MASARYKOVA UNIVERZITA V BRNĚ
FAKULTA INFORMATIKY
http://is.muni.cz/

1 APPLICATION FOR THE EUNIS ELITE AWARD 2005

for Excellence in implementing the Administrative Information Systems for Higher Education.

2 THE APPLICANT

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2.1 Short description of the product

The Masaryk University Information System (IS MU) is an authenticated web information system covering nearly every aspect of university administration. The system is provided for the whole of Masaryk University in Brno (cca 30,000 students), the second biggest Czech university. After six years of being used, the service of IS MU became an asset – in that it represents a move to the student-driven education and an ECTS system. The goal of the system is to promote e-administration, net communication and e-learning. The system has been widely accepted, enjoys massive use (up to 15,000 users and 1,000,000 operations per day) and is constantly being developed in house at the Faculty of Informatics, one of Masaryk University´s nine constituent faculties.

2.2 Brief history of the product

The development of the Masaryk University Information System began in December 1998. The first applications for test runs were available to a limited number of users in January 1999. Officially, the Information System was put into operation on March 1, 1999. At the start of the system, applications for the collection of data on publishing activities, CVs and the Catalogue of Study Courses were made available. Since then, about 1,000 web scripts in the PERL programming language have been implemented.

The product is developed, produced, licensed and operated by Masaryk University itself without any special co-operation.

3 INNOVATIVE CONTENT

Every university has an information system. Why is the IS MU considered to be an outstanding one? The aspects that make a real difference are **its administration results and its impact on Masaryk University**. These are briefly summarized below.

3.1 The Scope

Masaryk University, the second largest and oldest school in the Czech Republic, consists of nine independent faculties. Making the system a living part of life at all faculties requires supporting of very different approaches to study administration. The system is highly complex, provides every study program and every single teacher with an opportunity to use different tools. But, at the same time, IS MU unifies core procedures, so a student can enrol in any course given at any faculty, get credits and finally a diploma. Today, all students' operations can be done via Internet (selecting courses and exams, checking conditions for enrolment in the following semester to come, checking conditions for getting the diploma, etc.). Individual study plans and student-driven education could not be maintained by study departments before IS MU emerged. However, it is easy to do so today.

3.2 The Usage

A lot of information systems provide mainly access to information for managers. Data are often outdated and inaccurate. The aim of the IS MU is to provide access to valuable services to every member of the University, and thus people want to use it often. Once they get used to the system, they can easily maintain their data (personal information, teaching information) and keep it up-to-date. The access to the system is transparent, i.e. all applications have web interfaces. Apart from around 30 thousand students (for whom the system use can be made obligatory), IS MU serves several thousand staff members - people who greatly contribute to the "success" of the system, i.e. they provide information for the students through the system in a interesting way. Since there is no way to train thousands of users in a regular manner (face-to-face training), the system has to be simple and self-explanatory. The number of users who access the system every day exceeds 15,000 while the system performs up to 1,000,000 operations per day.

3.3 The "IT at its best" promotion

Thousands of young people, some of whom are likely to get employed as managers in very different areas of human activities (Masaryk University covers hundreds of study fields), graduate from Masaryk University every year. Since they study at the University, they have ample opportunities to get in touch with the top IT and Internet services, they have an opportunity to find out how computers and network can ease the administration and exchange information. They can use e-learning applications, communicate and create new information. A lot of young people can do so on their own without any university information system, of course. At Masaryk University, however, even students of non-technical branches are encouraged to use the system and thustheir typical "passive resistance to technology usage" gradually disappears.

To the best of our knowledge, Masaryk University's Information System copies real life and interconnects its segments. No other school runs the system of such an extent and no other school trusts technology so much.

An average user's mental and technical networking abilities are continuously growing. At the same time, it is possible to analyse other services and convert them into an electronic form. Such "sustainable innovation" is typical of the IS MU system. These days, there is quite a long list of things to do covering demands coming from different parts of Masaryk University wanting to participate in such electronic activities, which represents a clear sign that the people are involved and satisfied and that the system is another successful step made towards the information society. In the IS MU, Masaryk University gets a very powerful tool at an extremely low price.

