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INTEGRATION DEFINITION FOR FUNCTION MODELLING OF BUSINESS PROCESSES (IDEF0) IN LOGISTICS

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The article is devoted to the idea of IDEF0 (Icam Definition for Function modelling). It is a function modelling methodology for describing manufacturing functions, which offers a function modelling language for the analysis, development, re-engineering, and integration of information systems, logistics processes, and software engineering analysis.

In any industrially developed or undeveloped society goods must be physically moved between the place they are produced and the place they are consumed. The exchange process has become the cornerstone of economic activity. Exchange takes place when a number of organizations have a surplus of goods while someone else needs: there is a basis of exchange [1]. The alignment of companies that sell product or services to market can be called the supply chain. Logistics is a broad, far-reaching function tool for the management of flow of goods, information and other resources [2].

Modern supply chains are often a series of enterprises with different complicated relations between them. Designing the logistics process in these structures might be an unusually difficult task. During the logistics processes, many problems might arise, which should be addressed already in the planning phase. Many actions are not defined clear, there are no clear areas of responsibility, it is difficult to predict all details. These factors lead us to losses. But using the process description languages makes supply chain management easier, e.g. IDEF0 (pronounced I-def zero) [3].

IDEF0, or Integration definition for function modelling, is a functional modelling method for complex manufacturing environment which when graphically represented show the structural relationships between the manufacturing processes [4]. The name IDEF originate from the Air Force program for Integrated Computer-Aided Manufacturing (ICAM) in 1970s, which developed the first ICAM Definition, or IDEF, methods [5]. IDEF techniques include the following: IDEF0, IDEF1, IDEF2. In 1980s the IDEF1 information modeling was enhanced up to IDEF1X (IDEF1 Extended).

IDEF0 is used to produce a "function model", which is a structured representation of the functions, activities or processes within the models system or subject area. IDEF1 is used to produce an "information model", which represents the structure and semantics of information within the modeled system or subject area. IDEF2 is used to produce an "information model", which represents the structure and semantics of information within the modeled system or subject area [3].

The models in IDEF0 are easy to build and understand. IDEF0 (Integration Definition language 0) is based on SADT (Structured Analysis and Design Technique), developed by Douglas T. Ross and SofTech, Inc. In its original form, IDEF0 includes both a definition of a graphical modeling language (syntax and semantics) and a description of a comprehensive methodology for developing models [3].

The two primary modeling components in IDEF0 are functions (represented on a diagram by boxes) and the data and objects that inter-relate those functions (represented by arrows). When we used in a systematic way, IDEF0 provides a system engineering approach to [5]:

1. Performing systems analysis and design at all levels, for systems composed of people, machines, materials, computers and information of all varieties – the entire enterprise, a system, or a subject area.
2. Producing reference documentation concurrent with development to serve as a basis for integrating new systems or improving existing system.
3. Communicating among analysts, designers, users, and managers.
4. Allowing coalition team consensus to be achieved by shared understanding.
5. Managing large and complex projects using qualitative measures of progress.

Providing a reference architecture for enterprise analysis, information engineering and resource management.

IDEF0 models are composed of three types of information: graphic diagrams, text, and glossary. These diagram types are cross-referenced to each other. The graphic diagram is the major component of an IDEF0 model, containing boxes, arrows, bow/arrow, interconnections and associated relationship. Box and arrows compound ICOM Code, acronym of Input, Control, Output and Mechanism [5].

Semantics determines meaning of syntax elements and aids correctness of interpretation. First of all the box name should be a verb or verb phrase that describes the function of the box. After naming the box arrows can be joined to sides of the box. The arrows identify data or objects needed or produced by the function. Each

arrow should be labeled with a noun or noun phrase. The peculiarity of arrows consists in their disposition. Example of standard arrow disposition is shown in the figure № 1.

