

Information services using Internet technologies in the Public sector

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Abstract: This work presents a Web-based, database-oriented set of applications, which include an asynchronous Open Distance Learning tool (without the presence of a tutor), an application for retrieving information about work safety issues and allows information exchange between the public and different departments of Greek Power Company (GPC). All applications offer secure and easy administration, providing in parallel advanced telecommunication facilities.

Keywords: public services, on-line services, public-private relationships, public sector, databases, communication networks, Internet

1. Introduction

The new information society is emerging in which the services provided by information and communication technologies underpin human activities. New form of economic and social organization is generated the structure of which is no longer subject to geographical constraints but depend on telecommunications networks. This rises a challenge to public organizations to move forward in applying information technologies in order to provide more efficient services.

Public organizations and companies must adapt to a whole new structure which provides efficient access to information sources, support training activities in a more flexible way towards enhancing job qualifications and offer an enhanced mechanism to support information sharing between the public and the employees.

This work was done under the project POWERNET with coordinator the Greek Power Company (GPC) and partners the Computer Technology Institute, Systema Informatics and Linguaphone. The main aim of POWERNET (EMPLOYMENT / ADAPT EU Programme) is the design and employment of an information system based on Internet and Extranet technologies [4] for the GPC and to facilitate adaptation of the workforce due to changing conditions based on the application of information technology at the GPC.

The explosion in popularity of Internet underscores the tremendous potential that now exists for rapid, networked sharing of information. Tools, such as World Wide Web (WWW) and various Internet browsers make the Internet readily accessible even to novice computer users. Moreover, the WWW has proven itself to be a cost effective means to provide information sharing and exchange.

The supporting system of the network applications mentioned before is based on the provided services and functionality of World Wide Web (WWW). The WWW servers

have been developed inside the training department of (GPC) which provides the central node of communication, processing and reference.

The main operations of the *Information Service* site include:

- The design and development of a data base to be used by the GPC employees to support efficient information retrieval about Safety Material
- The design and development of an ODL tool to be used, as a prototype, by the GPC employees for providing English Grammar lessons. The basic aim is to familiarize the employees with new services over the Web and evaluate the tool developed
- Support Computer Support Collaborative Work (CSCW) capabilities by applying Microsoft Netmeeting. Also, communication of a specified set of users (employees) is supported by a closed mailing list
- The design and development of a procedure to support the process of sending a message to a specific department / address of GPC and receive a response / answer

This paper is organized as follows: in section 2 we provide details of the system architecture, specifically presenting analysis, design and implementation issues. In section 3 the functionality offered by the system is outlined. The last section summarizes conclusions elicited from our work and presents future work issues.

2. System Architecture

2.1 System Analysis

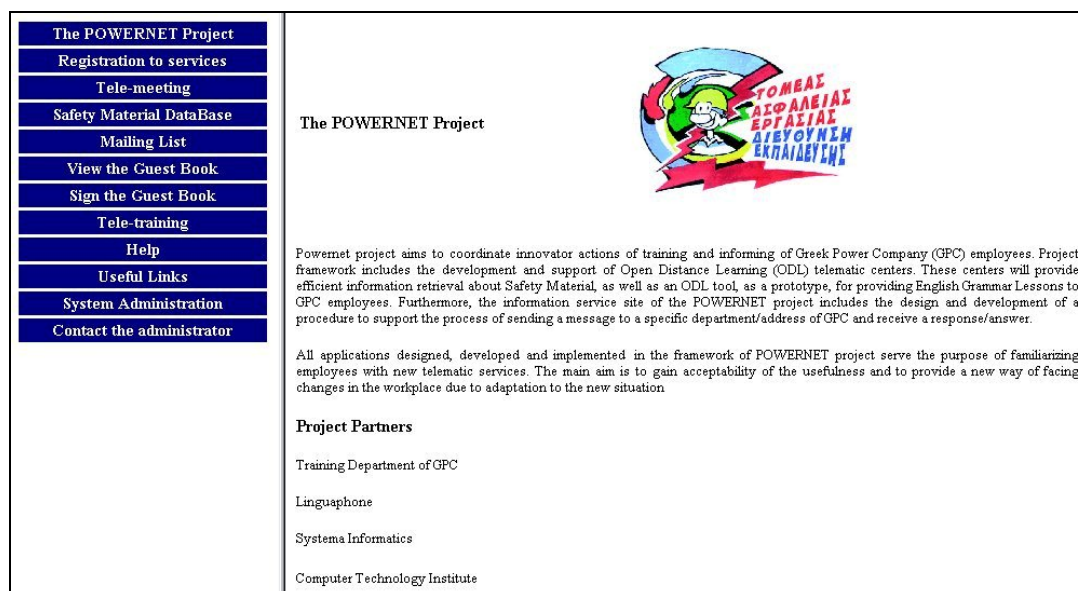


Fig. 1: Introductory Page

GPC internal studies and relevant ones based on the experience from other European Power Companies guided GPC in specifying a first set of applications that could serve the purpose of familiarizing employees with new telematic services. The main aim was to gain acceptability of the usefulness and to provide a new way of facing changes in the workplace due to adaptation to the new situation. Thus, it was defined

that the project should support ODL activities, communication with the public (*Information Exchange Mechanism*), assist the process of organizing and querying the Safety Material Database and provide a platform to support CSCW and message exchange through a mailing list.

The whole system should provide a friendly and easy-to-use user interface. One way to achieve this is to access the applications through classical browsers, widely spread nowadays. The system should provide access to two different levels of users. **Visitors** should be able to access information material, use the *Information Exchange Mechanism*. **Registered users** of the system (GPC employees) have access to the Safety Material database, the ODL tool, the mailing list and the collaboration tool. For anybody to subscribe as a user the system provides an application form to be filled in and sent to the administrator which checks the user data and then registers him / her. There must be a predefined check mechanism for all users' accesses. This mechanism must always inform the visitor (citizen) for a successful or unsuccessful attempt when he / she tries to use the provided services.

The Safety Material Database should include descriptions of different items organized in the following categories:

- Hand protection items (gloves)
- Head protection items
- Eye protection items (glasses)
- Breath protection items
- Hearing protection items
- Feet protection items (shoes)
- Items to protect against falls
- Protection Uniforms

All users have the possibility to access all databases and make queries to retrieve specific information. Only the administrator has the privilege to insert a new user, insert or delete a record.

The design and implementation ODL tool was based on user requirements and led to the following functional specifications:

- ODL services are offered to authorized users of the system
- All authorized users (employees) should be able to access the system through a personal computer connected to Internet
- Learning activities should be supported by the ODL tool
- There must be a Data Base Management System (DBMS) that works behind the Web Server and provides the whole system with an efficient way of manipulation. The DBMS will keep all the data needed to facilitate efficient operation of the ODL tool

The *Information Exchange Mechanism* offers the facility of sending a message (question, remark, comment etc) to GPC (towards a well-known department / public service) and receiving a response / answer. Citizens can send a message (or multiple messages) without using an email account.

Additionally, there are some non-functional requirements that should be met in order to ensure the quality of the system.

The system should be available 24 hours a day based on the fact that GPC should be able to provide services all day long. Also, the system should be able to provide updated data to the users as soon as these data are made available.

In order to secure the consistency of data only the administrator has the authority to modify database data and to provide access rights to new users (GPC employees). The administrator is responsible for changing the access rights of the functionalities of the system in order to comply with the changing user requirements.

The system has been designed using an open architecture to ensure smooth integration with new products and services. Also, small changes of enhancement, extension or adaptation can be performed without necessarily redevelopment of the system and without the need for an interruption in its operation.

2.2 System Design

In Fig. 2 there are the three layers of the system, in which the system is embedded.

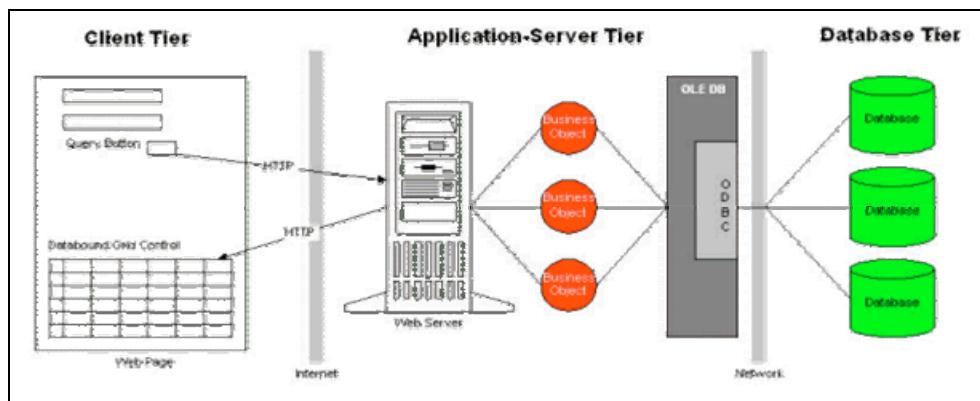


Fig. 2: The three-layer architecture

The architecture presented is an extension of the traditional client-server architecture to the Web producing the above three-tiered model. Tiers represent a personal operating space or a machine. At a traditional client-server a part of the application lies on the local host and the rest on the server.

The client tier represents the users of the Web page. Employees and the Public can use this browser to access the system (e.g., MS-Internet Explorer or Netscape Communicator 4.x).

At the second layer there is the World Wide Web Server, which operates as an interface between the two other layers. ASP scripts provide the interface with the user, defining the data that will be presented each time to the browser as well as the connection with the real data stored in database and file system. By using ASP we can create interactive pages independent of the browser adopted by the user to select the specific pages (*information*). Our choice was based on the fact that the development platform was an NT Server, the ease in development, and the existence of a well-defined set of documentation [1].

Finally, at the third layer there is the file system of the Server, where all the available electronic material is stored (messages, responses, several log-files etc).

2.3 System Implementation

Web server scripts [1] were used to develop the backend of the application. HTML (dynamic HTML) and HTTP were used to separate the content from the presentation for easier design and data management. There were applied for the structure and presentation of the pages.

Active Server Pages (ASP) were applied to allow the use of programs that are executed in the environment of WWW Server and specifically in the environment of MS-IIS 4.0. ASP pages are files that contain HTML headers, text and script commands. Moreover, ASP pages call ActiveX components for the execution of functions, like connection with a database or computations.

ASP pages are responsible for the administration of information stored in the system database. For ASP pages ActiveX Data Objects (ADO) achieve the connection with database, through OLE DB and ODBC.

The database should be accessed through the Web page and there is no need for special hardware for the client. For the development and access of the database the server should provide the Microsoft SQL server 6.5 and Active Directory Services Interface (ADSI). The development of the database was based on the integration of ADSI technology with ASP and VBScript, enhancing the development of Internet applications, which need to access directory services. The integration of OLE DB applications is based on an OLE DB query interface. Internet applications by using ASP can easily be developed and administrate ADSI objects at the server and resolve the results at web page. The databases contain all the necessary information about the users (identification information), messages (questions, remarks, comments and the respective answers / responses), information about safety material (name, description, code and usage), and the training material (text audio and video).

The exchange of information through Internet requires a data security mechanism, since the unauthorized access at this information is relatively easy-to-handle. The system will be extended to provide more security and safety automated mechanisms in order to ensure the authorized access, tracking more controlling levels [2].

The *Information Exchange Mechanism* can be accessed via standard, unmodified web-clients (as Internet Explorer 4.0 and Netscape Communicator 4.x) without using an email account [3].

3. System Functionality

The integrated information system services available can be separated in two categories. In the services that are available to simple guest user of the web site and the services that are provided to certified system users.

There is also the system administration service. System administrator is responsible for updating the system database with the registration data of all the users. System administrator also supervises the system operation and usage by keeping and studying statistic data and forces users with penalties in cases of inappropriate usage of system resources.

The WWW service is used in such a way to support the hierarchical presentation of the services provided by the system. As described earlier, there are two levels of presentation based on the different access privileges of the users. All users have access to pages containing general information about the system but only authorized

users (employees) will be able to follow a specific hyperlink towards a certain service. If the specific service is addressed only to the employees of the GPC then an authentication mechanism will require his login and password (which is assigned to him / her by the system administrator). Any visitor can become an actual user of the system by filling up a specific form with all necessary data and stating which specific services (mailing list, database etc) he / she is interested in having access. This form is automatically sent to the system administrator who is responsible of opening a relative user account (username and password), after checking the data of the application form.