4 TOWARDS THE EVALUATION CRITERIA

4.1 The de-centralization of management/administrative responsibilities
- one of the system's main goals;
- teachers have full access to the system: Teacher's notebook agenda covers about 35 applications;
- The Study and Examination Regulations mention the IS MU system 18 times;

- students are encouraged to attend to and solve particular administrative tasks via Internet;
- a sophisticated automatic system for selection and registration in courses including demand/offer solutions is implemented.

4.2   The support of additional services for students

- IS MU serves as an authentication point for other systems, e.g. university canteen, dormitories, access points (doors, copy machines);
- the style of IS MU web pages allows the students with disabilities (blind people) to easily access the system;
- IS MU offers several additional services: private web space, discussion boards, bulletin board...

4.3   Greater efficiency & productivity in the institution

To take only one example, IS MU covers the university-wide selection of physical education lessons for about 20,000 students. Every student can choose the sport from the list offered for the whole University and then attend the classes of which he/she wants This, however, was not possible before the IS MU era for administrative reasons.

4.4   Support for internet access and activities

Since the use of IS MU is more or less obligatory, every member of the University becomes capable of using Internet services, finding information, handling e-mail etc.

4.5   Commitment for user education

The next goal of Masaryk University is to develop broadly used e-learning activities. Today, the IS MU system allows teachers to display their teaching and educational materials and a lot of types of tests, store students' homework and discuss things or chat with students. E-learning tools can be used in any type of university education, e.g. in language education for teachers, etc.

4.6   Rapid implementation

Rapid implementation is provided by an extreme programming paradigm and the fact that the system is developed in-house; close to the users' needs. Prof. Jiří Zlatuška (professor of Informatics, last Rector of Masaryk University) played an important role in the implementation of the system during the first few years of its existence.

5   THE PROJECT

5.1   The advantages of the system

IS MU is a part of the university environment and real study life.
IS MU is developed and validated in various university environments.
IS MU contains reporting tools needed for state institutions.
IS MU makes credit and non-credit study system, regulation of the study by the student himself/herself and inter-university and inter-faculty studies possible.
IS MU systematizes management, control and organization of study and makes the study regulations "tailor-made").
IS MU supports other forms of studying (adult and distance learning, e-learning etc.).
IS MU implements e-learning (video server, voluminous education materials, LMS – Learning Management System).
IS MU integrates a sophisticated system of admission process.
IS MU makes identification and administration processes (data collection and acquisition etc.) and execution of the activities electronically possible.
IS MU enables wide academic public to do their work independently of the system administrators.
IS MU supports integration in other existing systems.

5.2   The goals of the project

Developing the system was chosen as one of several alternatives available. That is, it was possible to buy an available solution (but at that time it would be like "buying a pig in a poke"), to have it developed by a software building company or develop it on our own. We were well aware of the fact that all the alternatives might result in a failure. Nevertheless our final choice turned out to be the best.

The project was to be compliant with a real study life, copy academic year processes and follow Study and Examination Regulations. The users of this system have been students, teachers and the staff of Masaryk University in Brno. Nowadays, it is also graduates, distance -learning people and some other additional colleges and universities that use the system. To sum up, the system is used by about 66,000 users.

IS MU is being developed to address not only the demands of decentralized management and administration, but also those of separate faculties.

