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# E-Assessment and e-Survey system

Technical offer for lot 3

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Skopje, 12.06.2008

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## 1. Modern way of data gathering and analyze

In the past two decades lots of changes happened in the society in which we live. Those changes also affected the way how organizations operate in commerce, public administration, education, and in science and engineering. Many of these new developments are fuelled by: market globalization, enhanced meaning of knowledge, and information and communication revolution. Today's companies are not only competing with their local concurrents, but they are forced to expand their services on foreign markets where they are facing with bigger competition. These companies must have the ability to recognize, understand and use very fast everyday opportunities in order to survive in this very competitive marketplace.

During everyday working activities workers retrieve information, act on it and archive it every day. This process, with the manual information gathering, searching, faxing, copying and hand distribution, is costly and time consuming. The inefficiencies of the process, divert staff from the important part of their jobs—making productive use of the information.

In order to survive in today's highly competitive global market place, companies must improve and fasten the process of gathering and analyze of everyday information. Fast and reliable analysis of the gathered information may be a key factor for its productivity, its strength versus competition, and its ability to gain loyal customers. A major goal of information technology is the effective support of a company's business processes, and can be used to improve the ways company information are gathered and analyzed, which will improve customer service, and bring needed flexibility to all aspects of business operations.

eTest is web-based system for data gathering, validation and analysis. It can be used as standalone application, or as application which is integrated in the local company network, or with the local company portal. It is useful for companies which often have needs to gather and analyze data, and make decisions according to those results. Its web architecture, different levels of security offer easy way to create, organize and manage web based questionnaires and after that analyze the results from those questionnaires. The results are also exportable to different tools for further statistical analyze.

## 2. eTest specifications and functionalities

### 2.1. Technical specifications

The system for web-based surveys eTest is realised as three tier Web application. The main reason for its realization as Web application, instead of traditional client-server application, is the characteristics of the Web applications to be installed on one computer, and then used from any computer in the network on which web browser is installed. Installations like this offer very easy application maintenance, because upgrades which are installed and eventual fixes are done only on one computer in the network. The development of new standards which are not dependent on the operating systems makes Web applications accessible from any web browser working on any operating system.

Three-tier architecture was implemented in order to achieve separation of application layer from data layer. This type of architecture offer easy upgrade in the future. The system architecture is shown on Figure 1.

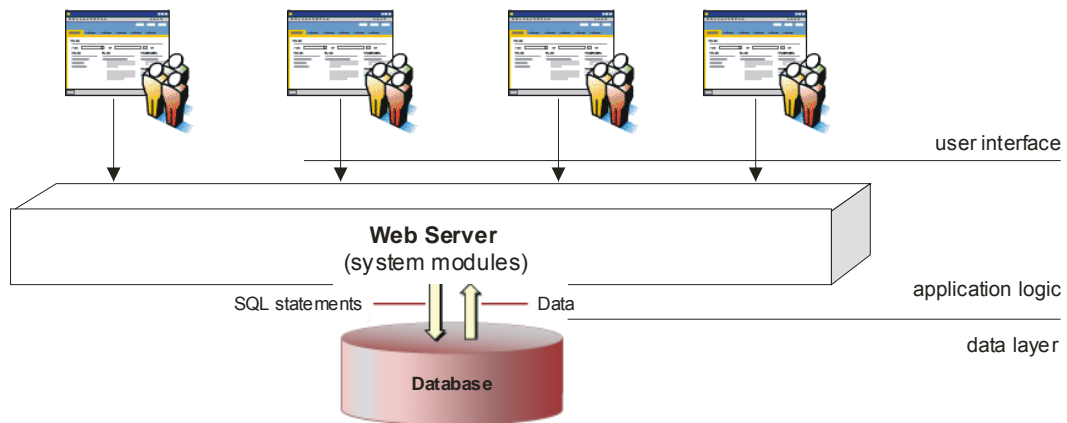


Figure 1. Three-tier architecture of the system for web-based surveys

User interface layer is connected with the application logic layer and is used by the users which submits requests. Any computer on which web browser is installed can be used as a client, and it is not depended on the company which produced the browser. Also any wireless device can be used which has integrated web browser in it.

The application logic layer consists of web server, on which files coded in ASP (Active Server Pages) scripting language are stored. The operating system is Windows 2000 server, with Internet Information Server installed. Other Microsoft operating systems can be used also. The function of this layer is to accept the requests from the user interface layer, generate answer to those requests and send them to the users. This layer can communicate with data layer in order to produce the answer.

