, depending on the purpose, objectives and conditions of the enterprises. A comparative analysis of information systems, from the point of view using integration solutions, technologies and standards. As the analyzed systems were chosen system, which at the moment are being introduced in the Russian market, such as the ERP-systems SAP Business Suite, ORACLE JD Edwards EnterpriseOne, 1C Enterprise, Microsoft Dynamics NAV, Epicor, MES-systems Proficy Plant Applications, Pharis, SPRUT-OKP è PLM-systems TeamCenter [2].

ERP-system for the most part cover core processes of the enterprise. Large developers of ERP-systems usually have in their arsenal modules PLM, MES, BI, DSS, HRM, etc., which monopolize the market information systems

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and hinder integration with existing embedded systems. The big developers of ERP-systems usually have in their arsenal modules PLM, MES, BI, DSS, HRM, etc., which monopolize the market information systems and hinder integration with existing embedded systems. Because, the absence of integration solutions to the enterprise, customer is easier to abandon the current system of local information and to purchase the necessary module, than integrate. PLM includes the main stages of the product life cycle, from initial idea to the development of maintenance and even recycling [2].

MES - a set of specialized software is used to solve problems of coordination, synchronization, analysis and optimization production output in producing. When integrated corporate information system with MES-systems, or other production information systems is used ISA-95 standard, which is based on the formation of XML-schema implementing description of the object model. The project on formation XML-schema is called B2MML. Addition to this project, there are a number of parallel implementations of ISA-95 standard in the form of XML-schema, the most famous analogue is the MIMOSA project [4].

Information systems use different methods of communication: standard RPC XML RPC; web services CSV, XLS; protocol exchange structured messages SOAP; open structure of data in DBMS technology. NET Framework; standard semantics of RDF. Developers of information systems also use control reference information standard (MDM-system) and the document management system, unstructured information and various types of content (ECM-system) are used as a means of integration, enabling to coordinate data various information systems. The data management system usually not included in the set of ERP products and act as additional paid options [4].

Based on data analysis it can be concluded that the information system using single technological data integration solutions that basically designed for single platform information systems with identical architecture. For communication of information systems necessary to create the integrator. This connector interface for adaptation of information and subsequent transmission of data streams between the information systems.

As noted above, PLM includes everything that any way associated with product life cycle, from initial idea to develop maintenance and even recycling. PLM system Teamcenter (Siemens) is important for the business units directly involved in the product creation process: design, development, as well as other areas of the company such as sales, finance and accounting.

PLM system should provide instruments that give targeted support for product development and production processes and to ensure the competitiveness of the company, allowing the intelligent use of product data. As an open platform, it can be integrated with mission-critical systems: ERP, MES, CRM and SCM.

The object of study in this article is the problems of creating a single information space based on ERP and PLM systems. We consider the examples of the integration PLM system Teamcenter (Siemens) and the ERP system SAP R / 3 (SAP AG). For example, work to form a database for SAP-ERP is done manually in OJSC "KAMAZ", with over 50 engineers, which is a deterrent to full-scale implementation of SAP-ERP in production. At the same time this information for the formation the database would be transmitted from TCE-PLM. However, the lack of integration of the two systems do not allow to automate the transfer of data from one IS to another. Manual maintenance of database is very costly and lead to significant losses for the company.

The problems of integration between IS mainly focuses on providing interoperability of data. This requires the creation of new or modifications of existing interface. Each interface has a lot of the same parameters: the means of data transmission, the transmission and processing of data in text format, transmission and processing of data in a tabular form, the transfer of objects, etc. (Figure 1) [3].

