

## DEVELOPMENT OF MEANS AND A PLATFORM FOR RESEARCH

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**Abstract:** The paper describes the operation of a web platform made for an e-research center. The platform includes a number of procedures performed and the specific tools of research process designed to facilitate online research management, to facilitate dialogue between clients and professionals, enhance teamwork, encourage exchange of ideas and the construction and design of prototypes of new products.

**Keywords:** *e-research centre, platform*

### 1. Introduction

PCs can create virtual spaces that are used in an innovative manner, spaces for training, information, communication, collaboration, exploration, documentation, multimedia, word processing, illustration, simulation and virtual reality spaces.

In this work is presented the development and testing of a general software infrastructure for a virtual research center. The infrastructure must support all activities concerned with technical virtual research, especially in problem solving, correcting and assessing solutions. To give a modern interpretation of distance research, it was primarily the relationship between the structure of a center for research and dialogue can be developed through it.

### 2. Development and characteristics of e-research platform

#### 2.1. Development of e-research platform

The main phases of the development platform are:

- Developing Virtual Research Centre - creation, consolidation and expansion (infrastructure, operational methodology);
- The initiation, conducting joint research and development;
- The creation, development and maintenance of facilities and research platform;
- The study of models of product development and manufacturing process;
- The knowledge management;

- The research activities - joint design;
- Dissemination of results and knowledge transfer to industry;

The input data refers to the participating universities and research centers, human resources and materials, the existing knowledge base. The output which are resulting from research and design activities, are the products used in industry, the knowledge that will increase database and feedback which improve continuously the business center.

Efficiency and viability of such a platform is based on systematic and systemic structure that allows continuous improvement, which could be extended.

The platform also allows the dissemination of knowledge through databases.

#### 2.2 Characteristics of e-Research Centre platform

The platform includes a number of procedures performed and the specific tools of research process designed to facilitate online research management, to facilitate dialogue between clients and professionals) enhance teamwork, encourage exchange of ideas and design prototypes new products.

The website was done using Microsoft Visual Studio 2010, free version of the code editor, editing applications are of the HTML and ASP programming language, the applications for managing databases are build in Access, and

statistical evaluation is accomplished through Excel applications.

### 3. Platform functionality

Depending on the issues raised and shaped theme, specific steps will be taken. Since design research is carried out by research teams in different locations, it is necessary to communicate a precise methodology supported by special software and a phased deployment of the research methodology to a fully efficient.

#### 3.1 Access

The access can be made from the Internet or intranet from any computer connected to the Internet. The access to the general information and those related to projects within the center is free.

#### 3.2 Menu Sections

The main window of access to the site, which is open on the activities menu and the center where you can access the pages related to: Product Design, Design Services, Product Design, Process Design, Maintenance is shown in Figure 1. In these pages have general information about products, processes and services designed engineered by Research Centre.

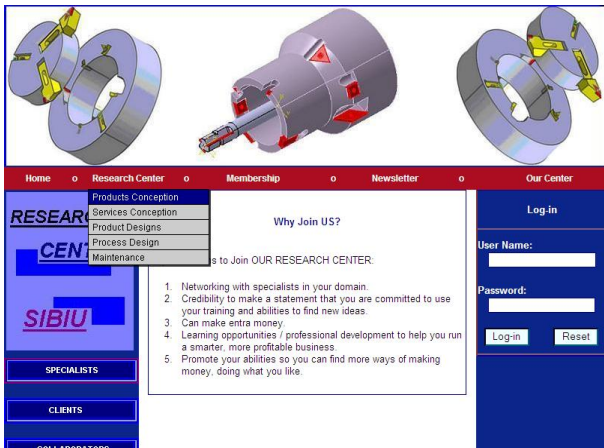


Figure 1: Access page to the Center Activities

The access to the members' personal information: professionals, associates or customers are secure. Each specialist, customer or employee shall enter into the database by completing an application that is generated by accessing the "Application". Each user receives from the platform administrator an username and initial password, which can be customized after the first login. On acceptance of entry in the database, it

generates a message of acceptance, the new member receives the right connection space (log-in).

#### 3.3 Data Bases

Databases are build in Microsoft Access and contains tables that store information about customers, employees, professionals, projects and newsletters.