The main system-related feedback comes from students, teachers and administrative staff. Students usually encounter IS MU for the first time during their admissions procedures. The system supports the comprehensive processing of electronic applications submitted by applicants (electronically via a web interface), provides editing tools for the dean's office and import/export applications for processing information in other systems. After a student is admitted all study records are managed by IS MU. Hence, students can view, change or apply for a change related to his/her study electronically. For example, a student can sign up for a course inside the system. The system also enables students and teachers to interact with each other. Teachers can post all kinds of details pertaining to their courses such as information about study materials, examination dates and assessment of their students' work on the system. The students, on the other hand, are immediately (usually thanks to the connection of their mailbox inside IS MU with their mobile phones) informed by the system about these changes. Almost every request received by the system for getting information or performing a change is processed online so that students, teachers and administrative staff always get up-to-date data. Finally, the dean's office administrative staff can perform a lot of student-related operations, those concerning the students' studies, teachers and courses. A typical example is a regular inspection of students' results. In this respect, the system can provide a list of students with some study problems.

The system contains ample functions to support research and development, timetables, document management and University accommodation. IS MU provides data for authorisation systems allowing university members to login into university computers, access restricted areas inside the University buildings, etc. For this purpose, each person has an identification chip-card optionally supplied with the International Student or Teacher identification cards.

5.3   Main application groups (number of applications)

Study departments´ agenda (25)

Teacher's Notebook (35)

Student's Tools (20)

Catalogue of Courses (20)

Admission Process (30)

Study, E-learning (25)

Publications (15)

People (25)

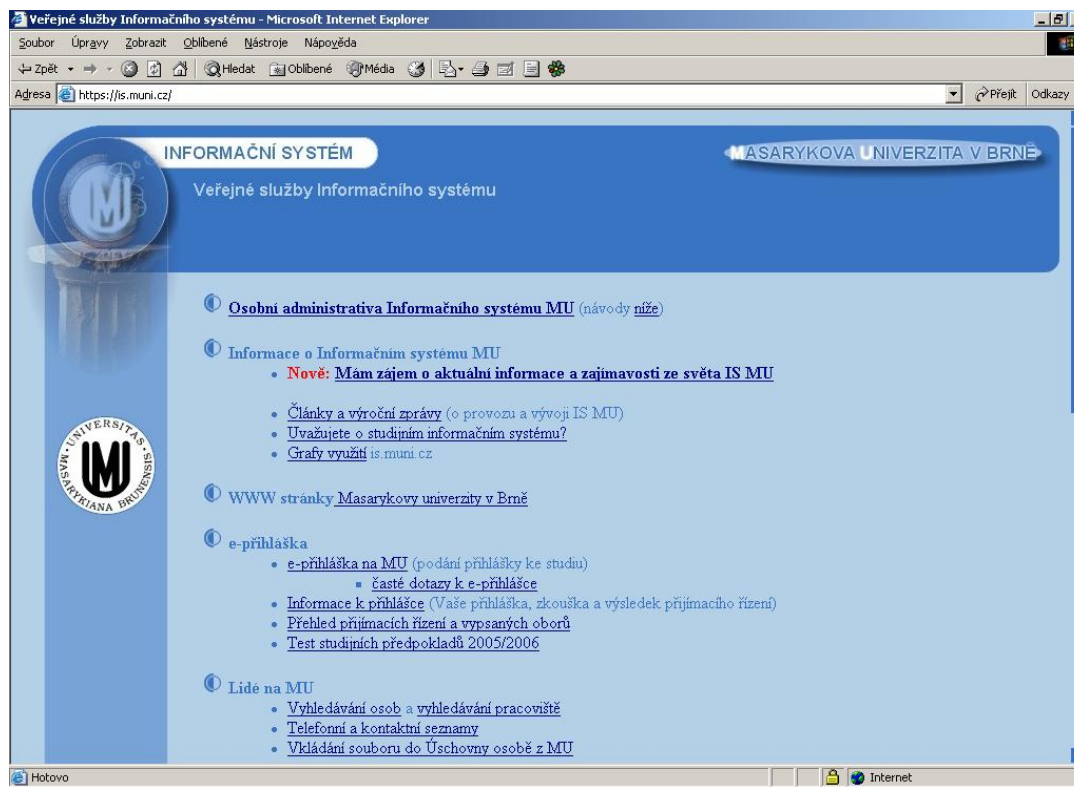**Communication** (40)

System (20)

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Figure 1: Non-authenticated web page of the IS MU system.

