

MODEL AND IMPLEMENTATION OF INTELIGENT INFORMATION SYSTEM OF E-BUREAU

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The paper presents selected results of model and implementation research concerning the design of a management information system (MIS) to support the functioning of office administration offering sale of services. The application was tested with view to implementation in the Association for Promotion and Scientific Innovations Implementation (AP&SII or Association). The following issues were discussed: methods of organization management modelling, suitable software, available tools supporting modelling, methods of implementation of models in organization systems, etc. E-Bureau information system is an application developed using Eclipse platform with the following plug-ins installed, namely Data Base Development Tools and PHP Development Tools. The system is based on libraries, i.a. Zend, Bootstrap, JQuery. The following programming tools were used: CSS, JavaScript, HTML, PHP.

Keywords: e-administration, e-Bureau, management information system design, business process modelling, electronic knowledge management

1. Introduction

System development modelling, including organization systems is usually connected with the need to carry out an initial study concerning the behaviour of a given organization in various extraordinary and extreme situations. The base serves

to develop a model of the system to be used for suitable experiments, including analytical and simulation research. With respect to control of organization system development, the model may be used for testing various parametric changes as well as structural changes that occur in the real developing organization system.

As regards market economy, organization systems are immersed in the information-decision system of economic processes. Therefore, according to systems development engineering, development processes may only be observed in long time θ . Each organization system may be viewed from two points, namely, from the point of a system of a given organization and its environment as a system. In the first case, the model of the system may be defined based on the requirements and needs connected with supply, and with its operational (production) capability. In the latter case, the model of the system may be defined based on the environment demand for products offered by a given organization system and on the environment's capability to satisfy the organization system's needs. Therefore, two models of organization systems may be developed, with the specified areas of potential directions of organization system development resulting from the comparison of the above mentioned two models.

Model analysis of organization systems profiles is, therefore, connected with the need to conduct detailed identification research concerning closer and further environment of the organization system, which causes entrepreneurs to invest in the office management systems that handle all aspects of organization system functioning, causing them to use information resources at their disposal effectively, and perform analytical and development research, etc. [4].

Information system as an information-decision system is a developing system, which underwent 5 stages of development. Literature distinguishes record and reporting systems (RRS), management notification systems (MNS), decision support systems (DSS), systems with knowledge base (SKB) and expert systems (ES) [7, 18-20].

At present, information system designers are required to orient software at knowledge bases and equip software with development-related elements such as the system's ability to learn and adapt during software execution. For these reasons, systems implemented at present, either systems with a knowledge base or expert systems possess knowledge acquisition mechanisms for knowledge obtained from various sources, which knowledge is processed by means of sophisticated logical technologies [7, 18-20], and made available to recipients in various user-friendly forms, including graphical forms. They are also equipped with explanatory modules used for the interpretation of the obtained expert opinions and evaluations.

Realization of systems with knowledge base or more modern expert systems requires high computational power and equipping tool environments in highly specialized and high-level programming languages. An important system that supports management information systems design is an environment known as *Computer*

Integrated Manufacturing (CIM). A useful technology used to support decision-making, during isolating and making data available, is *Data Mining (DM)*. Data processing in this technology involves selection followed by knowledge exploration [1-7, 18-20].

Another up-to-date IT technology is multi-agent programming environment, called Software Agents (SA) [8-11], where Agent is a unit operating in a certain environment, equipped with communication skills, monitoring the environment and making autonomous decisions to reach programming assumptions, that informs and reacts to changes. One of agents used to support office work is an agent for information management (electronic mail - messages filtration, daily schedule organizer) [16]. When a piece of information with a specified structure is obtained, a specified activity is performed, e.g. a relation between an order and information that the product is out of stock. Systems that acquire knowledge through experience known as *Artificial Neuron Networks (ANN)* are an advanced technological form.

While not exhausting the rich literature available on the subject, it is worth mentioning that *Integrated Management Information System (IMIS)* are the most sophisticated tools to support management process due to the complexity of service provided for the organization structure, data integration, and tasks performed within the organization (electronic transfer of documents), etc. Interconnected subsystems that belong to the integrated structure are Integrated Financial Planning System (IFPS) and Integrated Marketing System (IMS) [16].

A model developed to support the work within the organization is, i.a., OLAP, a system for analytical processing of data. Development of technology provided an opportunity to use information systems in practice in smaller companies. One of more important and more sophisticated technologies is OLAP (*OnLine Analytical Processing*), which allows for intuitive analysis in order to support management notification systems, or decision-making that is based on utilizing huge amounts of information customized to different needs individual users have [15-16].

2. Modelling processes in e-Bureau

E-Bureau electronic system design oriented at a specified organization, e.g. the Association for Promotion and Scientific Innovations Implementation, should be based on the results of the initial identification of the internal organization system of the Association as well as the system of its development control.

The problem formulated in this way, requires conducting the information identification of both the Association and its connections with its business partners. In this case, *realization of projects aimed at development of process-based organization makes reference models, which contain broadly understood organizational knowledge gain more importance. On the one hand, models of this type contain methodological knowledge related to organization functioning, on the other hand,*

they make a kind of tool for organization knowledge management, or a tool for changes management [4].

The association, as organization system is divided into integrated modules in an office unit. Thus, the first stage of pre-implementation steps was to analyze the functioning of its internal organization, which required obtaining the answer to the following questions: the object of the analysis, the reasons for conducting the analysis, time frames, scope and method of implementation as well as functional analysis of its control system. Therefore, work done during the development of the model of the Association's organization system and the system that controls the development, were, out of necessity, oriented at the organization's real demands specified during the pre-implementation analysis phase.

3. Implementation of the organization system e-Bureau

The following programming environments [5, 13, 16-17, 20] were used for the purpose of the configuration and implementation of the organization system e-Bureau (some results is shown in fig. 1-7 – source [16]):

- 1) XAMPP – as a platform to run the application written in, i.a. PHP, which application contains: Apache server with PHP implementation, MySQL database server, FileZilla server that allows access to the application with FTP (e.g. for remote repairs and maintenance), application for MySQL database management, phpMyAdmin and mail server Mercury as well as application server Tomcat.
- 2) DataBase Development Tool – as an element of a project implemented to facilitate the work of the application with large datasets.
- 3) Eclipse DTP – as a complex tool that comprises numerous components, i.a. framework tools for the development of expert systems for the management and transformation of models. Eclipse PHP Development Tools Project is the best of open source PHP Integrated Development Environment (IDE) tools. PDT ensures that IDE can use basic code editing options.
- 4) *MySQL* – as a relational databases management system, tools implemented in C/C++ languages, equipped with an interface for application programming in PHP.
- 5) PHP – as an object programming language for developing webpages and management in real time, compatible with XAMP server.
- 6) PDT - PHP edition with syntax highlighting, Java Script with syntax highlighting, HTML with syntax highlighting, PHP code completion from available code and auto-formatting templates, base for Zend Studio - extending PDT by numerous additional functions.
- 7) *Zend Framework* - a library that supports the development of webpages in PHP language, which requires that the applications be created according to the following pattern: model-view-controller. This ensures that the dependence

between the base structure and the graphical appearance of the application is minimal (e.g. changing the database engine from MySQL to Oracle does not require making major changes in the user interface).

- 8) *Controllers as a component that contains controllers*, i.e. classes that connect models with views. In order to use MySQL database as a warehouse for the application developed using Zend Framework appropriate entries were made in the configuration file, which enabled handling and implementation of forms, followed by validation and activities to enable handling by means of one interface. Graphics (presentation of elements - font type, text colour, margins) of the developed system was defined using style sheets. *Cascade Style Sheets (CSS)* applies to a language for presentation of the graphical aspect of a webpage. Style sheets is a list of directives that organize the way the page is displayed by the web browser. Separation of page structure and the visual form increased the availability area and facilitated making changes in the code of the document. The use of CSS allowed to make changes to the page appearance, and, simultaneously, display the page on many mobile devices.

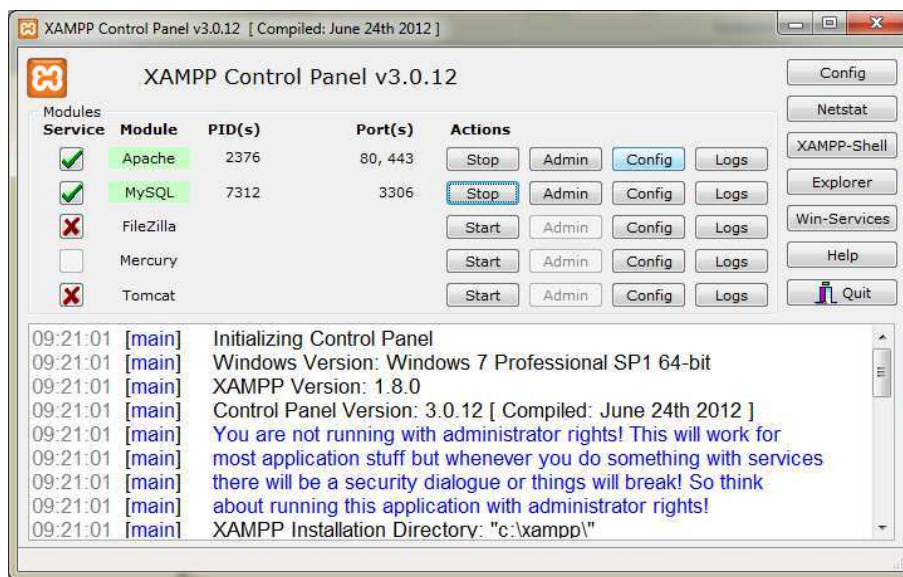


Figure 1. XAMPP - Programs package

- 9) *JavaScript (JS)* as a scripting programming language, is most often used for developing webpages. In this project, scripts are used for ensuring interactivity by reacting to events. JS checks correctness by verifying forms. An important assumption during the development of the system's functionalities was an

assumption that the elements of the service can be displayed when JS handling is disabled.

- 10) *Bootstrap* as a library published by Twitter (in order to make use of the potential this library offers, one needs to write correct HTML code and place references to *bootstrap.js* and *bootstrap.css* in this code), which enables efficient preparation of a professional webpage while eliminating problems connected with the graphical interface of the applications being developed.

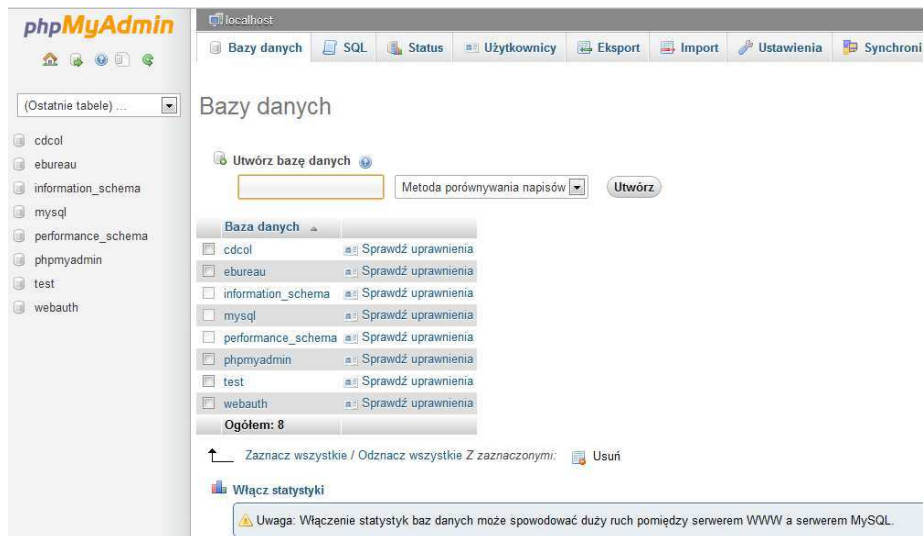


Figure 2. *phpMyAdmin*



Figure 3. Product

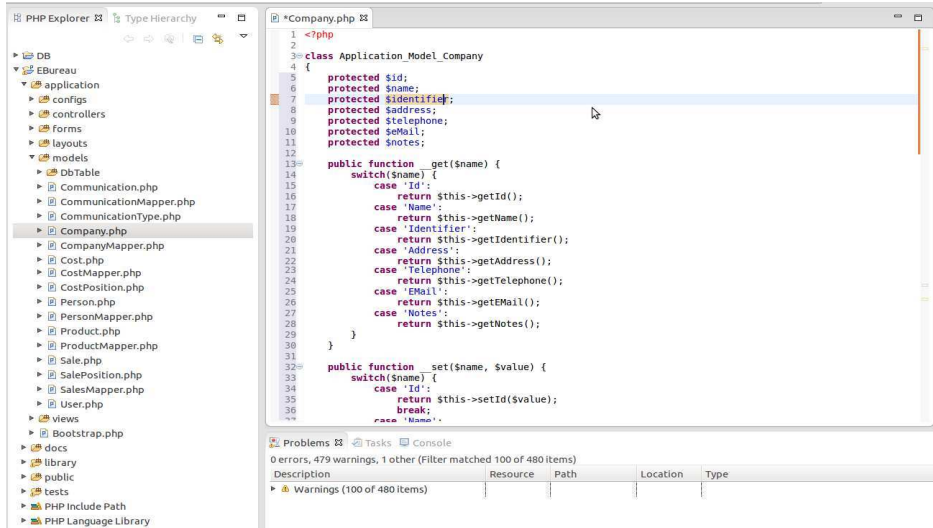


Figure 4. Company

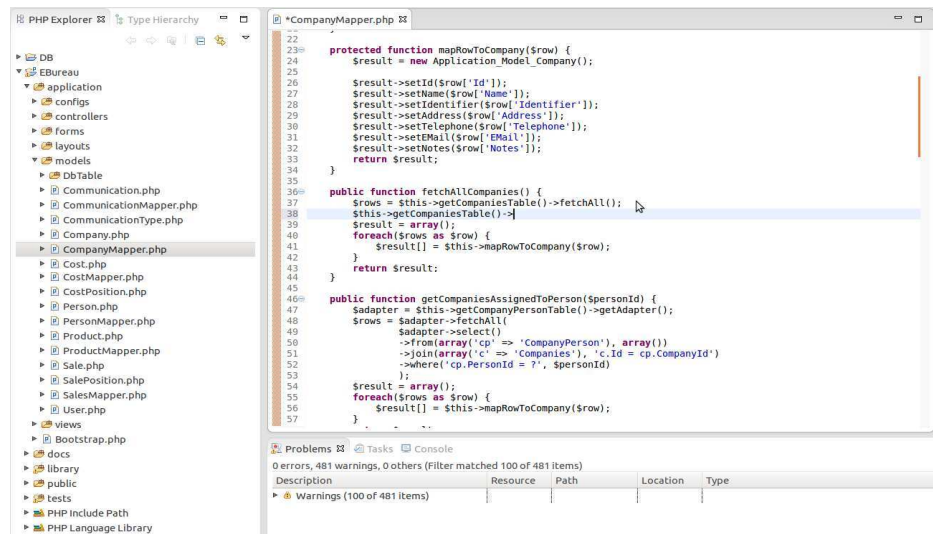


Figure 5. CompanyMapper

- 11) *jQuery* as a library that facilitates writing scripts in JavaScript language. The library helps to simplify complicated modules, enables the use of animations, dynamic changes on the webpage without making changes to HTML code [6, 16]. *jQuery functionality* is obtained by: selectors - selection and operations on the DOM tree; attributes - processing node attributes, extending events handling [4].

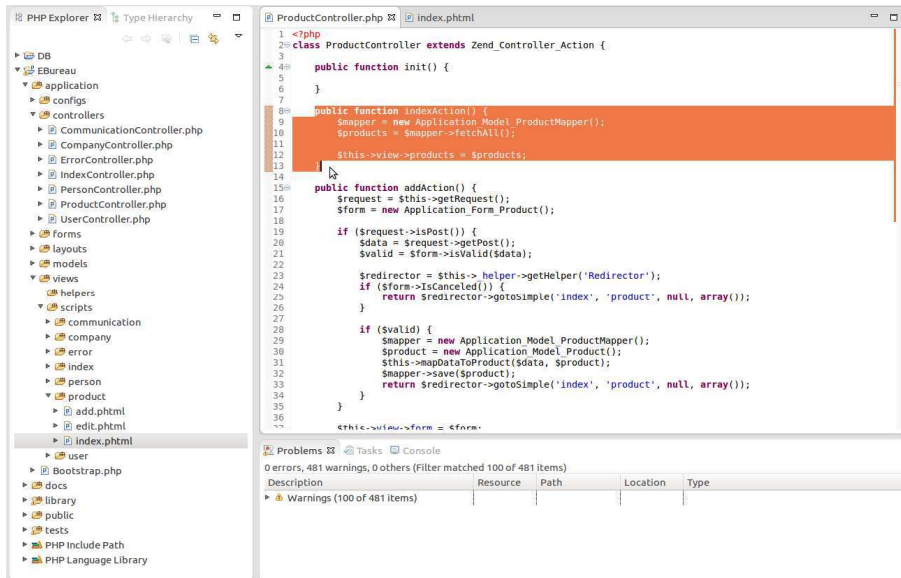


Figure 6. ProductController

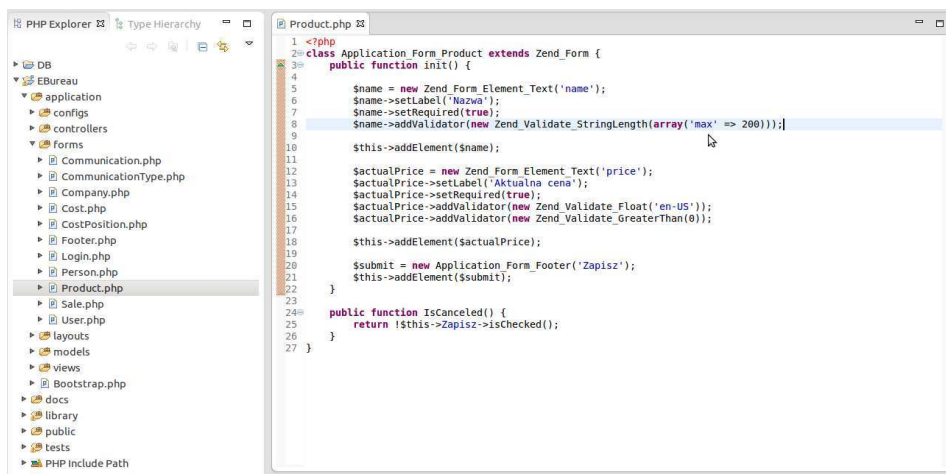


Figure 7. addValidator

- 12) DataBase Development Tool as a project implemented to facilitate the work of the application with large datasets.
- 13) Eclipse DTP as a complex tool that consists of components that can be used for development and that have numerous useful structures e.g. open source framework for the management and transformation of models to the required forms.

- 14) ZF – as a system that contains a set of classes enabling Forms handling. The names of these classes begin with Zend_Form - a class that represents a form as such, its most important methods are addDisplayGroup() - adds section to a form, addElement() - adds an element, init() overwritten in inheriting classes, used to initialize forms (mainly to add elements to a form).

4. Conclusions and directions for further development of the product

- 1) At present, there can be observed an increased interest in organization systems, especially as new possibilities connected with the design and development of systems oriented at large knowledge bases and expert systems emerged.
- 2) Organization system E-Bureau is an attempt at initial implementation of the organization system oriented at large knowledge base management.
- 3) E-Bureau consists of the following modules: *Creating task schedule, Assigning people to tasks, Defining types and adding tasks, Address book of employees, Address book of contractors and clients, Assigning people to companies, Defining companies, Sales, Costs.*
- 4) Implementation of the E-Bureau application connected with pre-implementation elements may be further developed by adding additional modules facilitating administrative work e.g. *Reporting, Synchronizing schedules with overseas offices located in different time zones, Client zone offering finished products whose reduced functionality versions may be tested (prior to buying full version)*
- 5) Both the E-Bureau project and the implementation of its modules was initially tested, and, in its present form, can be implemented in the AP&SII organization.
- 6) The introduction of information systems that facilitate the organization management allows to save money and time.
- 7) The future belongs to solutions that combine technological and business aspects – soft relations in interpersonal communication, especially in the structure that consists of many units, and organization systems like E-Bureau may become the main tool used to manage knowledge in micro organization systems in the future.

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