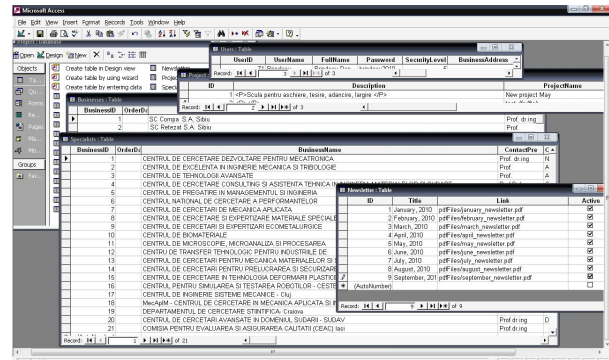


Figure 3: Tables from Access Data Base

#### 3.4 Secure Data

The platform management of the database, ( the add / change user names and / or passwords, the access to pages listing and changing the lists of customers, experts and partners, the adding pages and newsletters and projects) is secure and can be accessed and performed only by the administrator.

##### 3.4.1 Specialists Data

Information about the identification of members can be viewed only by the site administrator.

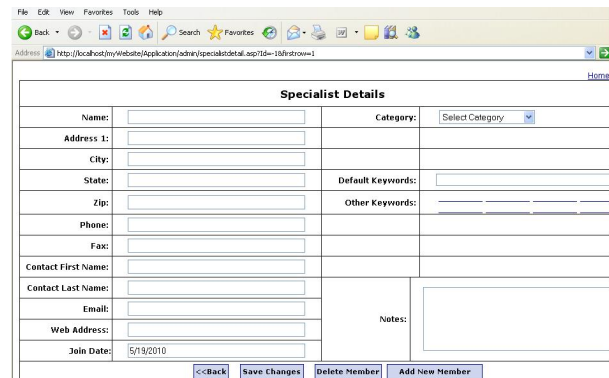


Figure 4: Specialist Detail Page

This page allows you to add a new member, following receiving the of application by the platform manager. The window that can be viewed behind the application, by the administrator of the platform is shown in Figure 4. On the basis of

completed applications received from new members, new information is added by pressing the "Add New Member" button. The input data can be modified or deleted by pressing the "Save Changes" and "Delete Member" buttons.

### 3.4.2. The Specialists Section

This section provides information on research areas and centers that can provide advice in the field. Platform database contains data related to research centers or universities in Romania. Customer registration database platform is build based on the activity field, so they can be easily accessed by selecting the industry. Specialist is a generic term used for individuals (experts, researchers, teachers, etc..) and for institutions, research centers, etc.. as they have skills and can work in an e-research project.

### 3.4.3 Customers Section

In this section you can access to view / change personal information stored in the database. Customer registration in the platform's database is carried out by their field activity, so they can be easily accessed by selecting the industry ("Select Category" - Figure 5).

Search	Category	Business Name ▲
Search	Select Category	S.C. COMPA S.A. SIBIU
Search	Select Category	S.C. RETEZATI S.A. SIBIU
Search	Select Category	S.C. AUTOMOTIVE SRL TARGU MURES

Figure 5: Window add new customer database

## 3.5 Communication Module

Communication includes discussion forum tools needed, on-line sessions, internal messaging.

The forum tools were developed to support the listing of asynchronous discussions, the project manager coordinating discussions based on the project development. There are also possibilities for chats video – on-line sessions, internal messaging (custom work groups). Addition page on the server for the name and URL address of the .pdf files, which are newsletters (informing letters) for storage in the database.

## 4 Using e-research Platform

A general process for conducting network research involves the following steps:

- *Establishing customer contact;*

The responsible for this section is the platform administrator. When the client is seeking or

making a product order, process, or improve its new project, the first stage of the dialogue can be achieved by sending a text message, in an e-mail form. On the home page is the "Home" menu, which contains all the contact details of the center.

- *Registration by the administrator of the proposal;*

The page allows the administrator to add a new project based on what the client requested. The project may be based on designing a new product, or it can be based on improving a product or an activity which is part of a bigger process (for example, determining the internal tensions for a particular item

- *Designation of project manager;*

Depending on the category in which the project (field) fits, the platform administrator, sends the proposal of the customer to the specialists that are added in that field related database. Depending on the capacity and availability of specialist, the project manager is appointed. Note that the administrator can be also the project manager, at the same time.

- *Composition of the Working Group;*

The forming of the working group is a task of the project manager and of the platform manager, which will invite potential specialists in the field to be part of the team. The specialists database of the platform enables fast selection and information of the specialists that may form the group.