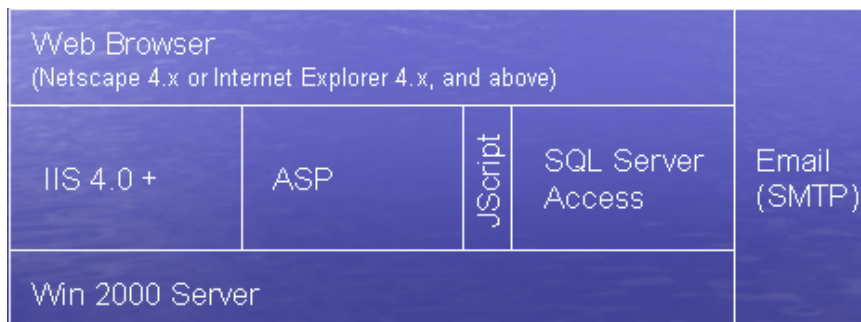


Figure 2. Technologies used for creation of eTest

Data layer consists of SQL Server 2000 database. This database is in communication with the web server on which dynamic web pages are executed, and where the answers to user requests are generated. The communication between web server and the database is using SQL statements.

Technologies used in the development of this application are shown on the Figure 2. On Figure 3, the main page of the application is displayed where users log in.

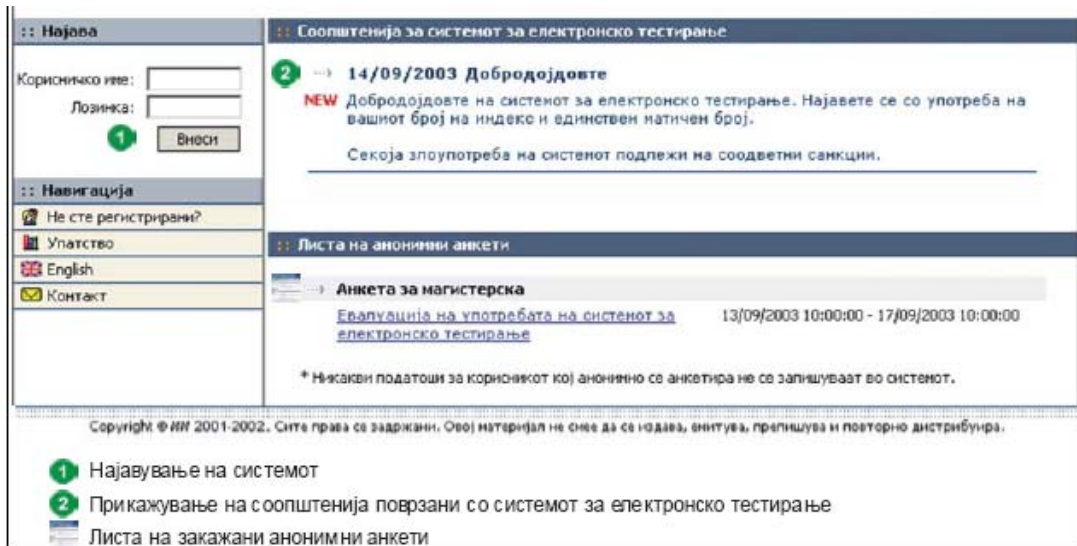


Figure 3. Main Page of the application

## 2.2. System requirements

Recommended configuration for the web server on which eTest will be installed is Windows 2000/XP Server, installed on computer with Pentium 3 800MHz, 256 (MB) RAM memory, и 40GB hard disk space. Minimal system requirements for eTest installation are:

<b>Processor:</b>	Computer with Pentium 4 2GHz or faster
<b>Operating System:</b>	Windows 2000 Professional Server Windows 2003 Server
<b>Memory:</b>	1 GB
<b>Hard Disk:</b>	100GB
<b>Web Server:</b>	Microsoft IIS

As client, the application can be accessed from any computer which have web browser on it. The minimal system requirements every client should have are:

<b>Processor:</b>	Computer with Pentium 4 or faster processor
<b>Operating System:</b>	Any
<b>Memory:</b>	Depend from operating system and web browser
<b>Web Browser:</b>	Microsoft Internet Explorer 4+ Netscape 4+

## 2.3. eTest functionalities

eTest is web-based system for data gathering and analyses where html pages are dynamically generated on the server after asp scripts are executed. Depending on the user privileges, different options are shown on the page. The application itself can be divided in three connected applications:

- application for system administration;
- application for survey creation and administration;

- Application for users.

The system administrator defines users which will be responsible for survey creation and administration, other users, groups of users and surveys, and sets the relations which survey for which users is intended.