5.4   Example: Student's activities during the semester

The IS MU system is not available in English and therefore we can't fully demonstrate the features with application screenshots. However, to provide an outline we can briefly summarize student's operations. Thus, which applications are used by a common student:

Start of Semester:
* semester enrollment application - credit sums and obligatory course checking;
* opting out of courses - the student has to enroll in some of the courses he/she did not complete successfully during the previous semester. He/she may also opt out of some of those he/she does not want to attend;
* grading summary - the student checks data in the system and contacts the teacher if a problem is found;
* registration schedule, time-table application;
* individual study plan – information on which subjects the student needs to enroll in to graduate;
* registration - detailed information about courses;
* registration a registration cancellation of seminar group (choosing a timetable).

During the Semester:
* study materials server - reading and downloading material;
* homework storage - uploading files to be viewed by the teacher;
* tests - e-learning activities;
* continuous grading during the semester;
* pocket IS MU - phone access to the system;
* discussion board;
* students' anonymous feed-back for the teacher;
* M.A. thesis archive;
* individual tuition fee application;

* apologizing for absence from the study duties application;
* others.

The list covers only administrative tasks. We do not mention communication and presentation agenda here.

5.5 Connection to other internal systems

IS MU is especially a system for higher education and does not support other services such as personnel management (only part of it involves personnel administration enabling users to update their personal data) or financial and economic systems. In spite of this the cooperation with the systems of this kind appears indispensable and needed, and therefore special interfaces to share data between various systems were created.

5.6 Development and plans

This system has been management-aided since it came into existence and won support for technological expansion and therefore no administrative, technical or financial constraints have been encountered. Thanks to continual information insertion the system provides statistical information. Such information is very important for such large university and the really solid system is condition for their acquirement. But one of the significant pre-requisites for its support is that it is accepted by its users especially students. That is why the system is "client-focused".

Some occasional investments for its further expansion, whose purpose was implementing new features (e-learning, translation to English, etc.) have been obtained. Masaryk University Information System is fully integrated in the University's IT infrastructure. Its present and future role is to include and implement the internal study and other university regulations, to copy the real life study processes (workflow – "studyflow") and relieve or do away with administration and paperwork. Thus it has a positive influence on efficiency and productivity of the University.

The development team consists of analysts analyzing users' needs, current trends in education or changes in study regulations. They are also skilled system programmers able to to make all the necessary modifications and make them functional. The aforementioned facts save not only money, but also a lot of development time. In addition, the system development is very fast.

Some other future tasks also include the implementation of the advanced Learning Management System module for e-learning purposes and the translation of the system into English.

5.7 Technical information

Masaryk University Information System is a fully web-based system. It provides online access to almost all administrative tasks for all university members including teachers, students and other university staff. The system does not require any special installation on the client's side. That is, almost all currently used web browsers are supported and no special support for Java, Java Script or other more proprietary standards is needed. The only requirement for users is a HTTPS client and HTML viewer. This allows them to access the system from different environments including miscellaneous mobile devices and PDAs. Mobile phones with WAP clients are also supported but only in a limited number of applications. As regards security, each person has its own ID number and secret password, which are used for his/her authorisation. The ID number can be replaced with a nickname.

The system itself consists of an application cluster and a multi-tiered database cluster. The application cluster is built on a set of Linux servers with the Apache web server. Each server runs a set of about 1000 applications written in the Perl programming language. The client requests are distributed among the servers. In May 2005, 10 Intel 32-bit servers with the Linux operating system were allocated for to this task and two servers (one as a hot-swap backup) act as a gateway and application load balancer.

The next part of the system is a multi-tiered database cluster, which stores data and the second part of application logic. This subsystem is managed by two database instances each based on SGI Altix 350 server and Linux operating system. This server hosts Oracle Database Enterprise Edition 10g as database management software. At the present time, the database structure includes about 800 tables with the total size of about 50GB. The database includes also more than 500 procedural sources in PL/SQL language.