The POWERNET Project	<h3>Breath-Protection Material Search Form</h3> <p>Please provide below the desired criteria to form a query and find a specified record in the System DataBase. Note that, you can just press the "Submit" button to see all the records included in DataBase up to now.</p> <table border="1"> <tr> <td>Identification</td> <td><input type="text"/></td> </tr> <tr> <td>Name</td> <td>Everything in DataBase ▾</td> </tr> <tr> <td>GPC Code</td> <td><input type="text"/></td> </tr> </table> <p> <input type="button" value="Submit"/> <input type="button" value="Reset"/> </p> <p style="text-align: center;">  Back </p>	Identification	<input type="text"/>	Name	Everything in DataBase ▾	GPC Code	<input type="text"/>
Identification		<input type="text"/>					
Name		Everything in DataBase ▾					
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Registration to services							
Tele-meeting							
Safety Material DataBase							
Mailing List							
View the Guest Book							
Sign the Guest Book							
Tele-training							
Help							
Useful Links							
System Administration							
Contact the administrator							

Fig. 3: Safety Database Query

The e-mail service is used in order to provide a platform for all registered users to exchange personal messages. The application of a mailing list is used to support the restricted access only to those users interested in participating. Members of the mailing list can support the exchange of technical questions, questions about regulations and other issues saving thus time and help distribute useful information. The mailing list is closed in the sense that only authorized users, members of the list, will be able to send or receive a message. The list can be expanded with all those persons having the required qualifications (GPC employees at first). The system administrator is responsible for writing new members in the list and to watch the e-mail exchanged with the ability to interfere if a conversation exceeds some logical levels.

The use of Netmeeting to support Computer Support Collaborative Work (CSCW) aims in providing the following services to the user (GPC employee). Netmeeting is a tool that supports:

- **On line chat.** A participant writes his / her message and at the same time all participants can read it. A prerequisite for this that all participants are *alive* at the same time
- **Telecommuting.** Two groups gathered in different rooms have the possibility to chat, hear and see the people of the opposite group. In order to improve the optical presentation a projector could be used to project the image at a screen
- **CSCW.** Two or more individuals have the possibility to share a common application as for example to share a common text file while on the same time they have audiovisual contact

The Safety Material Database offers the user the capability of querying the database for a specific material based on its description (cloves, shoe), its usage and a specific

code. An authentication mechanism ensures that no unauthorized personnel can use this application.

The Safety Database can be used by the employees to retrieve information based on a unique code for each item (given by GPC), a specific description and an identifier specific for each item. The full description of an item includes except the above fields the items name, dimensions wherever needed, a full description, a photograph from the specific item, the usage and the class of jobs that the item cannot be used.

At the Safety Material Database the user has the ability access any of the predefined databases and to query for information based on specific fields identified by the user requirements. Only the administrator has the possibility to insert or delete a record.

The asynchronous ODL tool is username and password controlled and the user can access training material already prepared that include text audio and video. The video (and audio) is downloaded every time the student needs to access it. The tool offers facilities to support communication with the tutor (via e-mail), a library, a glossary and an application to evaluate the progress of the students.

