The TUGonline Project

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The goals

The TUGonline project started in 1997 and had the global goal to set up an all inclosing campuswide informationmanagement system for our university. The main idea of the project was to build a system that treats lecturers, researchers an especially students as valuable customers of our university and therefore support them with a state-of-the-art customer-service.The customers should benefit from this system in the following ways:

- no more need to move physically to a department to get or put some information
- no more loss of service because of closed doors due to opening hours of departments
- no more need to transfer or duplicate data on different media. The system is the source.
- no more paper on notice-boards presenting out-of-time data. The system publishes.

This input implicated a system that should support high quality in communication and workflows between all members of the university. The user enviroment below - today known as personal portal definition – was the way we wanted to go to reach that quality:

- each member should get a personal, uptodate view on the university, its data and services
- by looking at dynamically generated data from a database
- through personal identification
- with single-sign-on mechanism (one-time identification for all further services and actions)
- anytime, anywhere (in the WEB)
- on a secure way (using SSL)
- with garanteed response time (lower than 7 seconds)
- and high reliability (24 hours x 7 days)

To satisfy the needs above there was to design a new access- and data-model with the following constraints:

- All data should be integrated in **one** database.
  Keeping different databases up-to-date causes a lot of manpower.

- Every data item should exist **only once**, no duplicates, no transfers
  This implicated the design of **one** datamodel, that should include at the end all tables and relationships of all resources of the university.

- Data should be managed at the source by the authorized person
  When data is produced it should be input directly in the system, no cache on other media. Management privileges on organisation's data should depend on a person's rights in that organisation.

The environment

The University of Technology Graz (TUG) has about 1400 staff and 8000 students. It incorporates 5 faculties with 75 departments for education & research and different service institutions (staff and student administration, Library, Computing services,…). TUG federal budget in 2002 was 80million Euros, the income from contractual work in 2001 was 17million Euros.

The campus is distributed in different areas that are connected by a state-of-the-art network including a Gigabit-Backbone and a category 5 wiring inside departments. Beside there is a second network called "Virtual Campus Graz" that connects almost all dormitories in Graz via ATM-155 MBit/sec technology. This network is fully connected to the TUG backbone and therefore allows students to work from dormitory with the same quality as on campus.

The expenses for TUGonline till now were 18 person years of staff resource at the Department for Informationmanagement at TUG and about 1 million Euros for external persons – mainly students. The whole project has been carried out in close cooperation with many other institutions at TUG, especially the administrative departments.

TUGonline runs on an ORACLE 9iR2 database on a HP9000-server together with dedicated WEB- and FORMS/REPORT-Servers on SUN/Solaris. Each of the systems is supported by a standby system.

The planned scenario of the project and its actual state

We started the project in January 1997 and during the first year we designed and implemented the kernel of the system using the new data- and the access-model. We went into operation with TUGonline in January 1998. Over the years new applications were added to the system and by now the system offers a large number of services and management tools to different groups of persons.

The data-model

The design of the data-model started from scratch with the goal to build *one* model including all resource-tables with each item *only once*. The model now has the size of about 600 tables and is still growing. The full knowledge on the model gives us the opportunity to act or react very flexible to requirements.

The access-model

The access-model was designed to give a large flexibility in the assignment of rights to persons. It allows you to build a central-managed but also a decentral-managed system and you are able to dynamically migrate from one to the other when business-rules on the university change.

It consists of five layers:
- **Data** defines the database with its tables and relationships
- **Programs** are resource-specific applications that access data

- **Roles** define privileges for using a program in a specific way. Each program has his own roles (for example "read" or "edit")

- **Functions** belong to an organisation and are usually resource-specific (for example "inventory management"). Each function is assigned to one ore more roles (the above function could be assigned reasonable to the role "edit" of the program "inventory management").
  Functions are also assigned to identified persons. The relation between functions and roles as well as functions and identified persons is a many to many which allows a maximum of flexibility in setting up the system. You can build a central-managed system by just defining a few multi-purpose-functions in the top level organisation and assigning all roles to them. On the other hand you can build a very decentral-managed system by defining many resource-specific functions in lower level institutions of the university and assign the proper roles to them.

- **Identified persons** are real persons known to the system by unique usernames and passwords. The granting of username/password as well as the assignment of functions to staff is managed decentral in the departments. Students get a PIN-Code at first entry and later on demand at the admission-office.

Program technology

In TUGonline there are three types of applications:

- **WEB-application** for staff and students
  We are using PL/SQL as interface to the database together with HTML and JavaScript. Sessions are made unique by using session-cookies, that are only stored in memory.

- **FORMS-applications** mainly for the administrative staff
  ORACLE's FORMS technology allows to develop on a higher level with more functionality

- **REPORT-applications** for staff and students
  Those applications allow the easy generation and presentation of reports mainly as PDF files by using ORACLE´s REPORT technology.

The reengineering phase

In the last year we have started a reengineering of the system with the goal to improve the external and the internal quality of the system.

- **External quality:** We have developed presentation-modules to generate HTML-pages in a structured way, so that each page gets the same look. The page structure consist of header, navigation, body (including list- and mask-elements) and footer (see graphic below). With this concept we are able to modify the layout of the whole system very comfortable. To freeze text sizes we are using cascading style sheets.

- **Internal quality:** We have implemented public views and APIs (application programming interfaces) as interface to tables of main-resources. Now we are able to change table-structures and just have to take care that APIs and views deliver the same data as before.

The actual state

The current system (please take at look at http://online.tugraz.at) covers the management of all resources of our university exept budget because the budget-application is hosted centrally in Vienna. From the users point of view the system supports all kind of management activities exept those who need a written signature. The access is through a WEB-portal as defined in chapter "goals". The system handles about 10.000 sessions with about 200.000 page-requests on an average day. Below you find a detailed list of all actual services and management tools grouped by userprofile (students, staff, persons with functions in a department):

Services and management tools for students

concerning lectures
- get a view on description in ECTS-style including ECTS-credits
- register for attendance
- register for examination
- get a view on examination-results (records)
- print a certificate
- attend an evaluation, if registered for attendance
- attend a discussion group, if registered for attendance
- manage personal time&date-calendar
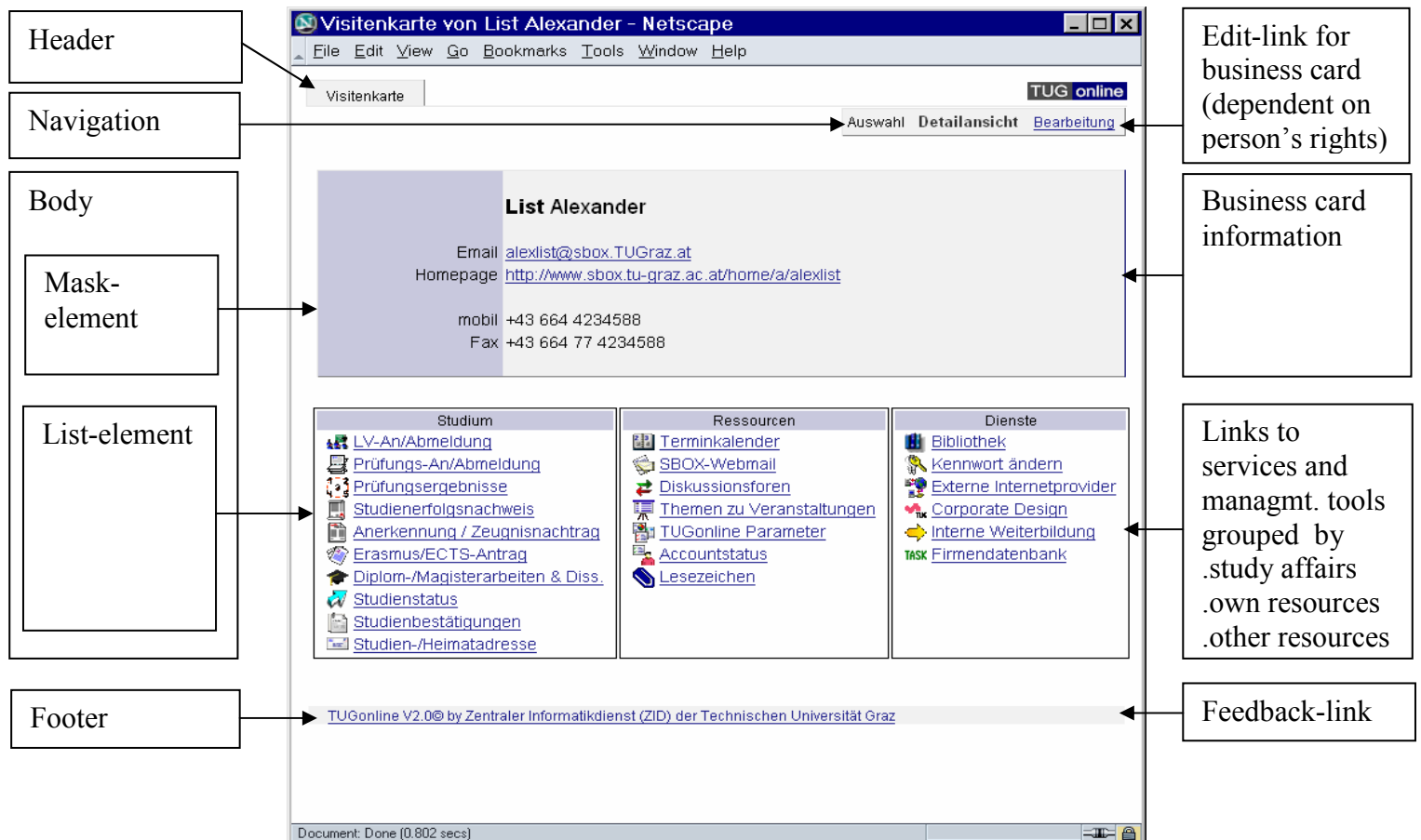 (automatically including dates and locations of lectures, where registered for attendance)

concerning studies
- register for an ERASMUS-study
- preprint an ECTS-transcript of records
- manage certificates or approvals
  (has to be confirmed afterwards by the admission-office)
- get information about the actual status of study
- print a confirmation of study for use with external organisations
- document abstracts of diploma or dissertation theses
- update home-adress & address-location near university

concerning other resources
- access the central mail-server & library system (no further login needed)
- manage the personal „business card" (email, phone, fax,...)
- manage personal bookmarks
- register for TUG internal further education courses
- register for a cheap internet-access at external internet providers
- register for automatic Email-delivery, when events with a specific topic are announced
- set parameters to customize the layout of the system
- get a view on personal account-status (privileges to use resources, disk space,…)
- change the access-password
- access a university related companies database (for future relations)

Below you see a male student's entry point in the system, where he gets a view on his business-card information together with the functions and services he is allowed to use.

Page structure   student's TUGonline homepage   Page content

Header

Navigation

Body

Mask-element

List-element

Footer

Edit-link for business card (dependent on person's rights)

Business card information

Links to services and managmt. tools grouped by .study affairs .own resources .other resources

Feedback-link

Visitenkarte von List Alexander – Netscape

File Edit View Go Bookmarks Tools Window Help

Visitenkarte

TUG online

Auswahl   Detailansicht   Bearbeitung

List Alexander

Email alexlist@sbox.TUGraz.at
Homepage http://www.sbox.tu-graz.ac.at/home/a/alexlist

mobil +43 664 4234588
Fax +43 664 77 4234588

Studium	Ressourcen	Dienste
LV-An/Abmeldung	Terminkalender	Bibliothek
Prüfungs-An/Abmeldung	SBOX-Webmail	Kennwort ändern
Prüfungsergebnisse	Diskussionsforen	Externe Internetprovider
Studienerfolgsnachweis	Themen zu Veranstaltungen	Corporate Design
Anerkennung / Zeugnisnachtrag	TUGonline Parameter	Interne Weiterbildung
Erasmus/ECTS-Antrag	Accountstatus	Firmendatenbank
Diplom-/Magisterarbeiten & Diss.	Lesezeichen	
Studienstatus		
Studienbestätigungen		
Studien-/Heimatadresse		

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Services and management tools for staff

concerning own lectures
- get an overview with main-parameters
- manage ECTS-description
- manage attendance and examinations
- manage time&date entries
- manage evaluation (access restrictions, questions,…)
- communicate with attendants (by Email or discussion group)
- get a view on lecture planning process (granting) for next year
- manage personal time&date-calendar
  (automatically including dates and locations of own lectures)

concerning own research activities
- manage research activities
- manage supported diploma and dissertation theses
- manage personal publications

concerning other resources
- same as students (see above) plus
- search for free lecture rooms
- manage time&date for dedicated rooms
- manage external functions, awards and honours
- get an overview on own active functions in the system

Services and management tools depending on a person´s functions at a department

concerning departments lectures
- get an overview with main-parameters
- manage ECTS-description
- manage attendance and examination
- manage time&date entries
- manage evaluation (access restrictions, questions,…)
- communicate with attendants (by Email or discussion group)
- manage lecture planning process (granting) for next year
- get a view on lectures time&date-calender
  (automatically including dates&places of department's lectures)

concerning department's other resources,
management of
- access-codes (PINcodes) for new members
- business card (address, Email, phone, fax, …)
- description (goals, contents,…)
- discussiongroups (inside department)
- distribution lists
- events (that are aggregated in a central TUG-event-calendar)
- function-assignment to persons
- internet-hostnamens (name, aliases,…)
- inventory (room, bar code label,…)
- library (budget, books,…)
- office supply ordering (folders, writing material,…)
- phone (displaytext, person / phonenumber relation,…)
- questionnaries
- research activities documentation
- room (usage, name)
- softwarelicences (that are ordered centrally)
- staff (from contractual work)
- time&date concerning rooms

