Desktop Application with Internet Access for the Administration of the Human Resources and Logistics of an Institution

LIVIA SÂNGEORZAN, DANIELA CRISTINA STOICESCU, KINGA KISS IAKAB

Department of Computer Science
Transilvania University of Brasov
25, Eroilor, blvd, 500030, Brasov
ROMANIA
sangeorzan@unitbv.ro, stoicescu@unitbv.ro, kinga.kissjakab@unitbv.ro http://www.unitbv.ro

Abstract: This paper is the result of a research project developed within the field of software engineering and supported by the Faculty of Mathematics and Computer Science under the supervision of Mrs. L. Sângeorzan. The main objectives are: the study of the communication process for human resources in different types of medium and large institutions; designing a logistic system for the institution infrastructure; creation of software applications designed to provide the necessary information for monitoring and controlling the flow of information in scientific research. This paper presents a desktop application, using internet technology, which provides the necessary support for establishing the performance in medium to large scaled institutions regarding the exchange of information and activities planning. To achieve a correct evaluation, it is very important to reliably acquire, store and update the relevant information on the human resources in a database.

Key-Words: Internet Technologies, Databases, Communication processes, Controlling, Workflows models

1 Introduction

Living in a world where continuous development, creativity and innovation stands in the list of TODO’s of everyday life has had influences to every sector of the society. Adaptation is the keyword of the century and this does not come alone: strong initiatives, measures and incentives are taken constantly so that the market can adapt to the consumer and, most important, in order to achieve the flexibility that will keep them satisfying the consumers’ need.

As generally known, good results come as a reflection of a good management and discipline. This rule is applied also in companies and for that managers will always seek and look forward for new ideas, services and products. They expect from those to help them not only in managing their company, but also to guide them to take better decisions and have a better control.

In the modern society these actual needs are becoming more often translated or passed in the domain of the technology. People are important, it is true, but without communication and planning their goals become almost impossible to reach or reachable but with great efforts.

Nowadays, almost every company has a communication tool, maybe even their own networking system or, they are at least taking advantage of one of the multiple capabilities of the internet – soon they are all going to be dependent on the technology for a simple reason: people will no longer be able to face so many changes.

For surviving they will have to learn, to adapt machines to take over the work, to create tools that will kept them in time with the plans and that will count the results in order to measure the profitability and yield.

Process efficiency, effective control and management, as well as effective measurement mechanisms are the goals and for achieving them, people will be counting from now on the technology.

The notion of technology is being used in many domains of activity from the real world, and within computer science. Shortly described, we could say that the technology can be defined as the science of the processes (how) and the ways (with what) of processing some resources (informational materials, energetics, etc), having the goal of creating some products. For example, a software product is obtained by processing informational resources (raw material for the computer) on a hardware support.¹

The technology of the future will be able to plan, organize, lead, control and direct. These functions have been enabled and become more and more accessible thanks to the comprehensive software development tools and services.

The dimension and benefits of the internet-based services and application is almost immeasurable. Every

¹ Velicanu, M. - Informatica Economică magazine nr.2 (38)/2006, Integrating Informatics Tehnologies into Oracle
day new possibilities are discovered, new technologies and processes are created and new prototypes are tested.

2 Information management through centralized databases and internet access

By studying a way of improving the processes of communication and logistics, a software application was developed which provides the necessary support for creating, assigning, controlling and sharing individual or group information, as well as available resources. To define and achieve a correct workflow for this kind of processes, the way the information regarding human resources is collected, stored and updated is very important (DeNisi, 1996).

2.1 Workflow systems for the management of institutions

During the project development the following targets have been set:
- Elaborating a communication layer which will enable the sharing of ideas, planning of tasks and meetings as well as uploading administrative papers for each task and human resource.
- Elaborating a human resource management layer which will be holding evidence of all the institution’s employee and of the amount of work that each of them has made.
- Developing a logistic module where the structure and planning of the resources can be made.
- Designing a document administration module where the users can keep and share all kinds of documents.

Carrying the activity of the institution in the best conditions depends directly on the activity of its personnel, on the uniform distribution of the amount of work and on keeping track of it. As observed, the application will be concentrating on structuring and creating logical workflows which will improve and support in taking managerial decision and as well, will offer the possibility of achieving the maxim in performance.

The logistic module represents the Operational core module and provides the framework in which the activities and resources can be planned and structured.

The Oxford dictionary defines logistics as "The time-related positioning of resources." As such, logistics is commonly seen as a branch of engineering which creates people systems rather than machine systems. Another definition describes the term as "The science of planning, organizing and managing activities that provide goods or service.". This definition would be maybe the most generic and comprehensive one but it touches exactly the points on which each institution is focusing in order to maximize their potential.

Having in mind the concept of logistics, we have concluded that the application designed as a helping tool for logistic processes must be able to respect following guidelines:
- must be flexible and adaptable
- must be all the time up-to-date
- must provide an overview of the resources of the company (no matter if employee or production materials)
- must provide the resources scheduling time at every point.