Survey administrator is the person which defines questions and sections in which they belong in a scope of a questionnaire. The sections are organized in form of tree. This person is responsible for survey strategies and can view and analyze survey results, searching by dates and range of dates.

Normal user is a person which can participate in the surveys. The administrator defines a group of users in which it belongs.

The application itself offers easy creation, organization, management and analyze of surveys. Some of its functionalities are:

### 2.3.1. Basic functionalities

#### Support for all types of web browsers

The main interfaces to the information lately are web browsers. Supporting the standard web browsers, eTest enables two way communications between users and the system, for all authenticated users.

#### Course organization

The basic structure of the system consists of courses which material is divided in lectures. A tree like organization of lectures is implemented. Each lecture consists of smaller parts and each part consists of different sets and finally of learning objectives, as shown in Fig.3. The course material in the lesson is divided in at least three parts (in Fig.3 marked as A, B and C). For each part there are at least 4 sets of questions. Each set of questions consists of at least 5 questions. At least one of these questions is hidden and is intended for final test exam, not for testing purposes. The remaining questions are candidates for online testing.

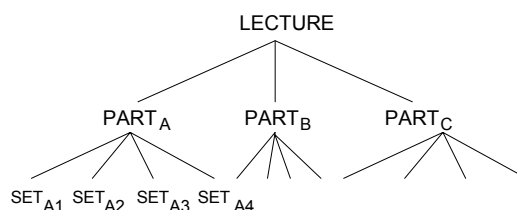


Figure 4. Tree like organization of the lectures

The system for eTesting can have unlimited number of courses which are administrated by uses with special privileges to administrate courses. The courses are independent from each other and have their own structure and question bank.

Име на област	Макс.	Исп.	Сан.	Пое.	Време	
1. Концепти	0	0	0	2	60	EDIT MENU X
Информациони технологии	0	0	0	2	60	EDIT MENU X
Општи концепти	9	9	6	2	60	EDIT MENU X
Интернет основни поими	7	7	4	2	60	EDIT MENU X
Функционирање на интернет	0	0	0	2	60	EDIT MENU X
World Wide Web	0	0	0	2	60	EDIT MENU X
Поврзување на Интернет	0	0	0	2	60	EDIT MENU X
Провајдер на Интернет сервиси	0	0	0	2	60	EDIT MENU X
2. Интернет адресирање	0	0	0	2	60	EDIT MENU X
3. Web прелистување	0	0	0	2	60	EDIT MENU X
4a. Информациски сервери	0	0	0	2	60	EDIT MENU X
4b. Податочни сервери	0	0	0	2	60	EDIT MENU X
4c. Апликациски сервери	0	0	0	2	60	EDIT MENU X
5. Безбедност и криптографија	0	0	0	2	60	EDIT MENU X
6. Интернет комуникации и технологии	0	0	0	2	60	EDIT MENU X
7. Електронска пошта	0	0	0	2	60	EDIT MENU X
8. Интерактивни комуникации	0	0	0	2	60	EDIT MENU X

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Figure 5. Example of course organization

## Question types

The idea for creating a system which will be able dynamically to create tests, lead us to use a model with question bank from which the questions will be selected. The questions are divided in different learning objects, according to the course organization described above. The number of questions available for every course is very big (usually 1500 questions per course).

The electronic testing system realized as computer-based testing is realized in such a way that each test generated will measures verbal, quantitative and analytical skills related to a specific field of course study. A different time constraint and score mark is associated to each area. The area consists of a set of questions defining one concept or one knowledge skill. We differ three classes of questions: verbal, quantative and analytical questions.

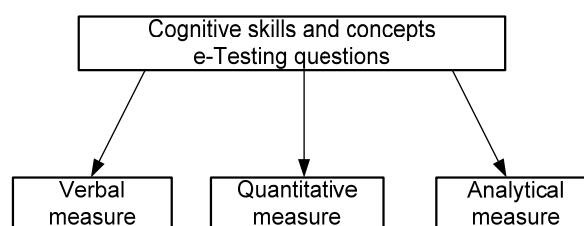


Figure 6. Knowledge based cognitive skills and concepts can implement e-Testing models by three types of questions with: verbal, quantitative and analytical measure.

From the types of questions we have mentioned above, the system for eTesting has implemented the following types of questions:

- multichoice questions;
- short answer questions;
- essay answer questions.

The main characteristics of multichoice questions is that students are choosing one or more answers from those which are offered as possible true answers. The number of offered answers is specified by the course administrator in the process of question design. Every question must have at least one true and one false answer. The student is making the choice using its mouse, clicking on the buttons in front of every possible answer.

