A SOLUTION IN THE DEVELOPMENT OF THE BILLING AND INFORMATION SYSTEM

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Abstract: The analysis of the complexity of the operation of labor organizations general services and continued expansion of the application of modern information technologies in all spheres of life and work showed there is a need for designing of software solutions that would significantly improve the performance of these services. Software processing of the billing process as an integral part of economic services brings time and increases the efficiency of the service in terms of speeding up the process of managing documents and reducing the volume of paper documentation. Functional and information modeling of billing system was done using IDEF methods, as the application model in MS Access.

Keywords: decomposition diagram, actions scheme, activities, entities, and databases

1. INTRODUCTION

Billing and information system (BIS), as part of the economic service of an organization, increases the efficiency of the service in terms of speeding up the process of managing documents and reducing the volume of paper documentation. Billing software is a part of an integrated information system of business organization that in addition to billing includes process development, process preparation, procurement, manufacturing, sales, accounting and payroll calculation. As separate units of information, published procurement processes [1] are processed and the wage calculation [2], while publishing of the commercial software version is in progress. The authors of this paper are working on realization of other units and other integrated information business system of an organization, so publication of a series of papers from this project can be expected in the future.

Modern methods of modeling eliminate the details and graphic displays enabling users to think about the process of modeling as a picturesque presentation [3], [4]. In other words, the modeling is a simplified representation of the real system through a set of objects (entities), the relationship between objects and object attributes. A set of inte-

grated IDEF (Integration DEFinition) modeling technique is the basic tools of modern technology and strategies for improving business processes. Confirmation of the high quality of these techniques is their implementation, for example, for the U.S. government, the Pentagon or NATO. Given modeling concept involves the use of this methodology for defining of each document. In this paper, we elaborate the functional modeling Billing and Information system (BIS) using IDEF0 method, i.e. CASE (Computer Aided Software Engineering) BPwin tool (Business Process for Windows). Applying Structural System Analysis (SSA) implemented using BPwin tool, the process of invoicing is displayed by the codebook activities, creating invoices and billing analysis. These activities are further broken down to the level of primitive actions for archiving documents, recorded in SSA, in an appropriate data storing capacity. In the implementation of billing process, in the part of the data organization, IDEF1X information modeling method is used realized through ERwin CASE tool (Entity Relationships for Windows) [3] – [6]. In other words, based on our functional analysis of the billing process, projection of the object-link model started, realized thru ERwin tool. The information model was used to create a database in MS Access and development of application model. Using final part of the design, management options of developed information system in real conditions were tested.

The aim of this paper is to apply the modern IDEF methodology in the development of the information system on the selected billing process and put it into service as such.

To achieve the desired goal, functional process model is created, information data model, application model and the implementation of the IS was carried out, which aims to facilitate business tasks for people working in this field [6], [7].

The significance of this paper is in comprehensive approach to the problem of the database organization that can serve as the basis for widening requirements for upgrading of such database and access to the Billing and System (BIS) on the www.webng.com/invoicing site.

2. FUNCTIONAL MODEL OF THE INVOICE PROCESS

After a detailed functional analysis of all the activities that make up the invoice process, designing of the information billing system followed. The analysis was performed using SSA method, which is a relatively complex process of invoicing presented with a set of simple activities and sub-activities. This explains the functioning of the system and enables its implementation.

Functional modeling of BIS includes processing context diagram (Figure 1), tree activity (Figure 2), and the decomposition of process diagram (Figure 3–5).

The context diagram defines the sets of inputs, controls and mechanisms that produce a set of outputs. At this level, the issue of generalization is observed with a smaller number of details. General overview of diagram context of the invoicing associated with the billing elements of inputs, outputs, controls and mechanisms in accordance with the IDEF0 standard is shown in Figure 1.
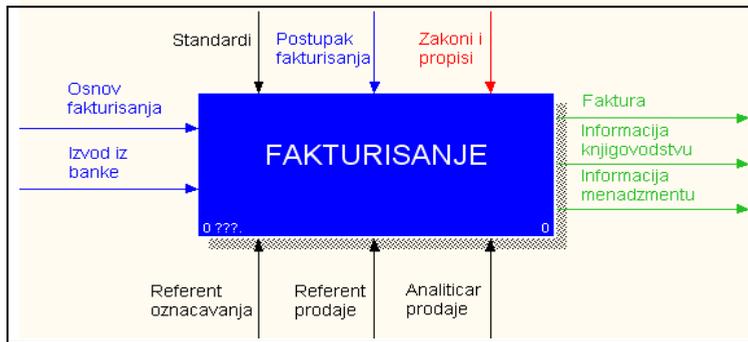
Figure 1: Diagram of the context of the activities A0 – INVOICING

Activity scheme represents a hierarchy of defined activities and provides a functional decomposition and insight into the depth of performing the connection between the activities (Figure 2). Activity scheme can be defined as a method by which a complex activity is broken down into several subordinated activities among which vertical (hierarchical) relationship were established. The hierarchy of activities decomposed billing process is shown in Figure 2.

Decomposition diagrams. Defining of the decomposition activity diagram according to IDEF0 method, a horizontal linkages between activities at the same level were created, which allows connecting relevant information defined in the activity scheme [1] – [6]. Billing process is decomposed to the activities of codebook, Invoice making and Billing analysis (Figure 3). These activities are further decomposed into sub-activities that can be seen on the activity scheme (Figure 2) and in Figures 4 and 5 which show decomposition diagrams of the codebook activity logs and Invoice creating.
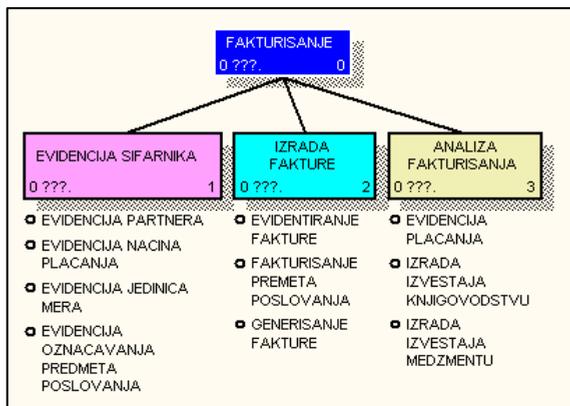

Figure 2: The activity scheme A0 – INVOICING

One of the features of IDEF0 method is a combination of graphics and text providing efficient work, and helps users to understand and master the operation of the system. Visual observation of the functioning of processes, activities, and sub- activities, as well as the

flow of data streams imposes a need for explaining them in detail. Therefore, further in text (Figure 3) Evidence of the codebook and Invoice creating are shown only with its decomposition diagrams with related sub-activities and elements of the inputs, controls, outputs and mechanisms (Figures 4 and 5).
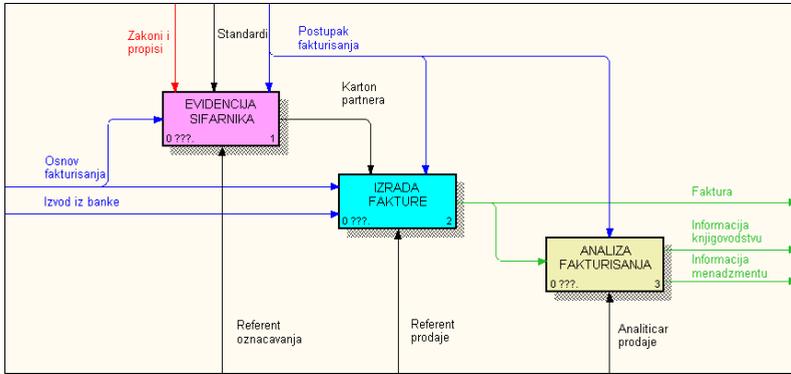

