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INFORMATION DESIGN OF FOOTBALL CLUB INFORMATION SYSTEM USING IDEF METHODS

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***Abstract*—**Information modelling of football club activities and organization has been done by IDEF1X (ERwin) tool within the project ''Football club Information System''. Information modelling is based on previously defined activities included in the football club work and organization by means of IDEF0 (BPwin) tool. Information modelling of data is done in terms of defining necessary entities, their attributes and relations. This model has been used to create application model in the program MS Access. The Football club Information System is illustrated by relevant forms of data base.

***Keywords*—**Information modelling, Database, Objects, Entities, Relations, Attributes, Flow of data, Football club, Player, Match, Coach, Health Bulletin

I. INTRODUCTION

MORE pronounced decline in the quality and success of Serbian football clubs and representation at international competitions impose a need for more comprehensive understanding of the development of the sport in Serbia. The development must be based on scientific and technological achievements. Information technologies have penetrated in all aspects of life and work, and have found application in achievement of top sport results. Their knowledge and understanding of the football development based on the application of information technology are applied by authors to a original solution of the *Information system of Football club (**ISFC**).*

One of the main task os ISFC is to allow the defining strategy in the management of the club. The integration is based on the integration of all information flows in a football club, and based on that, as well as on the defining of management processes that take place in the club and its environs. Also, the ***i**nformation system (**IS**)* should provide an easy communication with the external environment, primarily through the receit and processing of information constantly coming to the club. The management of the club of ISFC should provide support in decision-making at all levels, through accurate, complete and timely information relevant to the functioning of the club and achievement of designed goals. In the modeling procedure, which has certain methodological rules, it was indispensable to adapt the designing of IS with the real needs and possibilities of football clubs in Serbia.

This study represents the continuation of realization in the designing of information system of the Football club. Based on the realized functional model of ISFC [6] there was approached to the modeling of information system. Information modelling of data is done in terms of defining necessary entities, their attributes and relations.

The aim of this work is that at sport, organizational and business activities of football club to apply the modern ***IDEF*** (***I**ntegration **DEF**inition*) methodology in the development of the information system and such a system put into function.

The importance of work is in comprehensive approach to the database problem of organization that can serve as the basis for extension of demands for the upgrade of that kind of database.

In the first part of the paper are exposed the bases of information modeling based on IDEF techniques. After that is done the information modeling of the football club using ***CASE** (**C**omputer **A**ided **S**oftware **E**ngineering)* tool ***ERwin** (**E**ntity **R**elationships for **win**dows*).

In the second part of work, within the implementaion of ISFK, ERwin model is transferred into the programme for the management of the database - ***DBMS** (**Data**base **M**anagement **S**ystem) – **MS Access***.

The third part is dedicated to the applicative model. The work of application is illustrated by the most important forms in a sufficient extent that the functioning of the system to be clear to the reader.

II. INFORMATION MODELING OF A FOOTBALL CLUB

Information modelling activity is a key moment when programmer's ability and knowledge in the field of management and informatics are desirable. This activity is defined through the following sub activity:

- define detailed requirements;
- the creation of ***ER** (**E**ntity **R**elationships)* model;
- the creation of attributes;
- the definition of business rules.

Within ***defining the detailed requirements*** the process of redesigning is defined. This phase should do the following: determine which old rules remain and which new processes appear, make the connection of the corresponding operations or eliminate unnecessary ones, and determine the logical order of activities in the process. The result of this work should be the activity tree defined with detail, with the corresponding detailed decomposition diagrams (by IDEF0 methodology) and verification of the top-management companies.

Creation of ER model, using ***IDEF1X*** methodology is a new qualitative jump. Up to this moment, IDEF0 methodology was used to describe the dynamics of the operation, which is present as the experience and tradition in each company and which is defined through the activity of "Functional modelling". It can be said that this activity opens the "black box ", which has always been unknown to future users because they are not able to follow the thinking of designers of information systems. The first time users are active participants in this part and for the first time designers of the information system draw out of their experience and knowledge about specific company i.e. out of their images. Through the identification of entities, i.e. through the definition of objects of interest for the observation and the definition of links ER model is defined, by the top-down procedure, i.e. by an interview with the future users.