Short answer questions are type of questions where students are required to enter short numerical value or short text. These questions can be used to fill the text of some question, or to enter result of some mathematical assignment.

When students are dealing with essay questions they are supposed to provide their answer in one or more sentences. The system we have designed there is no possibility to evaluate those answers automatically at the moment, because of the complex statistical and lexical analysis needed. The evaluation of these answers is done by the course administrator when the test is completely finished. The use of essay questions lowers the test objectivity comparing to the questions with fixed answer, because the person which is evaluating the answers has influence on the final result

## Reporting

The system for eTesting and e-Survey implements evaluation of the entered answers at the end of the test, at the moment when the person which knowledge is tested specifies that the entered answers are definite. Because the most questions used in the system are fixed response questions, they are easy to evaluate when final results are displayed. The system displays the final results with an option to see the right answers compared to those entered by the user.

In order to eliminate guessing, we have implemented negative marking. The final score of every test can be displayed on two ways, either using points or percents. The system we have created displays the final result as percent of possible points, at the same time showing the points which student got and comparing those to the maximum points on the test.

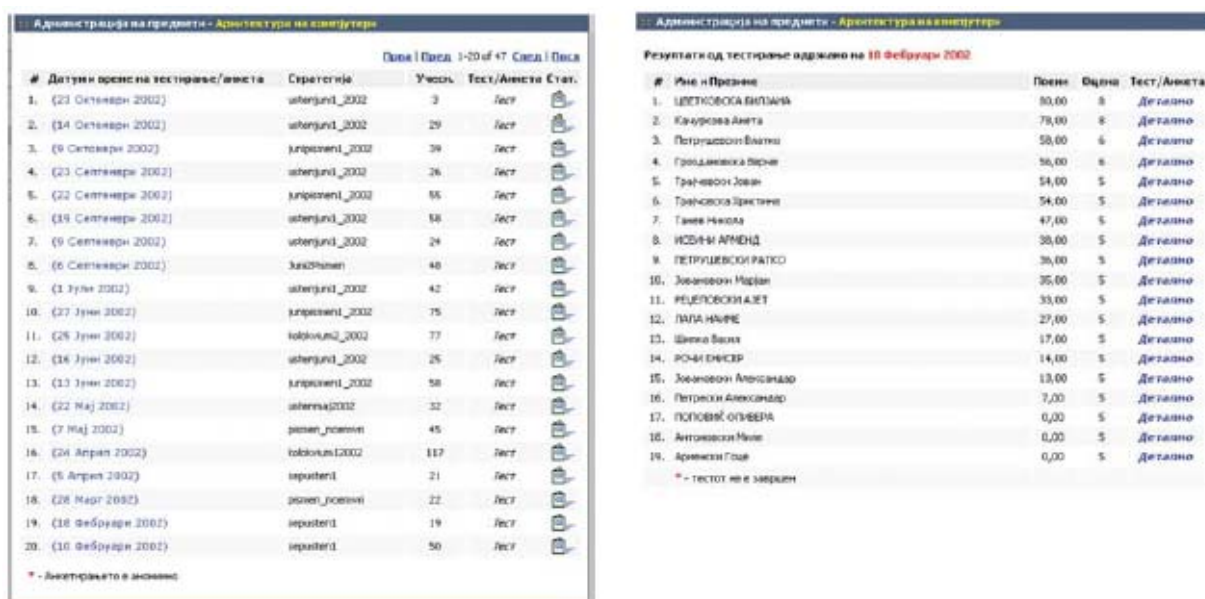


Figure 7. Reports Examples

### 2.3.2. e-Assessment module

The e-Assessment module consists of the modules for test creation and users module for assessment.

#### Test creation algorithm

Test creation algorithm is closely connected to the chosen method for test delivery. The idea for creating different tests for every student, forced us to apply the model for dynamic test creation. With that idea every student will get different test, with same weight like all other student. These dynamically created tests will have fixed number of questions.

The applied model gives opportunity for students to list the questions one by one, and answer only those which answer they know.

The strategy for test generation is defined from course administrator when he schedule the assessment. When setting the strategy course tree structure is used. The administrator is marking the learning objects from which questions will be selected, specifying the number of questions taken from every learning object. This way the course administrator will have control over the curricula for which student knowledge will be assessed. Because every learning object has questions with same weight, the tests which will be generated will have same weight too, but the students will get different tests from those learning objects selected by the course administrator. The system has a feature with which already made strategies are saved and can be used in the future.

