

## An Information System for Assisting European Union Organizations Interaction

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### Introduction

Bulgaria's integration in the European Union arose the necessity of restructuring the business according to the European laws. Many Bulgarian organizations are not familiar enough with the laws and the changes they need to make in their businesses in order to comply with the new requirements and to be competitive on the large European market. Searching and obtaining the required information costs time and resources. Information technology presents the opportunity to optimize the time and cost for gathering and processing of the information.

### 1. Method of approach

An information system for assisting the European Union organizations interaction has been developed. It combines several different areas into a unified system of information. The product distinguishes the four general sections because of their four different applications:

1. EU Funding – this section provides information about project funding. Users interested in this information are mostly companies willing to apply for financing projects.

2. EU Jobs – this section provides information about the possibility to apply for a job position in the European Union. Clients of this section would be individuals looking for opportunities in countries that are members of the EU.

3. EU Learning – this section provides information about possibility for education in higher educational institutions in the EU. The information would be useful for current students abroad or individuals willing to study in the EU.

4. EU Law – this section is for clients (individuals or companies) looking for detailed information about the European Union laws about specific questions, which can be asked by the clients themselves.

## 2. Access level types

After analyzing the functionality and the possible ways of accessing the system information the following access level types were set:

- Unregistered users – they can see only a small part of the information in order to become familiar with the system.

- Registered users – the registration is free of charge. The users receive a username and a password in order to log into the website. After logging into the system they are able to view much larger parts of the information, but not all of it.

- Paid users – payment is separate for each section. The users will be able to access the entire content of the section that they have paid for. In all other sections the system will recognize them as registered users and will grant them those level privileges.

- Super users – they can access the information in all sections of the website. They have access to the control module, which is used for editing and adding information to the website.

The user can register one account in the website with a unique e-mail address. Defining his access level type for each section is achieved through binary fields in the database table that contain information of whether he had paid for that particular section or he has a free of charge registration. In this way the registration process is kept simplified for the users, which is very important for attracting more users to the website.

## 3. Database design

A database has been developed for the functionality of the website. All the information is held in a single database. It contains the following relations, described by five sections as follows.

### 3.1. Relations used in the EU Funding section

Advice – contains recommendations for preparing the application documents.  
DBPrograms – contains information about the applicable projects for financing.

IndividualSearch – contains the data of the individual user queries. After the query is accepted, an operator sends the necessary information to the user.

Requirements – requirements for application for individuals, and companies or organizations.

Tools – contains information about the necessary documents for the application.

Training – information about educational seminars.

### 3.2. Relations used in the EU Jobs section

DBJobs – information about the available job positions that the users can apply for.

DBJobs\_cat – categories that can be used for sorting and searching job positions.

Seminar – information about seminars that educate users about the required qualifications for applying for a particular job position.

Tests – data (questions, correct and incorrect answers etc.), requisite for taking the online qualification test for users. In order to take an online test the user must be registered.

### 3.3. Relations used in the EU Learning section

DBSchools – information about the universities and the available programs.

LfromPDF – holds names of the files that contain the requirements for application to that specific university. The files are in PDF format and available to be read online.

### 3.4. Relations used in the EU Law section

LawFromPDF – holds names of the files that contain particular laws. The files are in PDF format and available to be read online.

### 3.5. Relations used in more than one section

Countries – a list with the names of the countries used in the Jobs section or EU Learning section.

FAQ – Frequently Asked Questions and their answers.

News – the news shown on the website.

Register – information for the registered users – private data, username and password, sections that they have paid for and additional information.

Texts – the texts shown on the different web pages.

## 4. Website structure

The project practically consists of four separate websites unified by the common design and using the same database. This is the reason why the four sections use the same classes. This makes it easier to add or change frequently used functions such as database queries, paging and error reporting. The project uses the following classes:

- mysql.class – all queries in the website are handled by a mysql object. This approach helps to avoid defining of the server address, the database name, the username and password for each query, which besides being a security threat for

that data, would require many efforts from the programmer if the website should ever be transferred to another server. The class contains a function that accepts the query as a parameter and returns its result. The function is used for connection to the database and returns an error if such connection is not achieved.