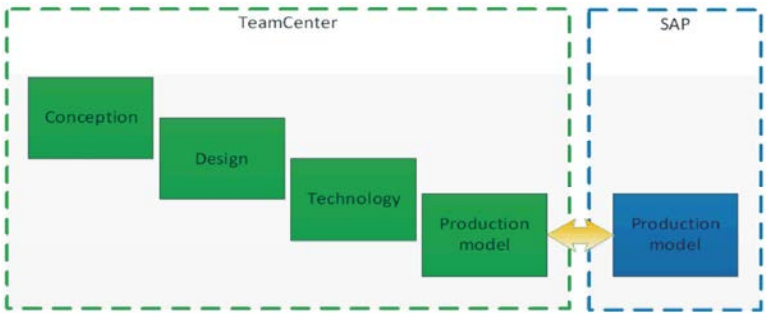

Fig. 1: Integration objects SAP-TCE

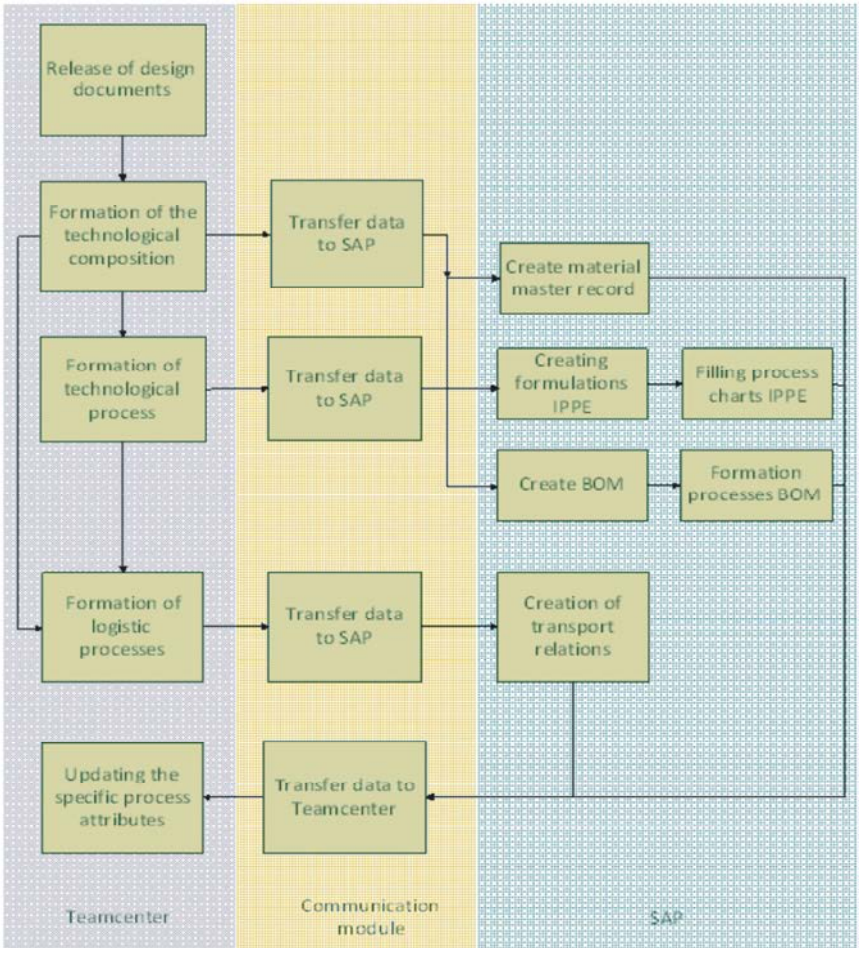

Fig. 2: Information workflow data SAP-TCE

For the integration data IS necessary to create a bidirectional integration schemes SAP-TCE. Each IS must contain procedures for preparation of data for transmission, processing the received data, etc. Absence of feedback with an explanation of the error is lack of such a scheme. The same disadvantages can be attributed to the lack of control data transmission between the information systems. Therefore, necessary to form the integrator with interface between members processes data exchange to be read and processed and immediately to prepare data for transmission. To fulfill these requirements is proposed to use the structure on the basis of intelligent agents, is a software-driven communication protocol and the synchronization of the business objects. The same scheme applies to the integration of three or more IS. The integrator should be able to convert from one form of data to another without losing information. When transmission of information from one system to another. The process will occur through the transfer of data to the transmitter convenient way, for example, it can be: calling a stored procedure in the database, launch executable file with parameters, network transmission data, uploading interface tables, etc. [1].

For realization this problem requires the development of a list of objects for the integration of SAP-ERP and TCE-PLM.

Analysis of the results of the first attempts to integrate SAP and TC showed the ability to automatically create and update objects in SAP based on the uploaded data from the TCE. (Figure 2).

Held unloading and update TCE in SAP for the following objects:

- Product Guide (material master record - MMR);
- Requirements (change master record - CMR);
- Technological formulations (AN (input nodes), SN (nodes structure), version of iPPE).

Table 1: List of integrable TCE-SAP data

Name data	Amount of change	Frequency changes	Direction of integration	Recommendations for integration	Notes
Nomenclature	Many 8500 MMR	frequently	Tc → SAP	mandatory	Products, wares, parts, components, metals and materials of the main production
Change master record - CMR	Many 1400	Frequently	Tc → SAP	Mandatory	Regulations
Features (options and characteristics)	Few 3	Frequently	Tc → SAP	Desirable, but can be paralleled to data maintenance	Library
Technological composition	Many 42543	Frequently	Tc → SAP	Mandatory	
Technological process	Many 3000	Frequently	Tc → SAP	Mandatory	
Organizational structure (plant, warehouse, workshop)	Few 3	Frequently	Tc → SAP Tc ← SAP	Desirable, but can be paralleled to data maintenance	Library
Routes	Many 10355	Frequently	Tc → SAP	Mandatory	
Product configuration	Many	Frequently	Tc → SAP Tc ← SAP	Mandatory	Feasible sets of options for a configurable product Terms of interdependence option values
Resources (equipment, personnel)	Few 6	Infrequently	Tc → SAP	Desirable, but can be paralleled to data maintenance	Library
Units of measurement	Few 1	Infrequently	Tc → SAP Tc ← SAP	Desirable, but can be paralleled to data maintenance	Library
Product grades	Few 2	Infrequently	Tc → SAP	Desirable, but can be paralleled to data maintenance	Library
Variant of manufacturing	Many 1620	Frequently	Tc → SAP	Mandatory	Primary and alternate composition and / or manufacturing process
Price of material in SAP	Many	Frequently	Tc ← SAP	Mandatory	Product attribute
Release program	Many	Infrequently	Tc ← SAP	Mandatory	Product attribute

Table 1 describes the list of objects for the integration of TCE in SAP and analysis in accordance with the specific requirements of integration. Sequence of determines the order of starting the proposed integration. Integration according to one group should be run strictly simultaneously.

The analysis showed that in the department of material specifications of the plant use 38% of engineering changes, in the service center of technological preparation of production use 58%, in the department of pre-production plant use 2.5% in the department of labor standards for plant use 1%. In the design process and product technology TCE create: design objects, technological objects, technological processes, operations and routes. which should be transmitted automatically in SAP as their creation. Therefore the construction of an automated integration module of information system is an urgent problem, because creating a single information space will allow the company fully automate management of business processes and production in existing information systems, make adjustments in real time, thereby eliminating the scrappy of automation and increasing economic efficiency the whole enterprise.

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