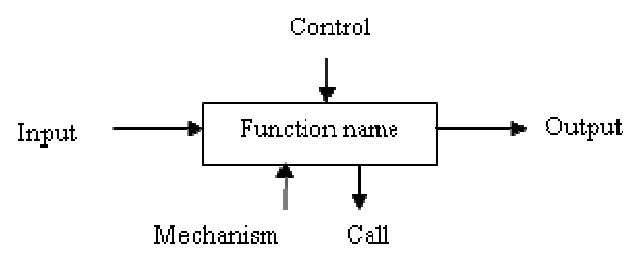

Fig. 1. Standard arrow disposition

Arrows that entire the left side of the box, named «inputs», are transformed or consumed by the function to produce «outputs»–arrows that leave the box on the right side. Outputs mark the data or objects produced by the function. Those arrows that entire the box on the top («controls») define necessary conditions for the function in order to produce correct «outputs». Arrows that connected to the bottom side of the box represent mechanism. The sense of the mechanism which described with upward pointing arrows is supporting execution of the function. And arrows pointed downward – call arrows – mean the sharing of detail between models or between portions of the same models.

In the process of modeling with IDEF0 consideration must be given to the aspect saying that each model consists of graphic diagrams, text and glossary.

Graphic diagrams contain boxes, arrows and their connection. All diagram types are cross-referenced to each other. The function represented on the top-level diagram is decomposed into more detailed diagrams until a subject is described on a necessary level helping to achieve the project goal.

Using a glossary in model is used to define some abbreviations or special phrases that were marked on diagrams to interpret their meaning.

The main rules of producing diagrams are:

1. Context diagrams shall have node numbers A-n , where n is greater than or equal zero;
2. The model shall contain a A-0 context diagram, which contain only one box;
3. The box number of the single box on the A-0 context diagram shall be 0;
4. A non-context diagram shall have at least three boxes and no more than six boxes. This amount of boxes can be explained with better understanding a diagram and convenient use in a project.
5. Each box that has been detailed shall have the detail reference expression of its child diagram written beneath the lower right corner of the box [3].

Creating an IDEF0-model is iterative process which consists of some conventional stages:

1. Creating a model by group of experts who relate to different scope of the company. According to terms of IDEF0 the group is called «authors».
2. The construction of initial model is a dynamic process in which the authors ask competent persons about the structure of various processes.
3. On the basis of regulations, documents and survey results a draft (model «Project») model is created.
4. Distribution of the draft for review, approvals and comments. At this step there is a discussion of a draft model with a wide range of competent persons of the enterprise (in terms IDEF0- readers). In addition, each diagram of the draft model has been criticized and commented in written form and then transmitted to the author. The author agrees or rejects critique with the statement of logic decision and again returns revised draft for further consideration. This cycle continues as long as the authors and readers will not come to a consensus.
5. The approval of the model. The head of the work group approve agreed model, if the authors of the model and readers (competent persons) have no disagreement about its adequacy.
6. The final model gives an idea of the enterprise (system) from a predetermined point of view and for the given purpose [6].

The clarity of IDEF0 graphic language makes the model quite readable even for those who has not participate in the project of its creation , so it is effective for presentations.

At present time there are many case-tools that support functional modeling IDEF0 standard. Best known case-tools are following systems: Design / IDEF (MetaSoftware, US, distributor – Metatechnology, Moscow), BPWin / ERWin (Logic Works, the US, distributor – Interface, Moscow). Orientsoft Company (Minsk) offers its own development on the basis of IDEF0 standard – system IDEF0 / EMTool [7].

Standard IDEF0 is widely used in the CIS in the Central Bank of Russia, the State Tax Inspectorate, the National Bank of the Republic of Belarus, in the aircraft and aerospace industry, in the development of information systems, and others [8].

An IDEF0-model is widely used in logistics.IDEF0 helps study logistic system taking into consideration next peculiarities: material, information, financial flows, also logistics operations and functions and the order of execution of logistics operations and functions. IDEF0 model can be considered as a universal model, applicable to describe the logistics systems in the view of the different functional areas of logistics - supply, distribution, and sale, transport and others. Possibility of decomposition processes in diagrams allows to present logistics functions through logistics operations [9].

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