ER model or Entity diagram is modeling techniques describing the structure of the data as a function of business rules processes or organization. Structure of data defines the entities, attributes and links between the entities. Then, entity diagram determines the logical limitation on the data, which define the business rules, as well as the operation for maintenance and research of the database.

By ***the creation of the attributes*** we got a description of properties in the previously defined entities. Properties of entities are defined through the identification of attributes for each entity, define the appropriate keys and the implementation of the normalization process. This sub activity is performed by bottom-up procedure, i.e. by the analysis of documents.

Defining of business rules is a synthesis of two previous sub activities and needs to define business limitations and behaviour rules [1 - 12].

In the implementation of working process of the football club in the part of the organization of data is used the information modeling standard ***IDEF1X*** *(eXtend)* realized through ***ERwin*** tool.

In Figure 1 is presented the information data model of ISFC. In order to achieve more optimal organization of system data in the information model was included 21 entities. Entities may be numerous, but in the implementation of this model they took into account the possibilty of football clubs with modest incomes, so a compromise solution was made.

III. IMPLEMENTATION OF ISFC

Implementation of IS was done by generating a database scheme, development of application and creation of reports.

Based on the information model, done in ERwin programme with the known procedure, automatically is created the database in the programme for management with the database - MS Access. In that way was avoided explicit manual creation and filling tha tables with the names of attributes, their types and lenghts, which is the main feature of ERwin programme. ***By creating a database scheme***, entities are put into tables, attributes into columns and connections in relationships. In Figure 2 are presented the Relatioships between tables of the football club database.

Applications were made on the basis of a created database scheme with the ability to set specific requirements of future users. This activity was carried out with all specifics of the selected MS Access of DBMS system. In doing so, they defined menus and attractive shaped forms. Defining of menu and movement through application was done in a way to reflect the logical way of work of user application. Screen forms, as one of the main types of objects in most DBMS systems, enable the user to read and present the data from the database, as well as enter of data into the database. Forms contain a certain number of other objects (controls).

Creation of reports was also done with all the specifics of the selected DBMS systems. Reports are the ultimate, most commonly the printed results of the execution of an operation. May contain data both from query results and starting tables, and generally consist of one or more [7, 8].

IV. APPLICATION

The application was obtained by transferring ERwin model in programme to manage the database MS Access (Figure 2). Handling the database is organized by opening the form in depths up to four levels. The design of form enables the quick and efficient work with the IS database. When opening the database automatically is open the main form (Figure 3). Via the main form is activated any of the forms whose names are printed on the labels along the appropriate command buttons. Each form though the command buttons enables further opening of sub-forms or the final forms. In order to clearer presentation of materials, an application part is organized in a way that next to each form is one of its final form. In further presentation in brief are described some of the properties of a series of application forms, which are selected in a way that through of them can be seen the manner of operation of the ISFC as a whole.

Form ***Gaming staff*** (fig. 4) includes buttons *Players*, *Health bulletin* and *Prohibitions*. Activating of these buttons open the appropriate forms containing the personal and professional data about the footballers (place in a team, selection – a category of players), evaluation of ability to play based on carried out medical

examinations, a player's form and eventual medical or sport bans to play. For example, activating the button *Players* opens the same name form (fig. 5) for input, review and updating of basic and professional data about the players of all selections of the clubs (cadets, juniors and seniors).

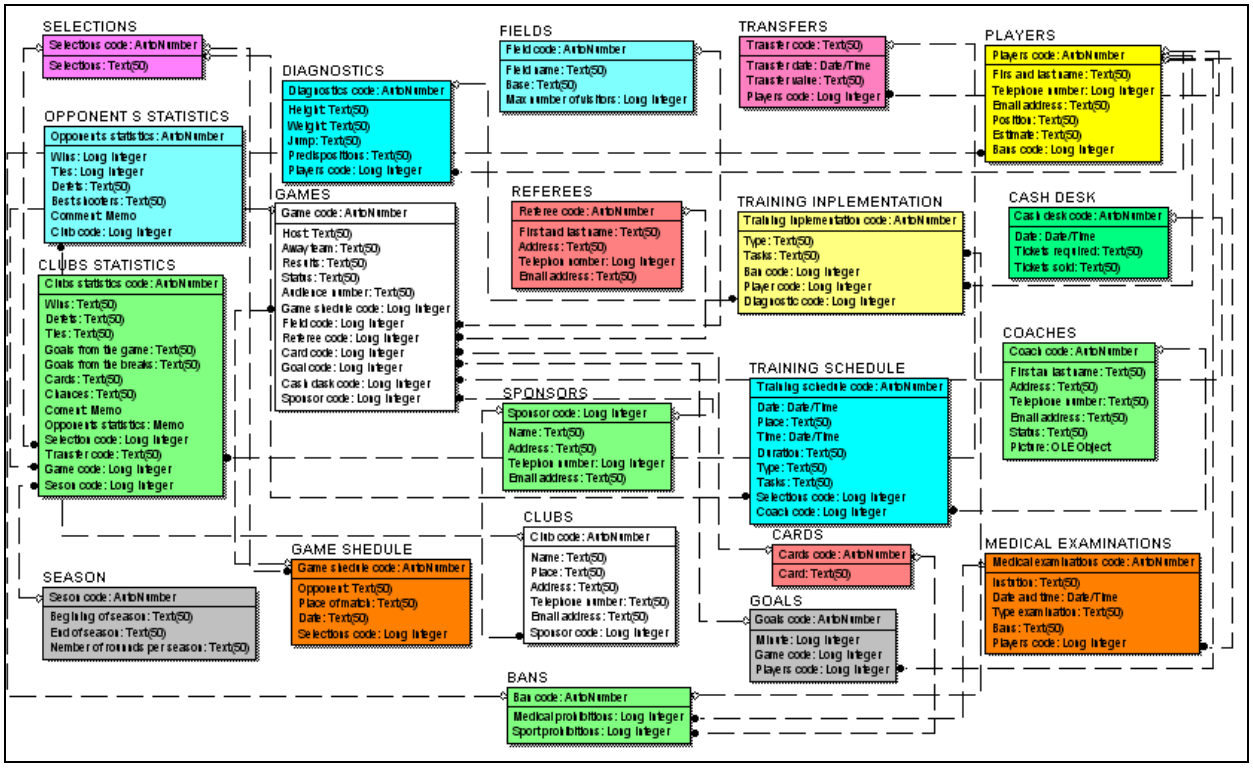

Fig. 1: Information model of FCIS data

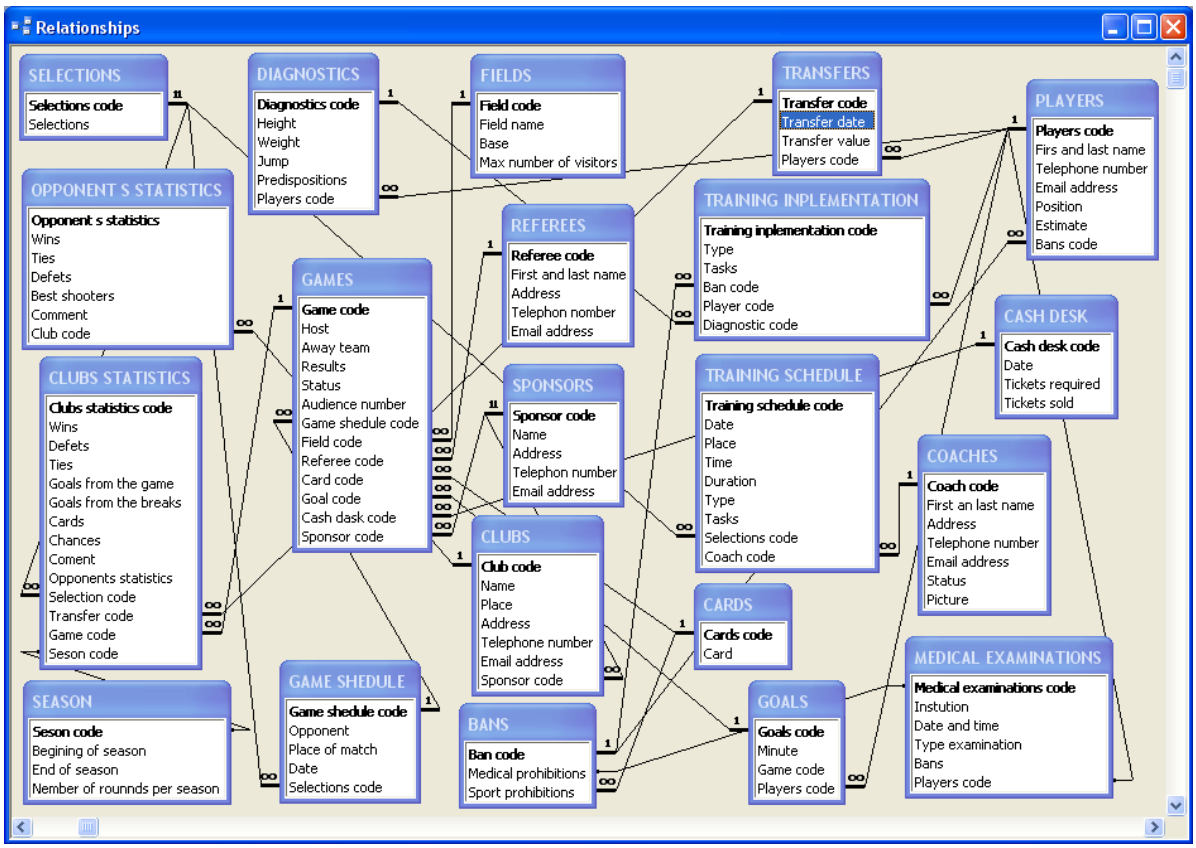

Fig. 2: Relationships between tables

Form ***Matches*** (fig. 6) include the most important information related to the club competition that is achieved through the final form ***Match***, ***Game schedule***, ***Season***, ***Goals***, ***Cards*** and ***Referees***. From the set of these forms is selected and displayed a form ***Match*** (fig. 7). In it are written the data on the date of the match, on the opposing team, about the achieved result, the sponsor, the referee, the selection of players and number of spectators. Form ***Training work*** (fig. 8) includes buttons *Coaches*, *Training schedule* and *Training realization*. Button *Coaches* open a form for input, updating and overview of data about the coaches who work at the club. Here are recorded both the personal data and the data on professional status of coaches. At the same button *Training schedule* opens the same form for input, updating and overview of data of the training schedule (fig. 9). In the form of ***Training schedule*** is recorded the location and duration of training and is carried out the selection of categories of players and coaches. From the form itself can be created and printed a report with information on training schedule [5]. Through the form of ***Training realization*** coaches evaluate the performance of the implementation of trainings and record observations about the training that can be used for corrections in the training process.

Diagnostic and statistical data based on which is assessed the physical and psychological readiness of the team that possesses this IS as well as the opposing team get through the form ***Sports statistics*** (fig. 10). It opens the following final forms: ***Team's statistics, Opponent statistics*** and ***Diagnostics***. Form of ***Team's statistics*** (fig. 11) is used for input and updating of data related to monitoring of efficiency and elements of team play and individual players depending on the position in the team. An important data is the comment that points to the elements in the game of the team that needs to be improved. ***Opponent statistics*** enable the monitoring of game of the opponent and preparation of the club for the match. Opening the form of ***Diagnostics*** is obtained an overview into the indicators of functional abilities and results of anthropomethrical measurements of the gaming staff.