- *Registering platform project team and client project;*

Table 'Admin users list is completed by the administrator, with the team selected on a specific project - a project that will receive a code. On the platform can be run in parallel several projects, and each of which can run separately. Also in this section can be completed the database with customer data and potential new specialists added to the project.

- *Establishing the schedule and procedure for teamwork;*

Useful methodology to be used is that of Project Management. The main stages that go through when applying this methodology are:

- The defining of the project theme in detail: specify the problem, purpose or major objectives, deliverables elements with deadlines (times required), technical specifications, costs, management support, etc.
- Planning the project
  - a. Defining the structure of work activities (activity name, duration);

- b. Implementation of network-type project plan will specify the order and durations of each activity;
- c. Allocation of resources to each activity (human, material, equipment);
- d. Optimization of planning in terms of duration;
- e. Estimated cost calculation.

The project may contain in addition to the actual research or the optimization design modules of products or technologies that achieve the design prototype and prototype implementation.

- *Establishing, analysis and completion basis;*

In order to establish research directions, grading criteria, the project manager analyzes the client wishes, according to the questionnaire that he completed. To create questionnaires or tests, the platform program contains Excel files. On the platform are already built predefined questionnaire types to be completed by the clients and specialists. Depending on the theme of the project, these questionnaires can be changed or new ones can be designed.

- *Establishing product requirements (classification criteria);*

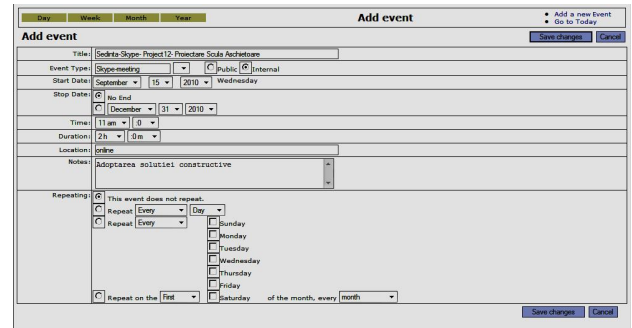
The platform administrator is responsible for the registration of a new project or proposal. The page allows the administrator to add a new project based on what the client requested. The project may be to design a new product, improving a product or an activity from a process.

After outlining the problem that is intended to be solved and the models to be developed, it is necessary a complex task of planning and tracking a project that aims to solve the problem. Useful methodology to be used is that of project management. The main stages that go through when applying this methodology are:

- Defining the theme of the project in detail: specify the problem, purpose or major objectives, deliverables with deadlines sites (times required), technical specifications, costs, management support;
- Planning the project:
  - a) Defining the structure of work activities (activity name, duration);
  - b) Implementation plan network type of project that will specify the order and durations of each activity;
  - c) Allocation of resources to each activity (human, material, equipment);
  - d) Optimization of planning in terms of duration;
  - e) The calculation of cost estimates.

The project may contain in addition to the actual research or the optimization of module

design and products and technologies that achieve the design prototype. Project activities will be added to the calendar center (figure 5), so, the team/research team to be informed of the date and time of deployment and type of action.



**Figure 5:** Add new action projects in calendar

There are cases when certain actions are repeated, they recorded as repetitive actions (for example - "Repeat Every Monday from 01 to 25 of October" - "the action is repeated every 01 months from October 25), (figure 6).



**Figure 6:** Model of schedule worksheet

The project manager sets the team's working procedure, inform and instruct the team in this regard. Also in this stage, it lay down the responsibilities of members. The administrator manages the material received and sends the information and their agenda to the professionals. The module allows managing the application-level platform structures in the database. The platform is composed of four administrative parts: system administrator or project manager, specialists, employees and customers. Between these structures there are specific relations of the organization of the program.

The project manager sets the working procedure in the system depending on the type of project in order to choose or to repeat certain steps, holding several meetings (synchronous or asynchronous), requests for opinions. The following presentation is a general procedure for



conducting an online research. The platform is generally available for the following steps:

- *The proposal to address theme ideas;*

At the request of project manager, each team member will complete in the assigned field (figure 7) three proposals for resolving the theme.