The system contains its own e-mail server for providing uniform access to university communication. Each university member can access his mailbox via a web interface or download his messages to his favourite e-mail client. The SMTP (the QMail server is used for this purpose) and POP3 servers run on the "load balancer" machine described above and cooperate with a special mail infrastructure stored within the database. Mass e-mails for thousands of users (e.g. one e-mail for a group of students) are also supported. In this case, the same body of the message is internally shared and is stored only once.

Sophisticated backup management of the system is also implemented. Data stored inside the database are archived and backed up automatically. In this respect, the system is stored in different geographical locations thereby being disaster- resistant.

Finally, IS MU integrates many functions for cooperation with other university systems (e.g. accounting and personnel systems).

5.8   2004 Annual Summary Statistics

On December 31. 2004, the Information System had 65,936 active registered users. In 2004, the system was regularly used by 33,096 persons and 38,016 users logged into the system occasionally. 17,061 students took part in the anonymous opinion poll targeting courses and teachers, which takes place each term.

Overall statistics:
- Total number of log-ins in May, 2005: 339,353,665.
- Number of log-ins during 2004: 97,733,624.
- Maximum number of different users logged in on the same day: 15,949.
- Maximum number of pages opened in the system on the same day: 801,564.
- Maximum server response rate: 110,000 requests per hour.
- Overall number of scripts (individual programmes) of the system: 1,107.
- Information is stored in roughly 801 database tables and about 70 categories.
- Number of publication records: 427,149 (Information Register).
- Number of queries responded to at a contact address: approx. 2,000.
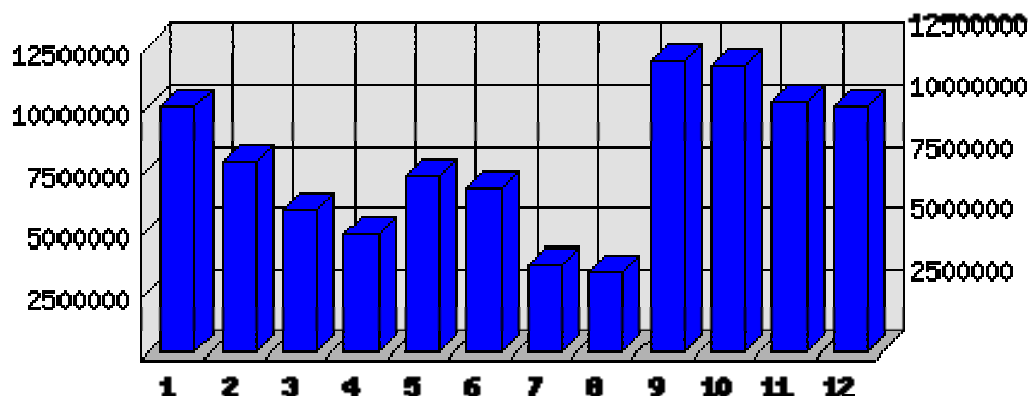- System availability in 2004: 99.17%.

Figure 2: Total amount of authenticated web transaction per month in 2004.

5.9   Support

The development team and university coordinators of IS MU provide a full non-stop e-mail support and personal assistance during their working hours.

6   IMPLEMENTATION

The Masaryk University Information System came into operation officially on March 1, 1999. The product is owned by Masaryk University, Brno, and it is provided to other universities only as an out-sourced service. It is currently used by three universities in the Czech Republic including Masaryk University in Brno, Charles University in Prague (one of their faculties) and Institute of Finance and Administration in Prague (private institution of higher education), but the plans are to expand also to Europe.

7   CONCLUSION

The Masaryk University Information System is fully web-based, online system which attends to nearly every task associated with university administration. To the best of our knowledge, there is no other system of similar extent in Central Europe.