Fig. 3**:** *Main form* of user application

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Fig. 4: Form *Gaming staff*

Fig. 5: Final form of *Players*

Fig. 6**:** Form *Matches*

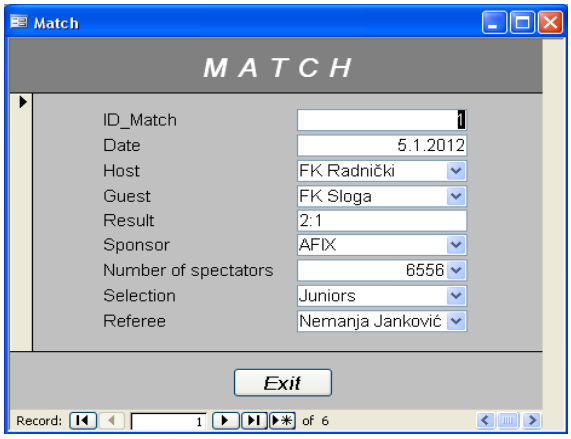

Fig. 7**:** Final form of *Match*

The application has a series of reports created by the query, subforms and final forms that you can get the full overview or an overview by date of the: carried out medical examinations, performed training or schedule of match. There were selected and presented reports on ***Medical examinations*** (fig. 12) and ***Training realization*** (fig. 13). Report on ***Medical examinations*** provides presentation in health of the gaming staff. Specifically, this report is a record of the medical examination of players, the institution in which the examinations have been carried out, types of examinations and medical reports.