Services and management tools for administrative staff

concerning studies
- curriculum
- student-administration
- lecture planning process
- payment for holding lectures
- confirmation of examinations or approvals
- advance notification for applicants
- SOKRATES / ERASMUS (incoming / outgouings, bilateral contracts,…)
- ECTS-transcript of records & diploma supplement (generation, delivery,…)
- final diploma or doctoral certificate generation
- trend analysis on students examinations (via datawarehouse)

concerning other resources
- organisation (name, type,…)
- staff (master data, type of employments,…)
- room / building (type, owner, …)
- inventory (registration, financing, owner,…)
- TUG internal further education courses
- office supply ordering

An analysis of its results and impact on the institution

One could ask, how did we manage the integration of this system in a university where – like on every other university – there are many persons making decisions following different goals and having different opinions. Below are some factors that made the system to a well accepted management tool.

Success factors and their impact on the university

- Transparency and management at the source lead to data quality
  Making public all our resource-data - exept sensitive personal data - to each member of our university and in global internet leads to a level of actuality, referential integrity and completeness that was never reached before. Being able to maintain data at the authorized person's workplace keeps data up-to-date and accelerates workflows.

- Communication leads to a corporate system
  TUGonline was developed in continious cooperation with all other institutions on our university, especially the administrative departments. This lead to a high level of confidence and acceptance. Many staff persons and also students think of TUGonline as *their* system, because many members' ideas or requests resulted in new features. Over the years there has developed a corporte member ownership of the system.

- Consistent look and functionality lead to better user-acceptance
  In the past people were managing resource-data with different tools using different user-interfaces. In TUGonline all management tools and services are presented in the same look with the same base functionality (navigation, windowmanagement). The introduction of a new tool does not frighten users, they regard TUGonline as the "university desktop" where they can expect all the tools and services concerning the university.

The european context

The mobility of teachers and students in Europe is increasing. Concerning beginners at TUG in academic year 2002/03 the Percentage of foreigners was 18,1% and the percentage of Erasmus students was 9,8% and we hope it will raise in the future. One condition for being attractive to students is the fully integration of the ECTS (European Credit Transfer System) as we have done on our university. TUGonline incorporates the whole ECTS-management including the automatic generation of the documents (transcript of records, diploma supplement). Students can make a preprint to control the content. Furthermore TUGonline presents the TUG information package including ECTS-attributes. With all these features this system opens our university as a virtual campus to all attentants in the sense of coordinated higher education in Europe (Bologna declaration and followup).

Further developments

We plan further developments in three areas:

Software development
- Customization
- Software configuration management (including bug- and feature-request management)
- Internal quality: public views, APIs for other resources
- External quality: improvement of presentation modules

New applications and technologies
- Alumni management
- Making the system bilingual (german and english)
- Integration of digital signature to produce digitally signed documents
- Integration of smartcards (for digital signature and second level of access)
- Integration of a Customer Relationship Management concept

Connections to other dedicated systems
- Management of human resources / financing / controlling (SAP-HR / Fi-Co)
  There is a concrete plan on our university to manage the budget (including inventory) and staff with SAP software in the near future. Due to that fact we will define interfaces to SAP and concentrate TUGonline on campus-managenent (education & research).

- Datawarehouse (Business Objects)
  The leadership demands reports concerning resources and their correlation as base for decisions, generated with a state-of-the-art tool. Therefore we have begun to define and fill data-structures for a datawarehouse and generated first reports.

- Content Management System (Artefact from Archive-IT)
  Many departments have data on different media (paper, slides, …). The goal is to maintain all that data in a content managament system and access it from TUGonline.

- E-learning System (eLS from Hyperwave)

  Multimedia education in the WEB demands the use of a professional E-learning system. This system should be integrated in the "single sign on" concept of TUGonline via LDAP.

- Central authentication and authorization server (eDirectory from Novell)
  This server should become the central LDAP server for all other systems on our university. As many of a person's rights are already managed in TUGonline, we will support this server with this information.

How this project could be applied to other institutions

In Austria some other universities are interested in TUGonline and with a few we are in intensive negotiations how to implement on their campus a customized version of TUGonline called CAMPUSonline. At the end of February 2003 we have finished the analyzing phase for setting up a masterversion for the universities of music and art in Vienna and Graz. Our plan is not to build different program-versions of CAMPUSonline for other universities, but to develop one masterversion that includes parameters for customization.