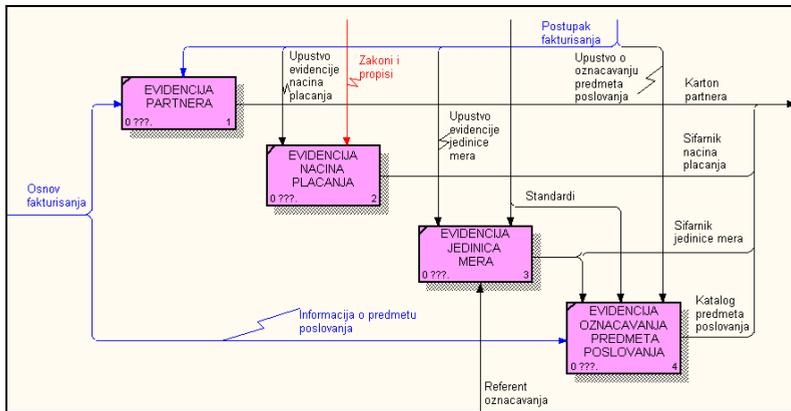**Figure 3:** Decomposition diagram A0 – INVOICING

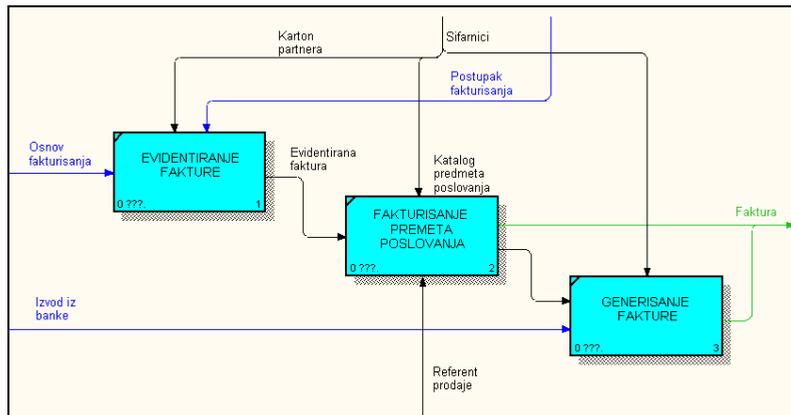**Figure 4:** Decomposition diagram A1 – CODEBOOK LOGS

Figure 5: Decomposition diagram A2 – INVOICE MAKING

3. INFORMATION MODELING OF BIS DATA

After making decomposition diagrams, definition of the logical data model started. Usage of the Information modeling (IDEF1X method) a billing process is represented by a set of objects in a simplified way (entities), relation between objects and object attributes [1] – [6]. Figure 6 shows the logical data model of the BIS, which is the basis for the definition of the physical database model.

Generating of a physical model from ERwin into MS Access database model, automatically establishes relationships between fields in the selected tables according to indexes defined on those tables. Relations between table fields are determined according to similarity (equality) of the name, type and size of fields [1], [2].
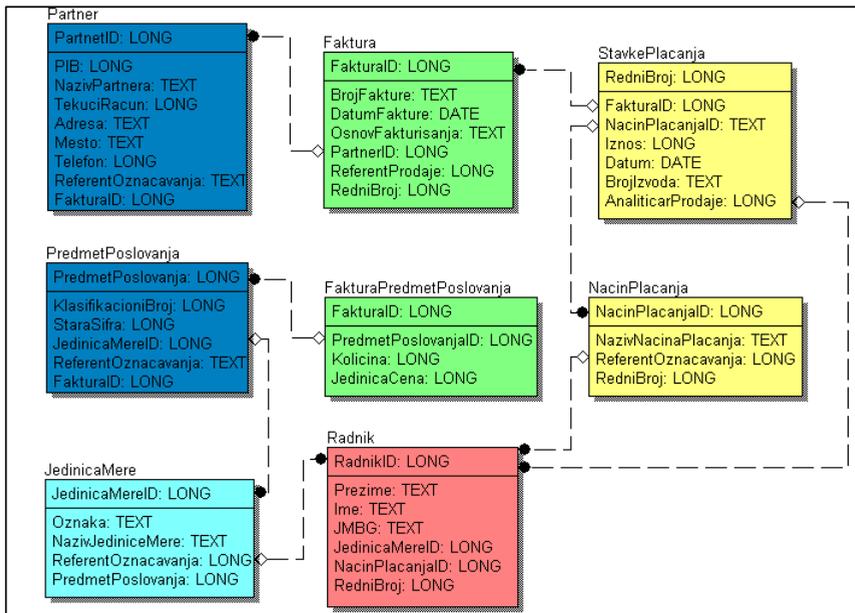

Figure 6: Logical data model of the IS INVOICING activity

4. REALIZATION OF THE APPLICATION MODEL

The application is carried out based on the database schema and the specific requirements of the user. This activity was carried out with all the specifics of DBMS systems – MS Access. Menus and attractive shaped forms are defined. Defining of the menus and navigating through the application reflects the logical mode of application users. The main form of database that enables efficient database management is on the front page of www.webng.com/invoicing (Figure 7). Access to the database is enabled for ASP (Active Server Pages) cells taken from the records of the application of codebook, invoice making, billing analysis [7] – [12]. Other forms, queries and reports that fully describe the operation of the system will be presented in one of the papers that are in preparation. It should be mentioned that existing software tools and methods for all phases of the development cycle and IS invoicing were experimentally verified.

5. RESUME

Given the complexity of the problem of business processes in terms of activities, various input and output data, influential and control factors and limitations of monitoring information flows, it is necessary to use modern computational methods for modeling processes.

IDEF is a set of standard methods and graphical languages used for the functional and information modeling in the field of software engineering and improving business processes. The goal of these contemporary IDEF techniques is to allow the experts to understand the problem from different aspects and levels of generalization. In this sense, integrated IDEF methods are some of the basic tools of modern strategies and methodologies for redesigning and improving business processes.
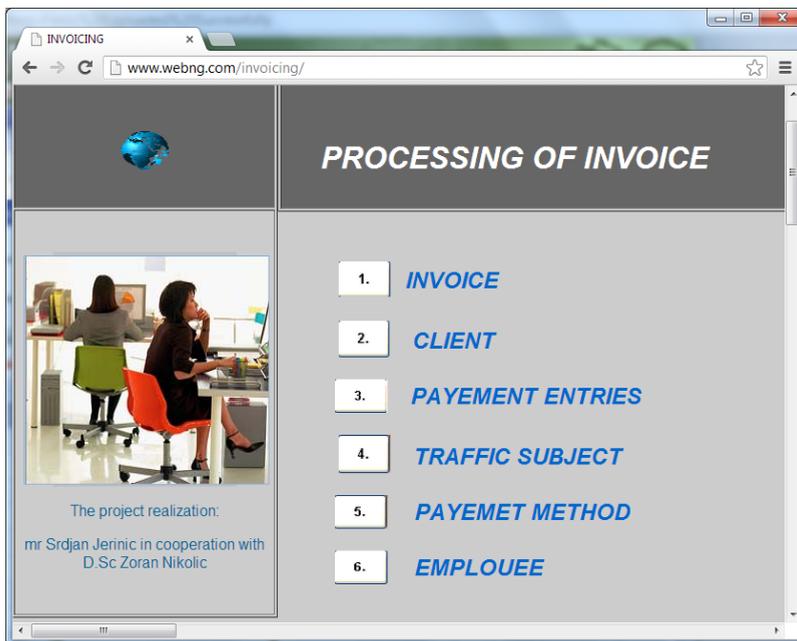

Figure 7: The main BIS form

These techniques are implemented in the design and implementation of the BIS. The paper presents the method of functional and information modeling of the system. This system is the original work of the author and emerged as a need for more efficient operation of the billing process. Further development of this application requires a certain amount of time for testing and verification of selected concepts. The project will be fully expressed within stakeholders and verification in practice.

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