**Figure 7:** Work sheet (synchronous-asynchronous) project team

- *Improve and complete the initial ideas;*

Since the working sessions can be run both synchronously and asynchronously, the project manager sets a deadline date and time when proposals are loaded by each participant. If this session takes place synchronously, this stage overlaps with the previous stage, so the participants in this session can make changes immediately after the initial data were added. In the event that not all team members are logged synchronously, it is recommended that the project manager to provide a period of several days to analyze and make possible amendments to the proposals.

- *Analysis of proposals and determining potential improvements;*

Ideas are centralized by the project manager and the site manager is posting at the "Project Description" section that is allocated to the project in progress, the solutions that match the theme. Solutions that do not correspond to the theme or are not feasible are eliminated with the agreement of members.

- *Comparison of proposals for selecting the optimal solution;*

The project team is the one that notes from 5 (the maximal value) to 0 - zero (minimum) proposed solutions. The proposal ordering application after scoring may be accessed by the platform manager, from the platform. Scores are awarded depending on the requirements to be met by product / service / project. Data is loaded by each party specialist in its field, and the centralization is made by the project manager.

- *Determination of the optimal solution;*

The Solutions hierarchy is done by collecting the scores given by team members. The field that is assigned to the project description is named "Project Description" on the "Project Information" page (fig.6.18) and it allows insertion of multiple data, as the window is provided with the cursor. All final data will be posted from shares concluded in this field manager. The fields assigned to the specialists will be emptied (blank) for the next steps.

- *Review the solution by each team member;*

The review of the solution through the model takes into account the highlighting of possible errors or omissions have not been studied or have not been considered in previous steps and that can be corrected at this stage. For this action the project manager may convene an online meeting to get a fairly and quickly feedback before a decision is being taken. In this case on the center calendar will appear a note named as a "Project ID xzy - Meeting September 15 at 10:00 am"

- *Adopt constructive solution;*

At this stage it is decided if the resulting solution can be adopted and implemented. Again, the team members "vote" and each will sustain its point of view. The meeting is Synchronous , under a joint meeting.

- *Modelling constructive solution/concept design;*

Modelling can be done by one team member designated for this purpose. It is indicated to be used a software that allows viewing and making changes to the design. The image is transmitted on a modelled solution. jpg,. pdf or. tif to the team members, for analysis and evaluation.

- *Improvements/changes in the constructive solution of the model;*

Team members are given a deadline to review and propose improvements to the model. They may post their opinions on the "Project Information", in the field assigned to each of them and then, during a synchronously meeting, the person in charge with

the modelling will present the improved variant. The final model image is sent by mail to the whole team.

- *Acceptance of Product;*

Team members will submit their final agreement in terms of modelling. Agreement must be given and the client, before the team ceased the activity. If the customer finds design deficiencies of the product, can make some suggestions to improve the maintainability design. The client can actively participate - on-line at the stage of conception. Consent given by the team is practically ending the activity of the design team.

- *Transmission of client project;*

Project Manager presents to the customer, the solution / project that is the subject of the research contract.

- *The audit project;*

The project audit is highlighting the strong parts of the project and of networking team work and also the weak parts, to be clearer.

- *Update data base;*

Platform manager responds of this activity. The accepted solution will be registered in the data base and presented under "Research Center" which is under "Product Conception" section, or "Product Design" section, depending on the type of research. The completed Project will be presented to the center members and prospective clients (if any) through the newsletter sent and posted on the platform. The virtual product design involves not only the virtual, but also the maintenance of process modelling, human interaction - modelling and application object model. Virtual product maintenance, analysis and testing can take place on real products. To maintain the virtual maintainability analysis system it has to be developed key technologies so that the platform can perform maintenance of virtual prototyping, modelling and simulation of maintenance actions based on failure analysis.

E-Research Centre should be seen as a living thing that needs to be improved and adapted with the evolution of business processes and technologies.

## 5. Conclusions

To achieve fair and effective planning of a project within a virtual research center is necessary to have databases that contain:

- Database that aims general Engineering knowledge, basis and specialty and liaise with experts in the field;

- Database with information on staff: qualified people, location, contact address, scientific skills, managerial skills, labour costs;
- Database which includes laboratories and opportunities available to investigate, research, experiment, and model in these laboratories;
- Database on equipment, licensing, precision level, input parameters, output parameters, user training required, running costs, consumables: characteristics, quantity, unit price;
- Database which contains the existing software.
- This information will be used to complete each activity needs of research projects to be carried out based on the methodology of project management.

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