Fig. 8**:** Form *Training work*

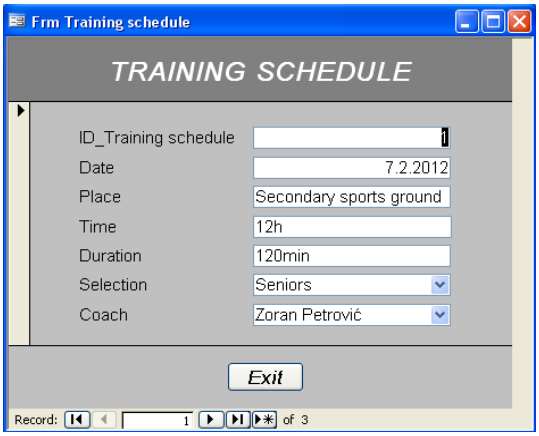

Fig. 9: Final form of *Training schedule*

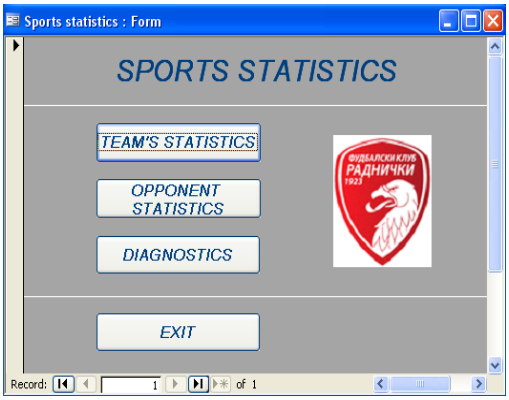

Fig. 10: Form *Sports statistics*

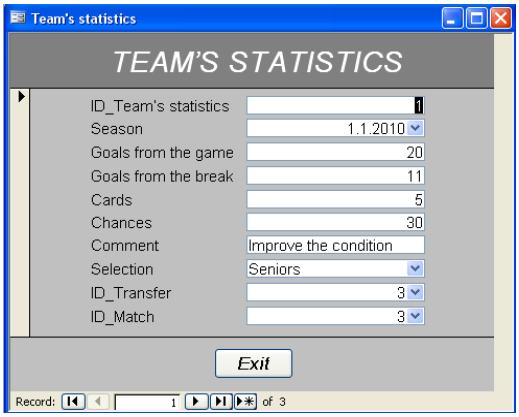

Fig. 11: Final form of *Team's statistics*

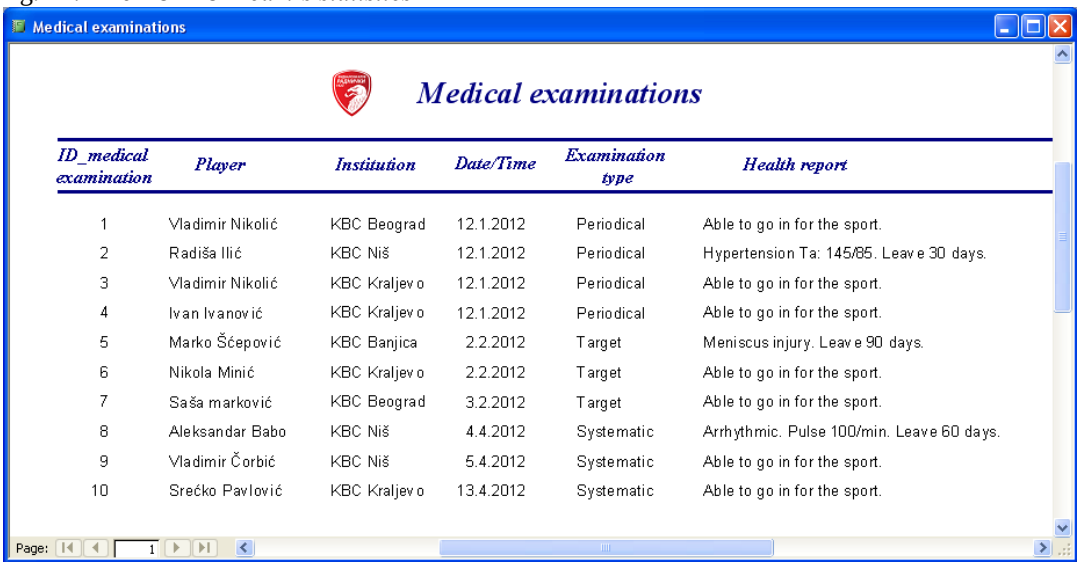

Fig. 12: *Medical Report examinations*

Fig. 13: Report *Training realization*

It's of interest to analyse the report ***Training realization*** which provides an access to the place of training, the type and duration of training, the task of training, the selection of the team that has made training, a coach, as well as the codes of prohibition and diagnosis of some players.

One of the features of MS Access programme is moving through the application via the form which in scenic way present the work of the system. In addition, there's done the optimal choice of form, the final form and report, so the description of application in more details was superfluous in this study. In any case, the remaining forms, subforms and the final forms of application, as well as their detailed descriptions can be found in literature [4, 5, 9 -12].

V. CONCLUSION

In this paper is done the information model of ISFC data and applicative programmes on the basis of the drafted data model. The data model was done by the IDEF1X standard in accordance with the defined entities and their attributes and includes 21 data tables. With the created relationships among the tables is insured the date integration. Development of applications based on the data presented model was done in a relational database including the MS Access programme, which has provided all the necessary resources for the implementation of applications. The structure of the application is set up to provide organizational unity of sports, business and administrative part of the system, grouping the appropriate options of programmes into seperate mini units. Thus is provided access of the thematic organizations to the segments of application by certain categories of users.

The study of database is the organized system forms in depth of performance, allowing users the selection in

access to the options of the programme. In this segment are developed the thematically grouped forms which enable the rapid access to some forms of data manipulation.

ISFC was implemented to the FC of Radnicki 1923, a member of the first division of Serbia. Probationary filling of table was simulated and tested the work of application in real conditions in general. Through the practical application of this system will be eliminated mistakes and failures that are likely to have been in the design process, which is, otherwise, constant occurrence in this kind of work.

The authors of this work are expected that the system will get the full verificaton through wider application, which will achieve the goal of this project – the improvement of football in Serbia

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