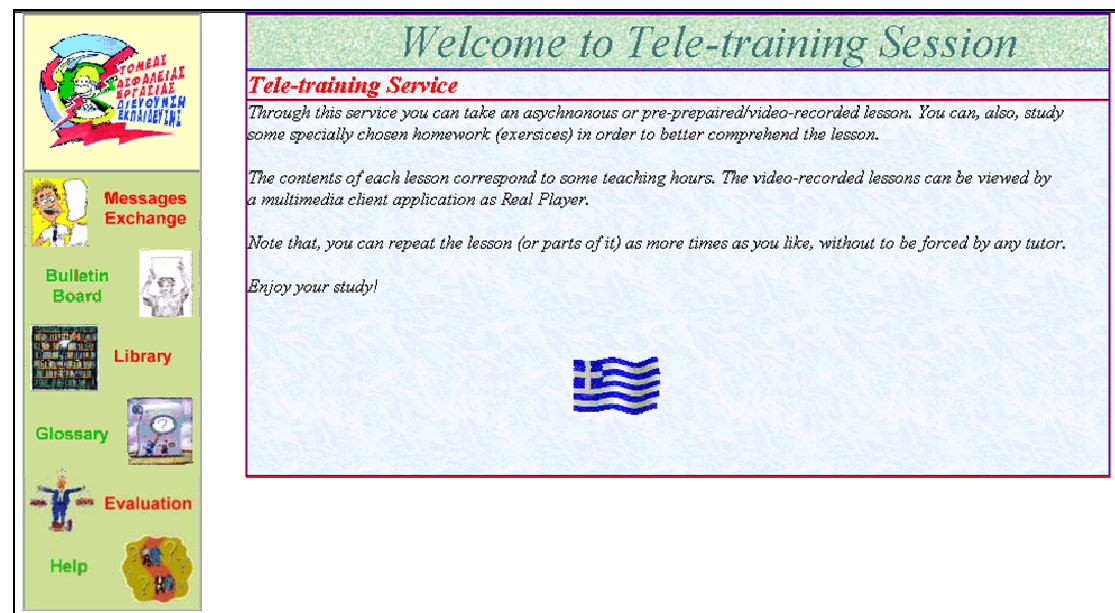


Fig. 4: The ODL tool

The services available at the level of the certified user of the ODL tool are:

- **Messages exchange.** The message board is a tool facilitates off-line way of cooperation with which authenticated system users can read and send *text-formatted* messages. Each message added to message board includes the name, the date, the subject and the main body of the message. System user can watch all the messages added up to the time he / she uses the service, send new messages, send follow-up messages, send follow-up messages to follow-ups etc.
- **Bulleting Board.** This service contains *Announcements* about the lessons and the exercises provided by the teletraining system.
- **Library.** The user has the option of either downloading the text of the lessons to his computer in order to study them, to have a look at the proposed bibliography

related to each lesson, and links to relative material in the Internet. The links are periodically updated and responsible for this operation is the system administrator.

- **Glossary.** During attending a lesson, users can recur in a kind of electronic glossary in order to be informed for the meaning of special terms, found in the text of a lesson.
- **Evaluation.** A questionnaire relative with the lesson a user attended is posted and can be downloaded for the user to fill it up and offering his / her opinion about the material, the structure and the services provide by the ODL tool.

In the *Information Exchange Mechanism* there was an attempt to emulate the procedure of interaction among citizens and any organization. The process can be described as: indication of ID card ↔ *registration request*, submit request ↔ *sending a message* and correspondence of local authorities ↔ *reception of a response*.

After the citizen has successfully made the registration request, he / she can send a message (question, remark, and comment) to a department of the GPC.

At first, the user gives the username and password that declared at the registration form. The authentication mechanism that *hides* behind this service, checks if the user has given valid data, comparing them which that record at system database and—in proportion- permits (or not) user to send a message by choosing the desired destination department from a list. In case, citizen does not know where to send his / her message, there is a department of *general purpose*, which is responsible for processing all kind of request messages.

When authoring a message, the administrator of the department uses the description field in order to be assorted. Then the user can write his / her message and send it. The system always informs user for the success or failure dispatching of the message.

To receive a response the user gives again the username and password and reads the answer from the desired department of GPC after a reasonable period of time (from the day the user sent a message to the GPC department / address).

4. Conclusions and future work

The above system aimed in introducing information technology services in the GPC and familiarizing employees and the public with the potential applications to be used. The main objective was to provide a platform (easy-to-use) to the employees of the GPC and to evaluate a set of applications against traditional methods pushing them to use and accept new services.

The ODL tool provided an efficient and user friendly environment and employees from all over Greece had a chance accessing it. The main criticism concerned the fact that the tool did not provide a complete set of English lessons and that they would prefer a more *live* tool. We intend to develop and incorporate, into the system, a synchronous ODL tool to support a *live classroom*.

The system has not been developed taking into account *hard security* issues and we aim in providing more security and safety automated mechanisms in order to ensure authorized access, tracking more controlling levels.

The *Information Exchange Mechanism* provides the public an easy-to-use tool that imitates the actual process of submitting a question / request to a Public Organization. We intend to embody the ability of following the progress of a request. That is, the

system could include workflow issues in order to keep track of the progress his affair is making.

Finally, the Safety Material Database will be enhanced offering the capability for multiple queries and will be expanded to include other items and will be linked to the relative storage facilities.

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