Име на област	Внеси бр.	Макс.	Исп.	Сам.	Време
1. Концепти					
Информациони технологии					
Општи концепти	<input type="text" value="0"/>	9	9	6	60s.
Интернет основни поени	<input type="text" value="0"/>	7	7	4	60s.
Функционирање на интернет					
Поврзување и конфигурација	<input type="text" value="0"/>	8	8	5	60s.
Протоколи	<input type="text" value="0"/>	10	10	7	60s.
Програмска поддршка	<input type="text" value="0"/>	6	6	3	60s.
Машинска поддршка	<input type="text" value="0"/>	6	6	4	60s.
World Wide Web					
WEB документи	<input type="text" value="0"/>	7	7	5	60s.
WEB сервери и WEB browser-и	<input type="text" value="0"/>	8	8	6	60s.
Web Site	<input type="text" value="0"/>	7	7	5	60s.
Навигација	<input type="text" value="0"/>	6	6	4	60s.
Хипертекст	<input type="text" value="0"/>	7	7	4	60s.
Поврзување на Интернет					
Интерни и екстерни мрежни	<input type="text" value="0"/>	6	6	5	60s.
Безбедна поврзување	<input type="text" value="0"/>	9	9	7	60s.
JSON	<input type="text" value="0"/>	8	8	6	60s.
Поврзување	<input type="text" value="0"/>	8	8	5	60s.
Машинска опрема	<input type="text" value="0"/>	7	7	5	60s.

Figure 8. Creating the test strategy

## Assessment

In order to participate in the scheduled assessments, users must be logged in their accounts. List of scheduled assessments is displayed at any time. During the assessment, any participating user gets questions chosen with the strategy defined for the assessment from the assessment administrator. The user answers the questions one by one, having option to go back and forward at any time, including the functionality to go directly to any question of the assessment. The currently displayed question can have image, text of the question and possible answered depending on the type of the question.

After answering the questions, result report is generated for every user, where it can see his answers and make comparison with the right answers. Summary of the points earned is also displayed.

Тестирање по Интернет	
Корисник: <b>МИРЈАНА</b>	Почеток: 14:34:57
Датум на Тестирање:	Крај: 14:58:16
Освоени поени: 44	Предлог оцена: 5

**Прашање 1.** Светски распространетата мрежа World Wide Web има намена да се

Точен одговор е:

- разменуваат документи на Интернет
- делат заеднички ресурси како печатачи

Вие одговорите:

- разменуваат документи на Интернет
- делат заеднички ресурси како печатачи

Освоивте 2,00 поени од можни 2 поени.

**Прашање 2.** Кој протокол ги разрешува Интернет адресите?

Точен одговор е:

- IP протоколот
- TCP протоколот
- HTTP протоколот
- HTML протоколот

Вие одговорите:

- IP протоколот
- TCP протоколот
- HTTP протоколот
- HTML протоколот

Освоивте 0,00 поени од можни 2 поени.

Figure 9. Student view of the results

### 2.3.3. e-Survey module

The e-Survey module consists of modules for creation of surveys, as well as of the user module for surveying.

#### Surveys

Any user can take scheduled surveys which can be anonymous or not depending on the strategy defined by the administrator of the survey. If the survey is anonymous then the users are not required to log in on their accounts to take the survey, while if the surveys are not anonymous then before accessing the survey, the users must log in into their accounts. This gives opportunities for targeting different types of users depending on the survey requirements.

During the participation in the survey, multiple questions are displayed to the user on one screen, grouped by the administrator of the survey. The user can go back and forward through the survey, answering those question which are relevant to him. The structure of the survey is accessible at all times which gives possibility for the user to jump to any part of the survey at any time.

The responses gathered with the e-survey module are used for generating reports based on the requirements defined by the administrator of the survey.

### 2.4. Installation and training

The installation requires hardware and software equipment specified in technical requirements in 2.1 и 2.2. The installation itself takes activity of 8 hours and the maintenance is through distance Internet connection.

For training 5 days are needed for persons which have prior experience in computers and Internet technologies.

Guarantee time is 12 months. During this time all problems generated with the system functioning specified by the agreement between parties will be solved.

Response time is 4 hours at most after the request made by the client.

### 3. Prices

1. Core module of the system
  - *Users administration*
  - *Departments administration*
  - *Courses administration*
  - *Announcements administration*
  - *Reports generation*
  - *System installation*
  - *Training*
2. E-Assessment module
  - *Creation of strategies for assessment*
  - *Administration of scheduled assessments*
  - *E-Assessment*
3. E-Survey module
  - *Creation of strategies for surveying*
  - *Administration of scheduled surveys*
  - *E-Survey*

Total:

The period for installation and training is 20 days after the contract signing

Offer is valid until 01.01.2009

Note:

This offer consists of one server license and unlimited client licenses.