Keeping these functional requirements in mind, we could say that the application should be actually the integrator core module of the company which connects the human resources with the activities in a corresponding time span.

Fig.1 Interaction between the core integrator factors of the application.

2.2 The proposed IT system

The project conducted has been aimed for achieving following targets:
- Developing and finding intuitive workflows
- Designing new conceptual patterns
- Creating loosely coupled modules that can be combined independently conceiving in this way multiple application configurations.
- Creation of a software tool that will enable the monitoring and coordination of the resources inside an institution.

The structure on which the application was build has been build according to the Model-View-Controller architectural pattern. The pattern isolates “domain logic” (the application logic for the user) from input and presentation (GUI), permitting independent development, testing and maintenance of each.

---

2 http://en.wikipedia.org/wiki/Logistics
3 M. D., 1997, LogisticsWorld
4 http://en.wikipedia.org/wiki/Model%E2%80%93view%E2%80%93controller
The entire application has been structured in such a way that all its packages and classes to be associated to a certain component of the MVC. In this way, we achieved a great flexibility of the application which can remove or add functionalities and plugins with very small code changes.

View and Control

Fig. 2 Architectural concept of the application

This desktop application uses modern programming techniques and libraries which help us to obtain an intuitive and friendly look, allowing users to easily understand the structure of the application, and thus providing a very smooth learning curve.

The application was built in such a way that the access to the application is granted for categories of rights which can be defined by the super user. An access right is associated to every module and functionality enabling in such a way a custom creation of user access groups.

Predefined, there will be still the already specified Super user, which will possess all the rights over the system and who will be able at any time to do all the necessary modifications.

The concept of User refers to the normal human resource which accesses the application. On the basis of the hierarchy of the organizational units (Fig. 3), every member will have automatic access to the information regarding his/her own account and the information belonging or inserted by other employees when he will be assigned with the corresponding right.

Fig. 3 Layers composing the application

3 Case study

The proposed software is a desktop application which uses C# as programming language that supports the user interface; it performs the form validation since it runs on the client’s computer and does not add any server load. After interception of the users’ actions and calls, it will trigger actions of updating, saving or deletion of objects through the generic DBPerformer object. This connector for database action was conceived in such a way that it can be adapted without great changes to any entity contained in the SaHRData project package, and by that, knowing exactly which parameters should be sent to processing depending on the object which is to be processed.

Based on the request parameters the DBPerformer will connect to the database and perform an SQL query to read, write or delete information. The database system chosen is MsSQL, which ensures consistency at every level with the application and the other Microsoft operating systems and servers. The SQL queries sent are interpreted by the SQL engine and the transactions are performed in the database. The generic DBPerformer will know to interpret the result automatically depending on the type of the object that is handled. After interpreting the result, the controls and logic will manipulate the data for displaying it in a corresponding manner.

3.1 Technologies

The Microsoft .NET framework is a software framework that includes a large library of coded solutions to common programming problems and a virtual machine that manages the execution of programs written specifically for the framework. Having a glance description of the .Net framework we could say that it is a tool which provides the following services: tools for developing software applications, run time environment for software applications to execute, server infrastructure, value added intelligent software which helps developers to do less coding and work more efficiently.

Fig. 4 Microsoft .NET architecture
3.1.1 DevExpress Library
A well recognized library of tools addressing the .NET developers is the DevExpress. This suite combines enhanced capabilities to the already classical .NET framework controls while providing a cutting edge sleek look which allows the application to be more user-friendly and easy to operate. The library is composed by multiple packages, addressing each type of components like grids and data editors, ribbons and toolbars menus, own calendars and scheduler controls, tree views, layout manager or charting and reporting controls which can be used in the same manner as the native .NET components.

3.1.2 MsSQL
SQL is a database computer language designed for the retrieval and management of data in relational database management systems (RDBMS), database schema creation and modification, and database object access control management.

A MsSQL database is a unitary collection of data, having a logical structure (tables, extensions, etc) and a physical structure (defined by a set of files).

Microsoft SQL Server is a relational model database server produced by Microsoft originated in Sybase SQL Server. The services offered in the release of MsSQL Server 2005 include replication services, analysis services, reporting, notification and integration services as well as full text search services. The last of them represents a very useful tool especially for large databases.

Referring specifically to Server 2005 it is important to specify that the version includes a component named SQL CLR (“Common Language Runtime”) via which it integrates with .NET Framework. Unlike most other applications that use .NET Framework, SQL Server itself hosts the .NET Framework runtime, i.e., memory, threading and resource management requirements of .NET Framework are satisfied by SQLOS itself, rather than the underlying Windows operating system. SQLOS provides deadlock detection and resolution services for .NET code as well. With SQL CLR, stored procedures and triggers can be written in any managed .NET language, including C# and VB.NET. Managed code can also be used to define UDT's (user defined types), which can persist in the database. Managed code is compiled to .NET assemblies and after being verified for type safety, registered at the database. After that, they can be invoked like any other procedure. However, only a subset of the Base Class Library is available, when running code under SQL CLR. Most APIs relating to user interface functionality are not available.