- `reg.class` – objects from this class are used for maintaining the user data. This includes the initial registration of the user, changing the user data and the data validation upon registration or change. Functions of this class are also used for sending validation e-mail upon registration as well as activating the user account after the validation e-mail and the requested action from the user – clicking on a hyperlink in the validation e-mail.

- `login.class` – used when the user logs into the system. Checks if the username exists in the database, if the submitted password is correct, and if the account is active. It allows the user to login if all the requirements are met.

- `error.class` – used for error reporting in the whole system. Contains one function that shows an error message depending on the error code, for example “The webpage you requested was not found. Please check the URL and try again”.

- `paging.class` – used for splitting long lists into pages in order to prevent accumulation of too much information in one page, for example news, jobs, universities. Contains one function that splits the data in pages depending on a variable.

- `test.class` – used for calculation of the number of correct answers given by the user in a test.

- `news.class` – used for displaying the latest news in the upper right cell of the website.

## 5. Organization of the information

Most of the web pages in the project contain text only and the information organization does not require special attention. But some web pages require different organization based on the type of information they present. In some cases the user should be able to communicate with the system – to define criteria, take a test or send a query. This article reveals the organization of the web pages that contain not only text but menus for choice, filling forms and others:

- News – news are a necessary part of each website with dynamic content. For most of the users, they are criteria if the website is regularly updated. The news should be easily viewable and accessed from any web page in the website. This is why a special place is provided for them in the right section of the website, where short excerpts are shown no matter which web page the user is currently viewing. They are in a separate cell, constantly scrolling from the bottom to the top of the cell and in that way drawing the user’s attention. When the mouse cursor is moved inside the cell’s outline the news scrolling stops so the user can read the news or choose a hyperlink. When he clicks on such a hyperlink he is redirected to a new web page where he can read the entire news article.

- User data – when a client identifies himself before the system with his username and password, he is given an option to edit his personal information and change his password. When the user clicks the PROFILE hyperlink, he is redirected to web page containing his profile information. Here he can edit most of the data he has already submitted as well as his password. The current user’s password is requested in order to change any of the data. The primary username that the user entered upon his registration cannot be changed in order to make it easier to maintain the accounts and avoid problems with forgotten username or its unintended change. On this web page the user can also see information about his current account status – which sections are accessible after the tax payment.

- Individual queries – in the EU Funding section an option has been implemented for individual queries related to particular projects for financing. A web form is used for that purpose, where the user should enter his First Name, Last Name, e-mail address and the question. In order to do that the user should be already registered and logged into the system, but in the process it was decided to avoid the automatic choice of the already registered e-mail because many users are supposed to be a juridical person and may need the answer sent to a particular e-mail address. Individual queries are redirected to a specialist in the field and the user receives the answer on their specified e-mail address.

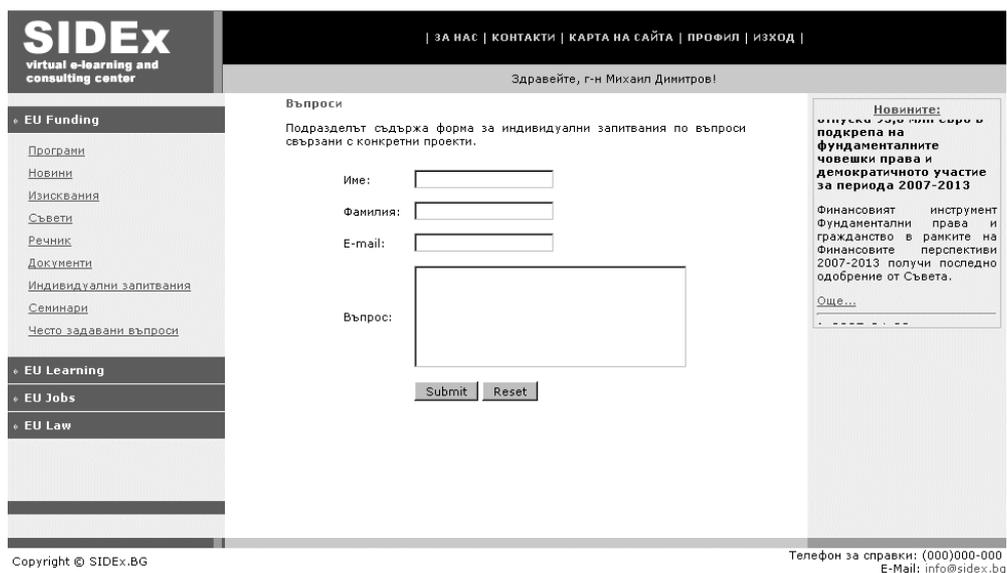


Fig. 1. Individual queries form

- Educational institutions – in the searching process for information about educational institutions the most necessary filter is the country where the user wishes to study. The choice is made through a drop-down menu containing a list of all European countries. After the country is specified the user is presented with a list of all educational institutions within and short information about each of them. Besides the basic information the user also receives contact information for the institution – link to the official website, exact location, e-mail address and phone

numbers. It is possible to view all educational institutions if the chosen option from the menu is “Europe”.

- Tests – the website offers example online tests for the registered users (Fig. 2). The user selects his answers for each of the questions and after he is finished he clicks the “Results” button and receives information how many correct answers he has given.

The screenshot shows the SIDEX website interface. At the top left is the SIDEX logo with the tagline 'virtual e-learning and consulting center'. The top navigation bar includes links for 'ЗА НАС', 'КОНТАКТИ', 'КАРТА НА САЙТА', 'ПРОФИЛ', and 'ИЗХОД'. Below this, a personalized greeting reads 'Здравейте, г-н Михаил Динитров!'. The main content area is divided into three columns. The left column contains a navigation menu with categories like 'EU Funding', 'EU Learning', and 'EU Jobs', along with sub-links for 'Новини', 'Работа', 'Демо тест', 'Съвети', 'Често задавани въпроси', 'Платени тестове', and 'Онлайн семинари'. The middle column contains a series of multiple-choice questions:
 

- When was the European Parliament first elected by direct universal suffrage? (Options: a) June 1979, b) June 1974, c) October 1980, d) February 1984)
- For the Member States, judgments of the European Court of Justice are: (Options: a) binding, b) not binding, c) binding if the Court so decides in the judgment in question, d) binding on some Member States but not on others)
- Where is the head office of the European Central Bank? (Options: a) Paris, b) London, c) Brussels, d) Frankfurt)
- The co-decision procedure introduced by the Treaty on European Union concerns: (Options: a) the European Parliament and the Commission, b) the European Parliament and the Council of Ministers, c) the Commission and the Council of Ministers, d) the European Parliament, the Commission and the Council of Ministers)
- What is the main role of the European Commission? (Options: a) To prepare proposals for rules and measures, b) To apply the decisions of the European Council, c) To apply the decisions of the European Parliament, d) To harmonise the legislation of the Member States)
- Who takes the legal decision on accession to the European Union? (Options: a) the Commission, b) the Council of Ministers, c) the Court of Justice, d) the European Parliament)

 A 'Резултат' button is located at the bottom of the question list. The right column features a 'Новините:' section with a news item dated '2007-04-20' regarding the European Union's budget and a section for 'Финансовият инструмент'.

Fig. 2. Test example

- Job seeking – job positions in the website are arranged in categories. When the user decides to search for a job he is presented with a list of the categories with a specified number of the available announcements. In order to optimize the view the user can see only the title, submitted date and the organization that has published the announcement. When the user would like to see more information about a specific announcement all he has to do is click on its title. In this way he can access the full text of the announcement and acquire more information about the organization. It is possible to directly apply for the position if the user has already created his Curriculum Vitae (CV) in the system. After clicking on the “Apply for the position” button the system sends an automated e-mail to the organization with the user’s CV attached.

## 6. Interface design

The website uses simple and businesslike design to decrease the distraction of the user. The task is achieved by using images only where they are necessary and lots of white fields in the interface. In this way, on a subconscious level, it creates the feeling of actually reading documents which leads to more serious attitude and understanding of the websites purpose. The interface theme is constructed in this way so it can be easily replaced with minimum efforts numerous times.

## 7. Paging

Often the amount of the information that is presented to the user is too large. Such an example is the view of the available job positions after selecting the category. Accumulation of texts that are too large on one web page leads to an almost impossible search for a specific piece of information. This is the reason for implementing paging for the presented information in some cases (Fig. 3).

The screenshot shows the SIDEx website interface. The header includes the SIDEx logo and navigation links: "ЗА НАС", "КОНТАКТИ", "КАРТА НА САЙТА". The main content area is titled "Новини" and displays a list of news items with pagination controls "Page 1 2 Next >>". The sidebar on the left contains navigation links for "EU Funding", "EU Learning", "EU Jobs", and "EU Law". The right sidebar features a "Регистрация" form with fields for "Потребител:" and "Парола:", and a "Login" button. Below the registration form is a "Новините:" section with a highlighted news item: "2007-04-19 - ЕС-Русия: Съветът одобрява сключването на двете споразумения за визови облекчения и реадисия на незаконни имигранти". The footer contains copyright information "Copyright © SIDEX.BG" and contact details: "Телефон за справки: (000)000-000" and "E-Mail: info@sidex.bg".

Fig. 3. Using paging in the system

## 8. Security

One of the most important elements for a website that contains user data is its protection. It is decided to locate the website on two servers in a local network. The database server and the control module will be disconnected from the global network and the possibility of hacker attacks will be eliminated. The second server which will be connected to Internet contains only the PHP files for the website. The only way to access the database from the global network will be using PHP queries. After examination of the main and most used attacks on PHP4 the following security measures were implemented:

- Server-side data validation – all the data submitted by the user that should be recorded in the database is validated by the server before it is used for any activities. This eliminates the risk of entering invalid data that can lead to database failure or unauthorized access. The data validation prevents SQL-injection attacks to the database that aim to inject malicious code as a value of a variable.

- Disabled `register_globals` – when this PHP option is enabled it allows access to each EGPCS (Environment, GET, POST, Cookie, Server) variable anywhere in the application. This allows unauthorized access to the website information including user data.

- Using `$_POST` where it is possible – `$_POST` and `$_GET` are the two methods used by the users to send data to the application. When using `$_GET`, the variables names and their values can be seen in the URL of the site and can be altered which is a potential security risk. When using `$_POST` the names of the variables are hidden from the user which lowers the risk of altering their values.

- XSS attacks prevention – the purpose of this method is to add and show unwanted code on the website (advertisements or links to other websites for example). This code is mainly submitted through forms and contains HTML tags or JavaScript. To minimize the possibility for XSS attacks to the website all the tags are removed from the data stored in the database. For this purpose, the PHP `strip_tags()` function is used. In addition to that, the `htmlspecialchars()` function is used to convert all the symbols into their HTML equivalents. The `trim()` function is used on some variables to remove all spaces and empty characters before and after their value.

- CSRF attacks prevention – these types of attacks send HTTP queries on behalf of another user and are used in websites that require user authentication. The purpose of this attack often is acquiring the user password. In order to remove this risk for all main activities on the website the user is required to enter his password (for changing user's personal data for example).

- User IP addresses logging – in case the website protection is penetrated the hacker can be traced back through his IP address and be held responsible for his actions.

## Conclusion

This publication examines a question of present interest for the countries that are going to integrate into the European Union. The project presents the opportunity for the companies and the citizens to examine the EU laws and requirements before taking any action. A web-based software product has been developed to be used as a universal database for questions, related to the EU. An effective solution that meets the user requirements has been presented. During the development process, special attention has been paid to the methods of presenting the information. A user's guide has been supplied for users who can't manage working with the website. The most common attacks against web-based applications have been examined and a security solution has been developed. The web-based system is a completed product that can be extended in the areas of WAP, subscribing for messages, news in the legislations and others.

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## Информационная система, помогающая взаимодействиям с организациями Европейского союза

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### (Резюме)

Работа рассматривает вопросы, связанные с интегрированием болгарских граждан и фирм в Европейском союзе (ЕС). Разработана информационная система, которая помогает взаимодействиям с организациями Европейского союза фирм и граждан в четырех основных деятельности: проекты, финансируемые фондами ЕС, юридические услуги по законодательству ЕС, предложения для работы в ЕС, обучение в высших учебных заведениях ЕС. Подробно обсужден интерфейс системы, защиту сайта и персональной информации потребителей от нежеланного доступа.