3.1.5 Advantages of applications with internet access
The advantages of a desktop application which keeps its database centralized and accessible over the internet for all users, combines both the advantages of a web application with the ones of the desktop’s application. Some of the most important advantages would be the controlled and secured access over the data within the application, greater possibility of error handling and better usability of the user interface (GUI).

3.2 Database structure
The database of the application SaHR is realised with the MsSQL Server Management Studio on a MsSQL Server 2005 and the complete diagramm contains the schema, keys and also the integrity constraints.

The conception of the database model was made according with the entity-relationship-model. Basically all the important and major objects handled within the application are represented by a table in the database. The properties of these objects, which are also complex entities represented by connection tables which are basically keeping a relations composed from two foreign keys.

The major components of the database are the employee, appointment, document, location, department, group and permission tables.

The relations implied by the conjunctions of the objects are most commonly referred in the following tables: employee_appointment, employee_document, department_employee, location_department, group_employee, group_permission.

3.3 Application guide
The application is divided into five loosely couples modules, each one having a specific job and functionality. Their only common point is technically hidden under the sharing of the same model but yet thorough the implementation of specific interfaces, a common behavior and functionality is still obtained. In this way the application can be adapted to the customer’s needs while keeping the uniformity and avoiding confusion.

The first view that the application opens is the Agenda. The views and controls of this module are summarized in the SaHRPlanning project. Here we can find all the specific graphical controls needed for the functionality of this module and also the controllers triggering the necessary events.

---

5 "Overview of CLR integration" Microsoft documentation, Retrieved 2007-12-03.
**Statistics and reports** is the second module of the application. Here you can generate reports regarding to the content of the agenda (the appointments).

**Human resources** represents the third module and it represents the administration of every employee together with its details.

The fourth module containing the **System Administration**, is included together with the fourth module in the SaHRAdministration project and contains access to the company’s data, including administration of locations, addresses, access right, holidays and database access settings.

In the first module, **Agenda**, the employee can insert its personal appointments (not visible for others) as well as public appointments in order to mark the period when he is not available. By assigning multiple employees to an appointment you can plan meetings and actions to which they have to take part, allowing them in the same time to insert their own comments regarding the planned activity. In this way a bidirectional communication is achieved which is constantly archived in the database, avoiding any loss of data.

In the **Human resources** module the resources of the institution can be defined. This includes the possible locations, departments and employee belonging to it. The relation between these entities will be related in the following order:

**Institution** – **Location** – **Department** – **Employee**

Each employee has a set of data assigned to it, containing all personal and institution related data. Also, each employee can upload different types of documents in the corresponding area.

In the administration area of the system we can configure the access hierarchy in a custom mode, by creating groups which are afterwards assigned with a set of predefined rights and with the users which must belong to it.

![Fig. 8 Window for modifying/adding access groups](image)

Based on the stored information, a series of reports can be generated from the **Raportare** (**Statistics and reports**) menu. Other kinds of reports can be defined at a later stage by the management personnel of the organizational entities.

The settings menu allows also configuration of the data belonging to the institution itself, like addresses, as well as a tool to backup the complete database for security purposes.

Another important menu is also the one representing the modules with which the appointments from the **Agenda** are assigned. The super user can create here new appointment modules or change the existing ones.

**4 Conclusion**

The presented software application is undergoing continuous development. The concept from which the project started was to offer an adaptable solution for facilitating the exchange of information and managing the logistics of a medium sized institution that can be represented either by an university or also by a simple commercial company. After analyzing the requirements of this type of customers we concluded to an architectural model which allows creating combinations of projects in form of packages that can easily be added or removed creating in the end custom solutions for each client.

The extraordinary flexibility is given by the centralized database, accessible through internet from any desktop client of the application. This is combined with the fact that every core entity used by the application can be extended, modified or renaming in such a way that it corresponds to the specific needs of
the customer. The application uses a MSSQL 2005 database server and specific .NET framework methods which makes it to be fully integrated with all the Microsoft operating systems and servers. The usage of the .NET framework gives the great advantage of user friendliness due to the fact that the majority of the users are already used with Microsoft Windows applications and that provides an easy integration with our system.

The application is very dynamic, communicating all the time with the user. Also due to the automatically reload of data, the user is kept in contact all the time with the agenda, which is able to pop up an info box whenever new appointments or tasks have arrived for him.

This project was aimed to provide a practical approach over real-life workflows within a company. The focus was added on creating processes that can be afterwards used in a loosely coupled way. In this way we can provide a great flexibility and achieve a greater performance in managing and controlling the activities rune within the institution.

Acknowledgements
Kinga Kiss Iakab is also affiliated with the Carl von Ossietzky University of Oldenburg, Germany. Her work was supported by the German Research Foundation (DFG), grant GRK 1076/3 (TrustSoft).

References: