SW REQUIREMENTS AND SYSTEM DESIGN

Enrolment Module

Author	Checked by	Description
Marjan Gusev		Template which contains WP1.1 (enrolment) requirements written by multiple authors.
Toni Stojanovski		Unnecessary detail, and sections not related to WP1.1 are removed.
Dejan Gjorgjevikj	13.01.2011	Additional business rules

CIRCULATION LIST

This document is intended only for participants of i-Know Project.

REVISIONS SUMMARY

Revision	Date	Author	Modified paragraphs and kind of modification
Draft.2.2	03/01/2011	Marjan Gusev	Template for working groups
Draft.2.3	13/01/2011	Dejan Gjorgjevikj	Additional business rules

LEGAL NOTICE

This document is prepared in the scope of the Innovation and Knowledge Management towards eStudent Information System TEMPUS Project JPGR 511342 – iKnow.

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CONTENT

1 Enrolment and migration module

1.1 List of functions

(ENR) Module for enrolment

- Management of enrolment of students (for every level of studies)
- Management of candidates, ranking and completing the enrolment of new students
- Exchange of information with the Ministry of education

(MGR) Migration of existing data

- Preparing web services, forms and specification of formats for migration of data from existing systems
- Correction and fine tuning of migrated data

1.2 Introduction

Students are the main purpose of the existence and operation of every university. Students are being enrolled at the university in a process called admission. Student admissions are a vital part of any university's running because students are what keep university alive.

The main purpose of every admission process is to:

- Acknowledge that the prospective candidates do comply with the internal/external policy/rules/laws for specific study program enrolment
- Select the candidates who, (in its judgment,) will make the best students and become valuable professionals.
- Plan the resources needed for the education process according to the interests of the future students
- Record statistical data collected from the prospective students in order to use it in future management / educational / other decisions.

Student admissions are usually organized in the certain periods of the year and last for a certain predetermined period of time in which a certain process of submitting applications, candidate selection and final enrolment takes place. In this process, the candidates (prospective students) usually express their intention to continue their education in a certain area of study by submitting an application at a certain university accompanied by other documents and certificates that are to certify that they satisfy certain prerequisites, and to support their application in the process of candidate selection. The applications are then reviewed by administrative officers to ensure that all of the required information has been provided, from the form itself to the supplementary documentation, such as degree certificates. If any of the required information is missing, an administrative or an admission officer contacts the potential student and arranges for the delivery of the outstanding data. The completed applications are then forwarded to the admission officers that according to the university/faculty/department rules for candidate selection prepare the preliminary lists of the admitted and rejected candidates. The candidates are then given an opportunity to formally complain about the admission officers' decision. After the revision of complaints, the admission officers prepare the final lists of the admitted students. The process continues for the admitted candidates by registering them at the university/faculty/department, filling additional enrolment forms, regulating financial issues, issuing the student an ID card, etc.

A poor admissions system can mean errors in the admission process that can result in wrong choice of the candidates, fewer candidates being admitted, lot of support personnel occupied by admission process during the admission periods and overly slow response time that dissatisfies the candidates and the university management.

1.3 *Reference* Documents

This section lists other documents which contain additional information about the enrolment process.

Ref.	Title	Document Id.	Edition
[1]	Закон за високото образование, ,,Службен весник на Република Македонија", број 35, 14 март 2008		
[2]	КОНКУРС за запишување студенти на прв циклус студии на студиските програми на Универзитетот „Св. Кирил и Методиј" во учебната 2010/11 година		
[3]	УПАТСТВО за реализација на Конкурсот за запишување студенти на прв циклус студии во учебната 2010/11 година. Note: This document is not available on the Internet. It explains in details the ranking criteria.	Added 12.01.2011 Microsoft Office Word Document	
[4]	КОНКУРС за запишување студенти на втор циклус студии на студиските програми на Универзитетот „Св. Кирил и Методиј" во учебната 2010/2011 година		
[5]	ДОПОЛНИТЕЛЕН КОНКУРС за запишување студенти на додипломски студии на студиските програми на Универзитетот „Св. Кирил и Методиј" во учебната 2010/11 година		
[6]	Листа на екстерни и интерни предмети од државната матура потребни за пријавување за запишување на студиските програми на Универзитетот „Св. Кирил и Методиј" во Скопје		
[7]	К О Н К У Р С за запишување студенти на прв циклус студии во рамките на реализацијата на „Проектот 45" во учебната 2010/11 година		
[8]	Latest proposed changes of the Law for Higher Education		
[9]	Best practice: Croatian National AAI service for education: http://www.aaiedu.hr/		
[10]	GEANT Identity federations: https://rnd.feide.no/identity_federations/		
[11]	Europass CV web site		
[12]	European Credit Transfer and Accumulation System (ECTS) Site		
[13]	Правилник за студирање по КС на ПМФ		
[14]	Diploma Supplement		

1.4 Objective

The objective of this project is to design a web-based system that will support the university enrolment process (on-line university admission system). The intent of the system is to:

- Exchange information about results
- Provide grading system and selection methodology
- Realize electronic registration and application
- Realize complete pro-active customized feedback
- Generate reports to university management and Ministry of Education

The main objective of this project is to design a system that will automate the tasks carried out by different persons in the organization and performing the student admission process. Specific design and implementation details will be specified in future documents.

1.5 General Overview

The system is intended to be used by the prospective students (candidates for university enrolment), the admission officers and the support personnel both at the university and departments/faculties level, and other government institutions like the State Statistical Office and the Ministry of Education.

1.6 Scope

The aim of the proposed system is to automate the system, pre-check the inclusion of all required materials and automatically rank each student's application based on a number of criteria. The data used by the system are to be stored in a database. A web-based application is to be provided for the candidates that will enable them to register for enrolment, provide their details including all the details from the certificates that have effect in the ranking process. This will enable the process to be simplified and considerably quickened, making the jobs of the people involved, especially the university staff and admission officers easier and faster. The system can support the current process but is meant to centralize it and make possible for the decisions to be made earlier and easier. The system should enable the future extension to almost fully paperless admission process including transferring the basic data of the candidates and their certificates in fully digital form (digitally signed) from other certificate providers (high schools).

1.7 Existing System(s)

This section explains the current situation with the enrolment process and procedures on the universities in the Republic of Macedonia. The process of admission of new students at the public universities is regulated by regulation from the university that is to be approved by the government (especially in the part of maximum number of students allowed to be enrolled on particular study programs and the scholarship). This regulation also prescribes the documents candidates should provide, the dates the documents are to be submitted to the University/Faculty admission office, final date the results must be published by the University/Faculty. In general, in a single admission period a candidate can apply for a place on one Faculty only. However, the faculties often allow the candidates to apply on several study programs that are held at the same faculty in which case the candidate must list them in preference order.

No university has an integrated web-based system that can support the admission process. Most of them accept the forms and certificates of the prospective students in person or by mail. Some of them use some kind of internal isolated software application to enter the candidates' data and to rank them and produce the list of accepted candidates.

Some of the problems of the current system include:

- Most of the information required by the candidates during the enrolment process is offered at the Faculties only (availability of forms required to be filled, instructions, results shown on bulletin boards, …)

Limitations of the proposed system are as follows:

- Lack of direct personal contact and support/consulting/guidance in the process of form filling and study program selection required by some candidates.
  - Proposed resolution: A parallel help / suggestion / support system tightly linked to the forms on the web interface should be provided. A channel for promptly communication to the candidates (e-mail, phone, fax, …) should be provided. A FAQ answering the

frequent questions about the enrolment process, the rules, the process, the forms to be filled and the documents to be provided by the candidates should be composed.

1.7.1 Existing system at European University (EURM)

Following diagram describes the current procedure for student enrolment at EURM. Enrolment Committee (EC) is a body consisting of representatives from all faculties at EURM which is responsible for the creation of a ranking list of all applicants who apply for enrolment at EURM. Students Administration Office (SAO) is responsible for all the communication with prospective students.
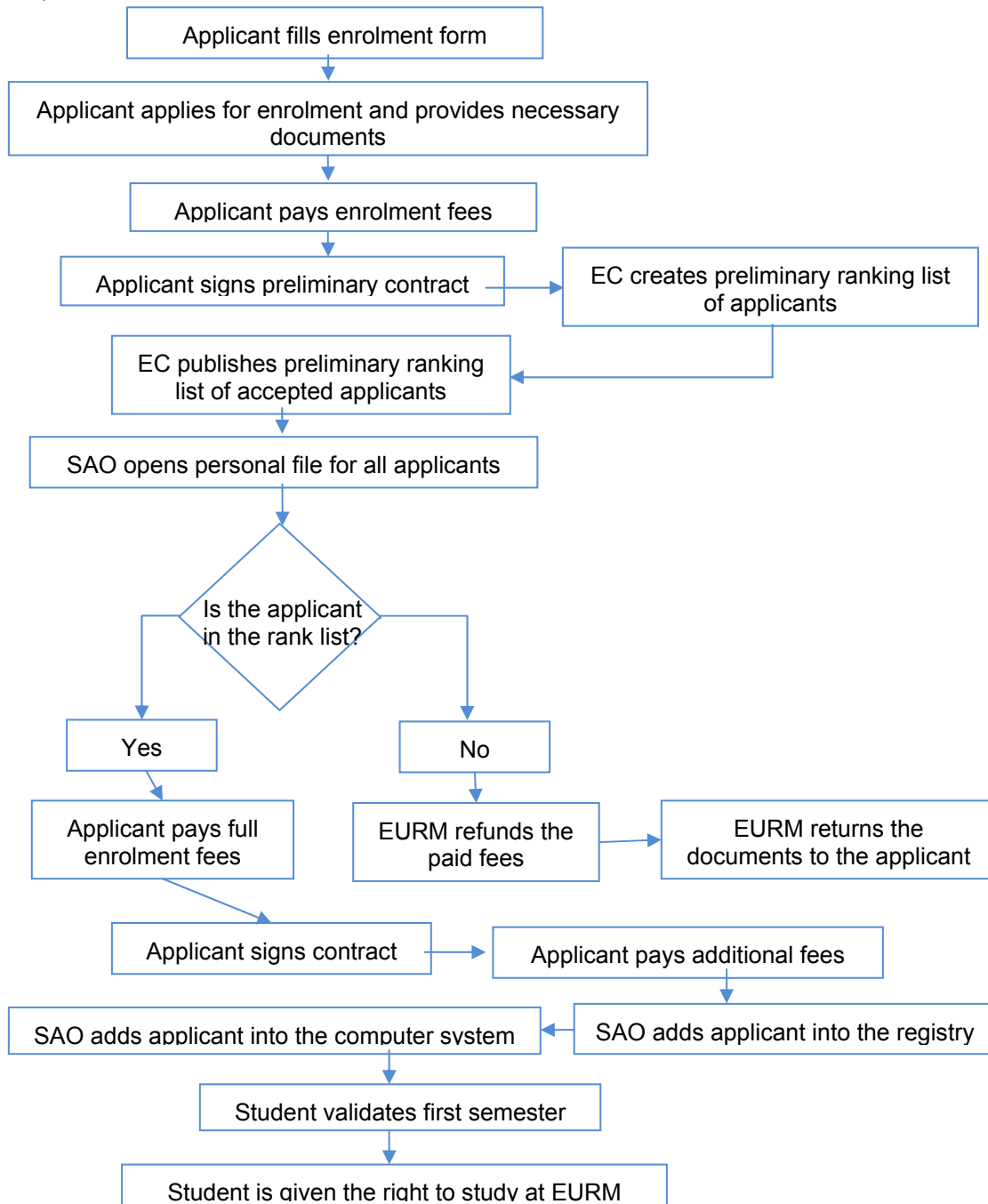
Figure 1. Procedure for Student Enrolment at European University

The procedure for Student Enrolment at EURM begins when an applicant fills a paper-based student application form. The applicant enters the following information: *Surname, Name, Middle Name*, *Address of living*, *ID Number, Date* and *Place of birth*, *Nationality, Gender,* home/mobile/work phone numbers, and *previous education* (secondary education, university degree, MSc): *name of the secondary school* and *Secondary Education Average Score*. In the form the applicant also enters data on his knowledge of *foreign languages*. The applicant also chooses a faculty. He also enters data about one of his parents (name, profession, and employer). The applicant also provides data on the method of financing and payment of tuition fees: self, parent, bank loan, or other type of financing.

In the next of the enrolment procedure, the applicant is required to provide the supporting document for his application: *Birth Certificate, Certificate of Citizenship, 4 Certificates from Secondary School, Secondary Education Diploma,* and *4 Photos*. For the Faculty for Detectives and Criminology, additionally the applicant needs to provide a *Medical Certificates*.

Staff from SAO checks the documents, and informs the applicant to *sign preliminary contract*, and *pay a part of the tuition fee*. After the enrolment period is finished, EC creates and publishes the *preliminary ranking list* of accepted applicants. The applicants are sorted by the average score from secondary school.

Next, approved applicants are offered to *sign contract* for studying at EURM, and also pay the remaining part of the tuition fee. Otherwise, the fees are fully refunded to the applicant within 3 days. Before the contract is signed, the SAO team creates personal file for the applicant, where all the documents are kept in. Within 15 days the applicant is required to pay the other fees: student uniform, student ID card, ISIC card, student insurance etc.

Once all the payments are made by the applicant, the SAO team inserts the student into the Registry. At the end, the applicant registers for the first semester of the first study year and thus is enrolled as a student at EURM.

Expression of interest web form

Prospective students can express their interest in studying at EURM by filling the following web form available at http://www.eurm.edu.mk/apliciraj.html:

Figure 2. "Expression of interest" web form for Macedonian applicants.

Data entered in the enrolment form is sent via email to the representatives from all faculties. It is the responsibility of the representatives to contact the applicants via email or phone. If the prospective student choose to apply for enrolment at EURM, then he/she can do so by filling the paper-based enrolment form as described in Section §**Error! Reference source not found.**.

Another web form available at the EURM web site (http://www.eurm.edu.mk/international-students/apply-to-enroll.html?L=2) is used by foreign students to express interest in studying at EURM. Following is the screenshot from the web form for foreign students:

Figure 3. "Expression of interest" web form for foreign applicants.

1.8   Benefits

The aim of the proposed system is to address the limitations of the current system. The requirements for the system have been gathered from the defects recorded in the past and also based on the feedback from users. Following are the objectives of the proposed system:

- *Reach to geographically scattered students*. One of the important objectives of the admission system is to be able to communicate with all the students irrespective of their geographical location.
- *Reduce time spent on enrolment*. Reduce the time taken to process the applications of candidates, admit a candidate, conduct the online examination, verify student marks, and send confirmation letters to admitted candidates.
- *Centralized data handling*. Transfer the data smoothly to all the departments involved and handle the data in a centralized way.
- *Paperless admission with reduced manpower*. Reduce the manpower needed to perform admission and administration tasks by reducing the paper works needed.
- *Cost cutting*. Reduce the cost involved in the admission process.
- *Operational efficiency*. Improve the operational efficiency by improving the quality of the process.

1.9   Goals

The main goal of the system is to automate the admission process at universities with improved performance and realize the vision of paperless admission. Some of the goals of the system are listed below:

- Manage large number of candidates with much data.
- Create candidate accounts and maintain candidate's data in an effective way
- View all the details of the candidates.
- Create extensive reports.
- Enable the candidates to take proactive role in the process by entering their data in the system
- Highest level of transparency: Provide the candidates with updates of the current status of the enrolment process
- Effective data management;
- Lowest possibility of human factor failure;
- Applying from distance.

2 Users

The software should enable creation of users and user groups through its user interface. For every new user created, the administrator of the software should be able to specify the forms and modules within forms that the created user can access and work with, with various levels of user permissions. All activities are tracked and stored.

Enrolment procedure can be carried out by the central university admission officers for all study programmes offered by the university, or distributed to faculties/departments where faculty/department admission officers are responsible for most of the steps during the admission process, depending on the organization of the university.

The following users and groups are to be initially created:

ID	User groups	Roles
AD	Administrator	• Manages all Faculty/study program data specifics of the enrolment process • Create and manage user accounts for other user groups • Manages all setup data • Create and manage courses, privileges and enrolment to those courses
EC	Enrolment Committee	• Conducts the admission process • Monitor and supervise the admission process carried out by Faculty / Study programme admission officers • Views and analyse comments • Analyses statuses and response times • Analyses quality of service provided • Views reports about FAQ • Issues reports to the University management • Issues reports to media / MOES
AO	Admission officer	• Receives and reviews complaints • Sends answers • Prepares preliminary and admission lists • Edits FAQ
SP	Supporting personnel	• Receives the forms and other documents/certificates from the applicants (in paper form) • Checks if all requested documents are provided an the forms are properly filled and signed • Keeps records of all received documents • Enters data from the paper only applications (received by mail, special cases, translated documents, etc.) in the system
ME	Ministry of Education	• View various statistical reports for applied / admitted candidates
SO	State Statistical Office	• View various statistical reports for applied / admitted candidates
AP	Applicant / prospective student	• Registers to the system • Inputs personal details, fills application • Fills details from his/her certificates (academic scores) • Submits / prints application • Views FQA • Fills complain request • View results
TA	Technical Administrator	• Manages the software parameters • Create and manage user accounts for other user groups

UA	University Administration Office members	- Views and analyse reports and data - Analyses statuses and response times - Analyses quality of service provided - Views reports about FAQ - Issues reports to the University management - Issues reports to media / Ministry of Education - Conducts the enrolment process - Monitor and supervise the process carried out by Faculty / Study programme - Manage the student and staff accounts using standard LDAP schemas - Enable and revoke privileges - Work in the office for communications with students - Provide administrative services for students - Manage students data - Coordinate work with faculty members and provide services
RA	Resource administrators	Define access to their resources using standard LDAP schemas
UC	University computing centre	- Maintain and monitor the infrastructure - Provide hosting for the AAI services for institution with smaller members - Maintain the users/resource database (LDAP and associated servicer) - Maintain the identities of the users (identity providers)

3 Functionalities

Basic functionalities of the e-Enrolment system are specified as follows:

ID	Functionality	Description	Objective
[1]	Creating / managing accounts	The administrator should have opportunity to create and manage accounts for the other user groups (except applicants)	To create and manage the accounts for the other persons from the university involved in the enrolment process
[2]	Manage master data	The administrator should have opportunity to manage the msater data used in the form filling process (list of municipalities, list of schools, …)	To manage the date that can appear in the application forms in an organized way
[3]	Manage study programmes, prerequisites and admission quotas	The administrator should have opportunity to manage the study programmes, prerequisites and admission quotas for every study programme	The admission quotas, accredited study programmes, dispersed study groups, prerequisites can change frequently
[4]	Manage points calculation, ranking and precedence rules	The administrator should have opportunity to manage: the way the points awarded to applicants are being calculated; the ranking rules; and precedence rules	Point calculation, additional assessment exams, interviews should be recorded. In case of multiple choice for study program selection (where allowed) certain precedence rules should be applied
[5]	Initiating enrolment process	Enables the administrator to initiate the process that starts with candidates registration and finishes with enrolment/rejection	Most of the other activities can be performed only while the enrolment is active
[6]	Applicant registration	Applicants register on the system by entering their e-mail. After the account activation the user can use the system	Applicants can register on the system before and during the application submission period
[7]	Filling application form	Applicants can enter all data requested by the application form in a web based interface and save them. Data includes all high school marks and graduation exam marks.	The applicant can recheck and correct the entered data before the final application submission.
[8]	Submitting the application	Applicants should print out a reference form with generated unique ID that is supposed to be submitted with the originals of the requested document and certificates to the admission office	The admission officer can view and check the consistency of the data entered by the applicant to the original documents. The data entered is later used in the ranking process.
[9]	Viewing preliminary results	Applicants can view the list of all candidates that applied for the same study programme	
[10]	Fill a complain form / request a revision	A candidate should be able to raise a complain about an error in his/her data as published	To allow the candidate to request correction of mistakes or revision of his academic/exam results by the admission commission

ID	Functionality	Description	Objective
[11]	Edit application form	Editing one applicants form in order to correct mistakes	Enables the officer to correct a mistake in the candidate application
[12]	Entering additional information in the application form	The system should enable entering of additional data in the application like results of additional exam	To enter data from additional exams
[13]	Ranking the candidates	The system should be able to automatically rank all the candidates for every study programme	To produce list of accepted and rejected candidates
[14]	Close the submission process and produce the list of candidates that have applied	The system should be able to produce the list of applied candidates	Publication of results
[15]	Production of the preliminary list of accepted and rejected candidates	The system should be able to produce the preliminary list of accepted and rejected candidates	Publication of results
[16]	Production of the final list of accepted candidates	The system should be able to produce the final list of accepted and rejected candidates	Publication of results
[17]	Produce various statistical reports for applied / admitted candidates	The system should produce various statistical reports for all candidates that have applied, for the accepted and rejected ones	Statistics reports
[18]	Online Counselling		
[19]	Audit log	The system should keep audit log with time stamp and user ID for all changes to the student application record once the application has been submitted	

4   UML Diagrams

In this sections we give several diagram which aim to depict the functional requirements for the software solution.

4.1   Use case diagrams

Following Use Case diagram depicts the use cases which need to be supported by the software solution.

Global system diagram
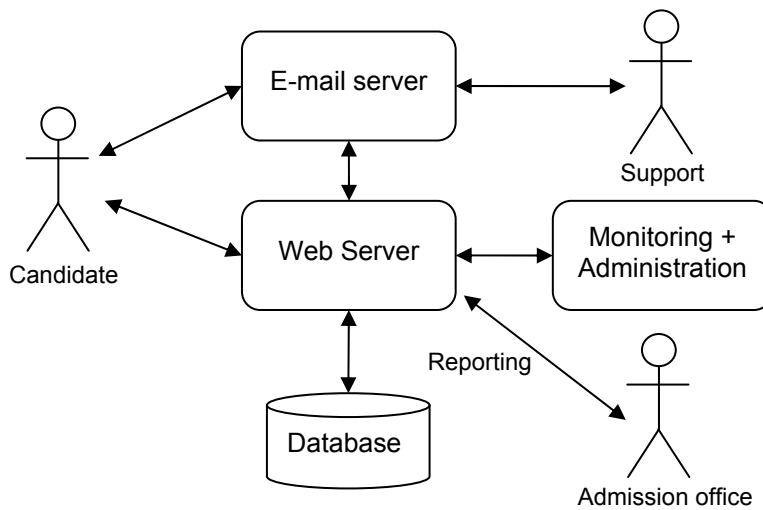
Enrolment system use-case
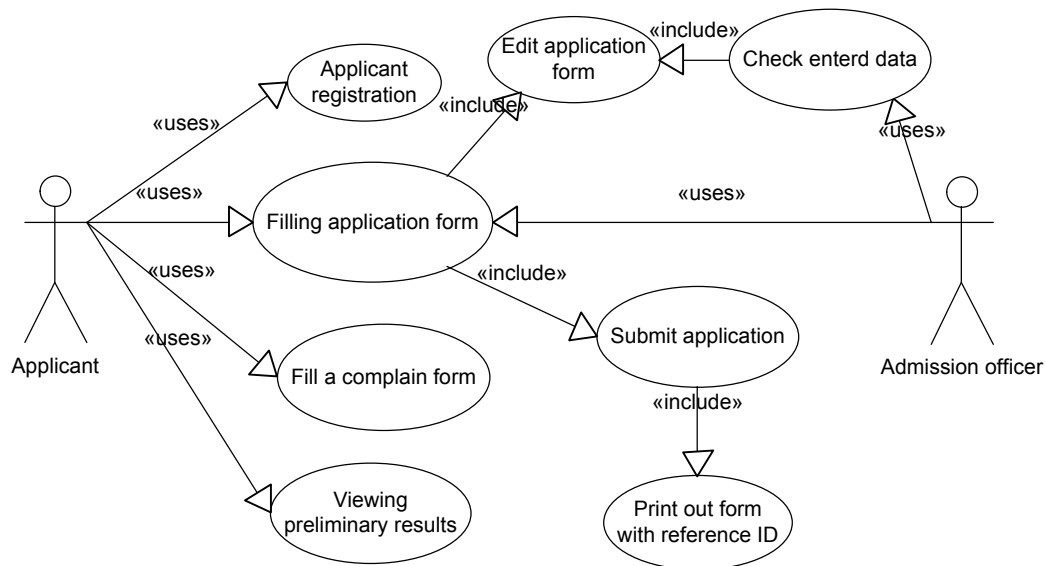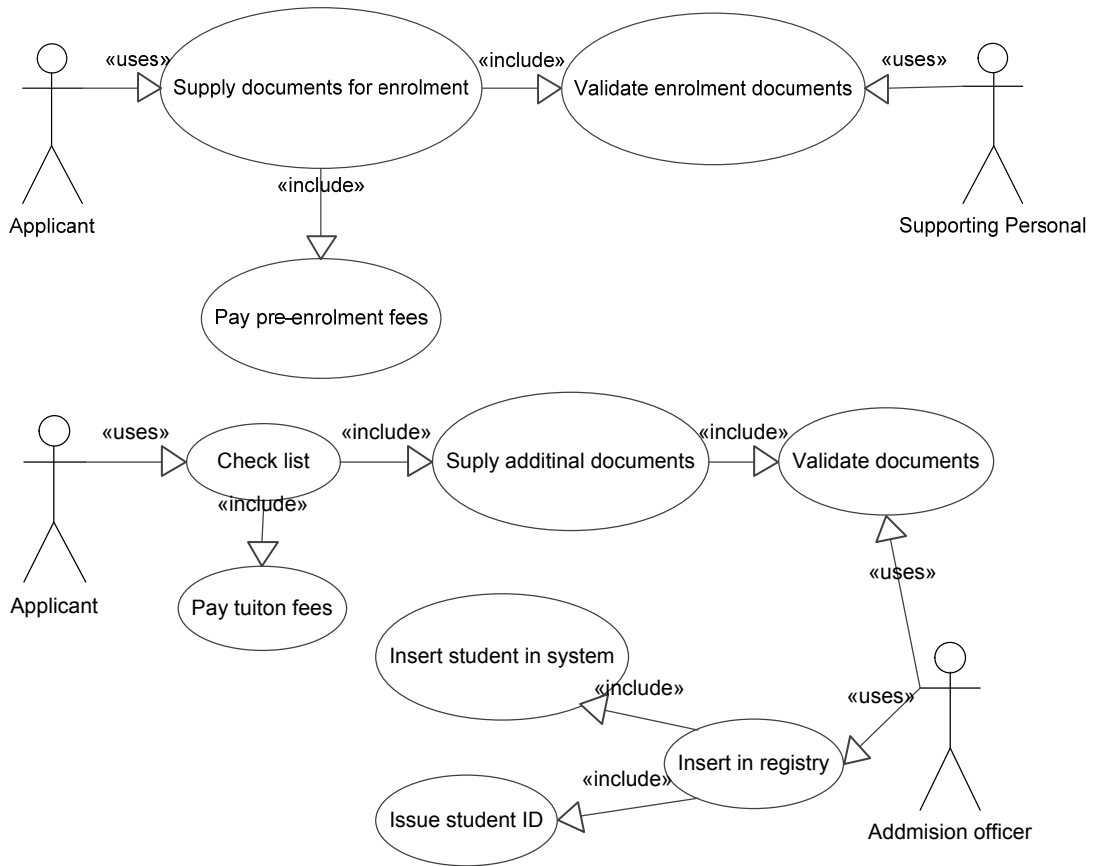
4.2 Activity diagrams

Following activity diagrams represents the business logic flow, and shows the activities and the events that cause the enrolment application to be in a particular state.

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                        ▼
              ┌───────────────────┐
              │ Applicant registers│
              │   In the system    │
              └───────────────────┘
                        │
                        ▼
              ┌───────────────────┐
              │  Applicant fills   │
              │   enrolment form   │
              └───────────────────┘
                        │
                        ▼
  ┌──────────────┐   ┌───────────────────┐
  │ Applicant edits│→│  Applicant checks  │────────┐
  │ enrolment form │  │   enrolment form   │        │
  └──────────────┘   └───────────────────┘        │
         ▲                    │                     │
         │                    ▼                     │
         │        No      ◇ Enrolment               │
         └────────────────   data OK?               │
                            │                        │
                         Yes│                        │
                            ▼                        │
                 ┌───────────────────┐               │
                 │ Applicant submits  │              │
                 │  enrolment form    │              │
                 └───────────────────┘               │
                            │                        │
                            ▼                        │
                 ┌───────────────────┐               │
                 │ Applicant prints out│             │
                 │  enrolment form    │              │
                 │   reference ID     │              │
                 └───────────────────┘               │
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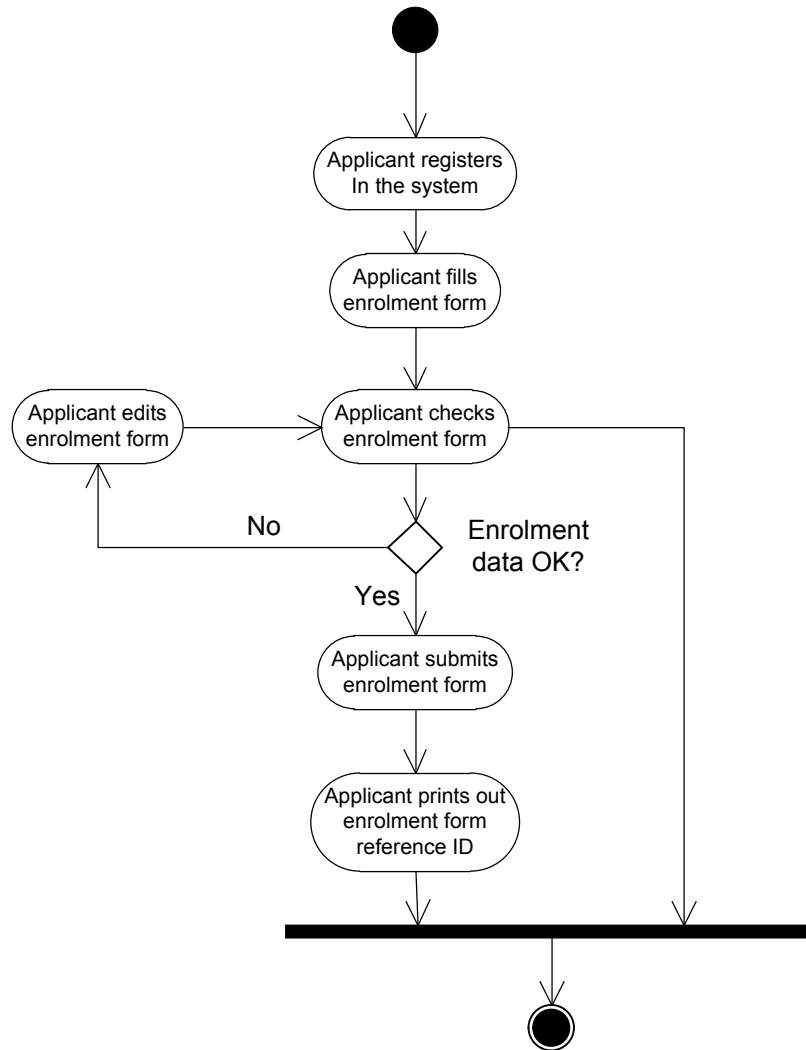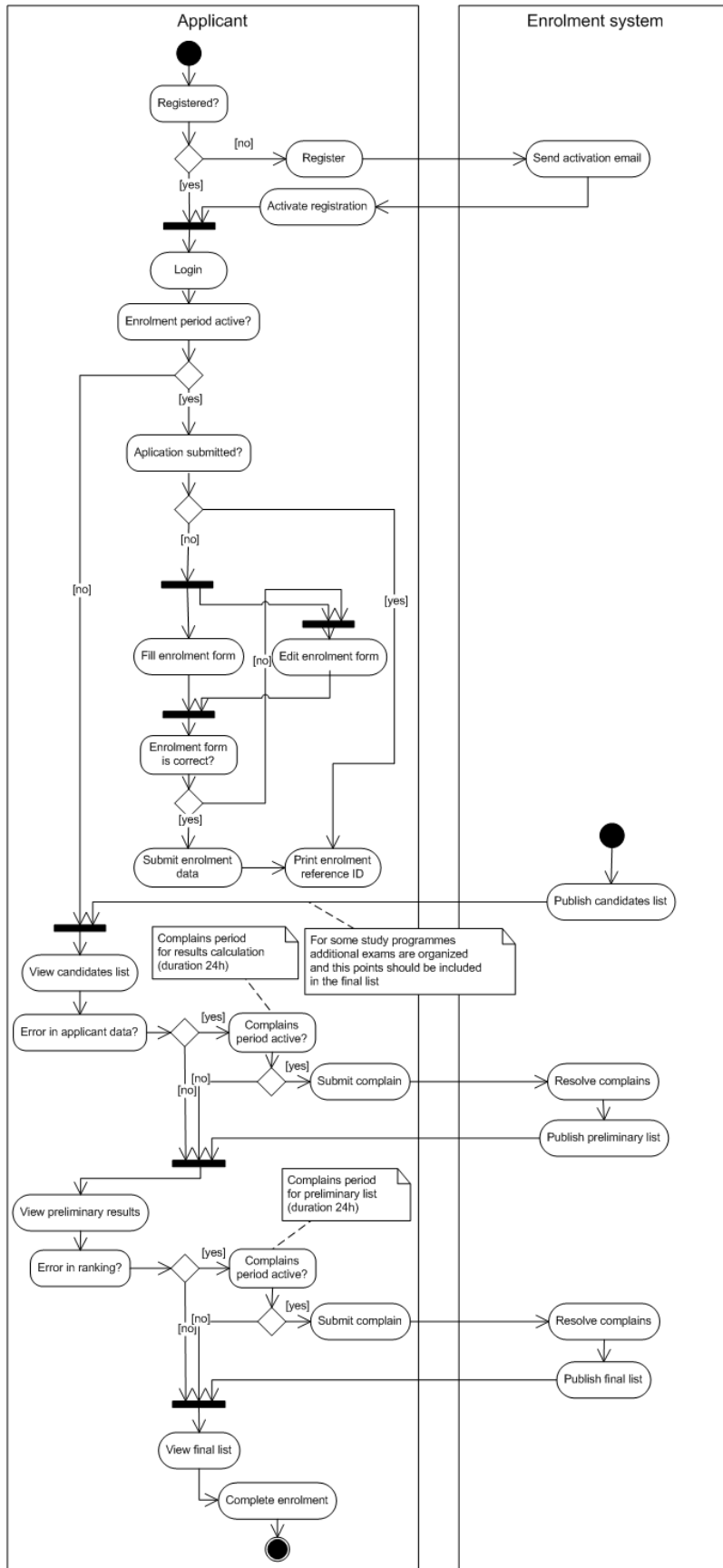
4.3   Sequence diagrams

Following UML sequence diagram shows the order of steps during the enrolment procedure, and the actors responsible for their execution.
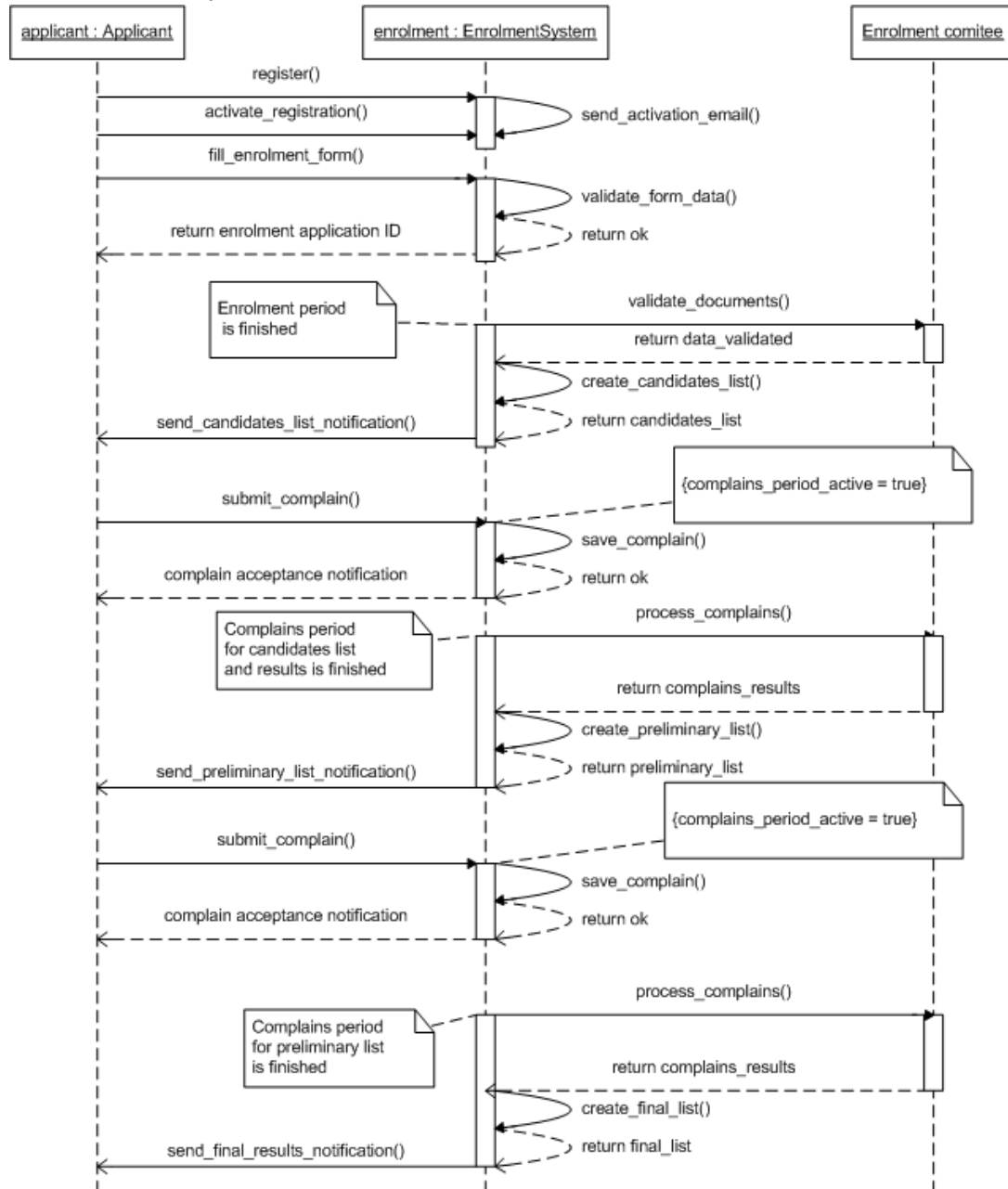
5   User interface

5.1   Registration and Login System

Applicants will carry out their own registration, providing the system with a way to associate a user to their application. This will enable the system to display personalized information when the user logs in and certain information. Giving each student a unique ID will also allow the system to associate the user with the data entered in the system associated to his application file.

On the initial visit to the admission web site the prospective students will be offered to open an account (create a profile) on the admission system. After identifying with their e-mail address and choosing a password (and verifying by captcha) an account activation e-mail message will be sent to the candidate. After activating the account the candidate can proceed to logging in at the system, filling / editing the application form, submitting the application, browse the ranking results, filling a complaint and perform the other activities of the admission process explained below. The system should provide a mechanism for resetting / retrieving a forgotten password.

The candidate should be able to configure its user profile on the system regarding the interface language, the notifications to be sent by the system on different evens (submit ion has started, list of candidates has been published, …) and the channel(s) used for notification (e-mail, SMS, …)

5.2   Application form filling

The system is supposed to enable entering all data that are requested for implementing the ranking and enrolment process as well as data requested by the SSO. Different data can be required by different universities / study progammes. Although most of the data is mandatory, some data can be mandatory in some cases and optional in other, or even not required for others. The system should provide a way for the administrator to configure which fields of the form are mandatory, optional or not required (hidden) and provide default values for them.

The system should provide several ways for completing the application form:

* Filling all the details in the application form by the candidate
* Transferring the high-school data for the candidate form the MoES using a web service and filling automatically some of the fields
* Filling all the details in the application form by the admission officer / support personnel for applications submitted in paper-only form

6 Data model

Following section explains the data model for the future Enrolment module. The data model is given as the most appropriate mechanism for description of the functional requirements rather than as the final definition of the data model. Developers of the enrolment module can define a different data model as long as the functional requirements are satisfied. Where more appropriate, functional requirements are defined textually without giving the data model e.g. §6.8Student enrolment period and §6.9Ranking the candidates.

6.1 Applicant

Applicant is the key data entity in the required solution.

This section describes the details which are contained in the application form for enrolment in the first cycle of studies.

6.1.1 Functionality

- **List**: Provide a list of all applicants. Provide, sorting, paging and filtering functionality.
- **Search**: Search for candidates by multiple criteria.
- **Add**: SAO staff can enter applicant's data.
- **Modify:** SAO staff can modify applicant's data.
- **Auditing**: All changes to applicant's data are logged.

6.1.2 Fields

Study details in enrolment form			
Field	**Description**	**Type**	**Possible Values**
Candidate Personal Data			
Candidate Number	Unique identifier of the candidate	Identity, Automatically assigned by the system	
Surname	Surname	Text	
Maiden surname	Maiden surname	Text, optional	
Parent's name	Parent's name	Text	
Name	Name	Text	
EMBG	Unique number of the citizen	Text (13 digit)	Includes checksum digit, candidate's date/place of birth & sex can be extracted
Date of birth	Date of birth	Date	
Place of birth	Place of birth	Text	
Municipality of birth	Municipality of birth	Text	Master list
Country of birth	Country of birth	Text	
Sex	Sex	Selection	Male / Female
Citizenship	Citizenship	Text	
Ethnicity	Ethnicity	Text	Master list

Mother tongue		Selection	Master List
Address			
Town	Place of living	Text	
Address	Address of living	Text	
Municipality	Municipality	Text	Master list
Country	Country	Text	
Contact/Phones			
Home	Home phone number	Text, optional	
Cellular	Cellular Phone number	Text	
{e-Mail}	Private e-mails	Text	
{Information channels}	Selecting information channels to be used to inform the candidate	Selection, optional	SMS, e-mail, …
Previous education			
Type	Profile of the high school	Selection	Master list
Name	Name of previous school	Selection	Master list
Town	Place of previous education	Text	Master list
Year of graduation	Year the candidate has graduated high-school	Number	-
{Studying language}	Studying language in the high school	Selection	Master list
High school average	Average grade of the previous education	real number	Shown – automatically calculated
{Subject Marks In Year}		There will be four structures of type SubjectMark – one for each school year	List of marks for all subjects in years 1-4 in high school
Graduation type	Type of graduation	Selection	State graduation; School graduation; Without graduation and International graduation
Following fields are filled if the applicant has State graduation			
External exam #1 subject		Selection	Macedonian; Albanian; Turkish
External exam #1 mark		Number 2-5	
Percentile rank #1		Real number	

External exam #2 subject		Selection	Master list
External exam #2 mark		Number 2-5	
Percentile rank #2		Real number	
Internal exam #1 subject		Text	
Internal exam #1 mark		Number 2-5	
Internal exam #2 subject		Text	
Internal exam #2 mark		Number 2-5	
Project task name		Text, optional	
Project task mark		Number 2-5	
Following fields are filled if the applicant has School graduation			
Subject #1 name		Text	
Subject #1 mark		Number 2-5	
Subject #2 name		Text	
Subject #2 mark		Number 2-5	
Project task name		Text	
Project task mark		Number 2-5	
Following fields are filled if the applicant is without graduation			
First important subject		Number 2-5	
Second important subject		Number 2-5	
Following fields are filled if the applicant has International graduation			
{SubjectAndMark}		Structure SubjectMark	
Project task name		Text, optional	
Project task		Number	
Special exam	Score on the additional special exam (if required)	Number	Some SP have additional qualification exam – entered by AO after exam
Education data source	How the education data were obtained. Filled automatically by the system.	Selection	On the web by the candidate ; by web service from MoES; by EO from paper application / documents provided
{Foreign language studied}	Foreign languages studied in the previous education	Selection	Master list
{Foreign language		Selection	Master list

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spoken}			
Special circumstances	Special case type	Selection	Master list
Personal data for the parent / guardian			
Name and Surname	Name and Surname	Text, optional	
Profession	Profession	Text, optional	
Employment	Employment	Text, optional	
Scholarship			
{Tuition payer}	Person paying the tuition	Selection	Parent/Guardian; personally, Other person; completely free of charge; partial discount, Bank Loan
Scholarship	Whether the student is receiving a scholarship	Selection	Yes/No
Scholarship provider	Provider of the scholarship	Text	
Enrolment Institution			
Faculty	Name of the Faculty	Selection	Master list
{Study programme(s)}	Name of the programme	Selection	Master list
Preference	Numerical preference of selected programme s	Number	
QuotaType	Boolean	Selection	State / Private quota (co-finansing)
Type of studies	Full time / part time	Selection	Master list set up by admin
Location	Location of the studies	Selection	Master list
Language of studies	Study language	Selection	Macedonian, Albanian, English
Start year	Year of enrolment. set up by admin	Number	
Enrolment term	Term of enrolment in the current year. set up by admin	Number {1,2,3}	
Note by applicant	Anything else the candidate thinks the admission officers should know	Text, optional	
Note by admission officer	Admission officer note on candidate's extra documents provided	Text, optional	
List of additional documents provided	List of additional documents	Text, optional	
{Course}	Subjects that applicant will sit as part of the high school final year exam, and requires tutoring classes from the University.	Selection, optional	Master list.

{Provided Document}	Documents provided by applicant in support of his application	Structure of type Provided Document. Optional	
{Signed Contract}	Contracts signed by applicant	Structure of type Signed Contract. Optional	
{Paid Fee}	Fees paid by the applicant	Structure of type Paid Fee. Optional	
Status		Int ∈ {Applied, Accepted, Rejected}	What is the status of the application?

Following table defines the structure SubjectMarksInSchoolYear.

Field Name	Type	Description
Marks	Text	List of all marks e.g. "55545543255"
School year	Number	{1, 2, 3, 4}

Following table defines the structure SubjectMark.

Field Name	Type	Description
Subject	Text	Name of subject
Mark	Number	{2, 3, 4, 5}

6.1.3   Business rules and access rights

- A student can fill an *application form* available on the web and enter all the required data. A student can also attach scanned copies of required documents.
- SAO staff can check and approve the data entered by applicants. SAO staff can define customisable notification or reminder to be sent to an applicant. If all the required data is correctly provided, then SAO staff accepts the application.
- Upon acceptance, corresponding notification is sent to applicant. Applicant is informed on the next step: applicant needs to provide the necessary documents in order to support and complete his application.

6.2   Applicants to second cycle of studies

An applicant for the second cycle of studies can be a new one or a student from the same university. For existing students, enrolment process starts from the ranking stage, because his existing data is used. Index name from the previous cycle is also kept.

Student admissions to second cycle of study are organized in the same way as it is in the first cycle.

Details for data on application form for enrolment of non-existing students in the system in the second cycle of studies

Field	Description	Type	Possible Values
Candidate Personal Data			
Candidate Number	Unique identifier of the candidate	Identity, Automatically assigned by the system	
Surname	Surname	text	

Maiden surname	Maiden surname	Text, optional	
Parent's name	Parent's name	text	
Name	Name	text	
EMBG	Unique number of the citizen	Text (13 digit)	Includes checksum digit, candidate's date/place of birth & sex can be extracted
Date of birth	Date of birth	Date	
Place of birth	Place of birth	text	
Municipality of birth	Municipality of birth	text	List stored in the database
State of birth	Country of birth	text	
Sex	Sex	Selection	Mail / Female
Citizenship	Citizenship	text	
Ethnicity	Ethnicity	text	List stored in the database
Address			
Town	Place of living	text	
Address	Address of living	text	
Municipality	Municipality	Text	List stored in the database
Country	Country	Text	
Contact/Phones			
Home	Home phone number	Text, optional	
Cellular	Cellular Phone number	Text	
{e-Mail}	e-mail	Text	
{Information channels}	Selecting information channels to be used to inform the candidate	Selection, optional	SMS, e-mail, …
Previous education			
Name of finished Faculty		Text	
Type of first cycle of study	Type of first cycle of study	Selection	Traditional system / ECTS
Diploma Name	Name of diploma for first cycle of study	Selection	List stored in the database
Study programme for diploma	Name of the programme	Selection	Stored list in a database
Town	Place of institution	Text	List stored in the database
Year of graduation	Year the candidate has graduated first cycle of study	Number	-
Studying language	Studying language in first cycle of study	Selection	List stored in the database
Credits	ECTS Credits	Number	
Studying average	Average grade of the cycle of study	real number	Shown – automatically calculated
{Foreign languages	Foreign languages studied in the previous	Selection	Stored list in the database

studied}	education		
Publication	Publication list	Text	
References	References list	Text	
Personal data for the parent / guardian			
Name and Surname	Name and Surname	Text, optional	
Profession	Profession	Text, optional	
Employment	Employment	Text, optional	
Scholarship			
{Tuition payer}	Person paying the tuition	Selection	Parent/Guardian; personally, Other person; completely free of charge; partial discount
Scholarship	Whether the student is receiving a scholarship	Selection	Yes/No
Scholarship provider	Provider of the scholarship	Text	
Enrolment Institution			
Faculty	Name of the Faculty	Selection	Stored list in a database
{Study programme}	Name of the programme	Selection	Stored list in a database
Presidence of selected programme(s)	Numerical presidence	Number	
Location	Location of the studies	Selection	Stored list in a database
Status	Student status	Selection	Full time / Part time
Language of studies	Study language	Selection	Macedonian, Albanian, English
Start year	Year of enrolment	Number	
Enrolment term	Term of enrolment in the current year	Number	1,2,3
Comment			
Note by applicant	Anything else the candidate thinks the admission officers should know	Text, optional	
Note by admission officer	Admission officer note on candidate's extra documents provided	Text, optional	
List of additional documents provided	List of additional documents	Text, optional	
{Provided Document}	Documents provided by applicant in support	Structure of type Provided	

	Contracts signed by applicant	Structure of type Signed Contract. Optional	
{Signed Contract}			
{Paid Fee}	Fees paid by the applicant	Structure of type Paid Fee. Optional	
Status		Int ∈ {Applied, Accepted, Rejected}	What is the status of the application?

6.2.1 Business Rules

- The candidates are ranked by the number of points scored. The rates are defined independently by Enrolment Committee on each carrier of study programme, which leads to manual score definition based on candidate documentation.

6.3 Paid Fee

6.3.1 Functionality

- **List**: Provide a list of all fees paid by an applicant.
- **Search** for candidates by paid and unpaid fees.
- **Maintain** the list of fess paid signed by an applicant.
- **Auditing**: All changes to paid fees are logged.

6.3.2 Fields

Name	Type	Description
Type	String [80]	Chosen from the master list of fee types
Date of payment	Date	
Amount	Currency	

6.3.3 Business rules and access rights

- System administrator can maintain the master list of fee types.
- SAO staff can maintain the list of fees paid by an applicant.

6.4 Provided Document

6.4.1 Functionality

- **List**: Provide a list of all documents provided by an applicant in support of his enrolment application.
- **Search** for candidates by provided and missing documents.
- **Maintain** the list of documents provided by an applicant.
- **Auditing**: All changes to provided documents are logged.
- **Electronic form:** Scanned copies of provided documents are kept in the system.

6.4.2 Fields

Name	Type	Description

Type	String [80]	Chosen from the master list of document types
Date provided	Date	
Electronic Copy	Object, optional	Scanned (or otherwise electronic) copy of the provided document

6.4.3 Business rules and access rights

- System administrator can maintain the master list of document types.
- SAO staff can maintain the list of documents type.

6.5 Signed Contract

6.5.1 Functionality

- **List**: Provide a list of all contracts signed by an applicant.
- **Search** for candidates by signed and unsigned contracts.
- **Maintain** the list of contracts signed by an applicant.
- **Auditing**: All changes to signed contracts are logged.

6.5.2 Fields

Name	Type	Description
Type	String [80]	Chosen from the master list of contract types
Date signed	Date	

6.5.3 Business rules and access rights

- System administrator can maintain the master list of contract types.
- SAO staff can maintain the list of contract types.

6.6 Study programmes

Study programme is the officially acknowledged and accredited comprehensive set of compulsory and elective course units that define the principal field of study.

6.6.1 Functionality

- **List**: Provide a list of all study programmes.
- **Search filter, and sort** the study programmes by all fields.
- **Maintain** the study programmes.
- **Auditing**: All changes to signed contracts are logged.

6.6.2 Fields

Field	Description	Type	Possible Values
Study programme name	Name of the study programme	Selection	List of all accredited study programmes
Cycle of studies	Which cycle of studies is the SP	Selection	1, 2, 3, other
Duration	Duration of the study programme in years	Number	

Type	Type of the study programme	Selection	Academic; professional; …
Full time / part time studies		Selection	Redovni; vonredni
Title gained after completion / graduation	What title the candidate gains after the successful completion of the SP	Text, optional	
Faculty	Faculty where the SP is accredited	Selection	List of all Faculties + university for interdisciplinary studies
Place	The place (town) where lectures are organized	Selection, optional	If dispersed studies of the same SP are organized on several places - selection of places; otherwise hidden
Language of study		Selection	List of values which are different for each SP.
Additional exam	Is there additional special exam for the candidates organized by the Admission Office (AO)	Yes/No	Some SP have additional qualification exam (eg. Art)
Enrolment numbers			
State quota	Maximum number of students allowed to be enrolled in state quota	Number	
Private quota	Maximum number of students allowed to be enrolled in private quota	Number	
Activation minimum	Minimum number of students needed to be enrolled in order to activate the SP	Number	
Tuition fee per semester for state quota		Number	
Tuition fee per semester for private quota		Number	
Minimum points required to rank for state quota	Minimum number of points needed to be ranked in the state quota		
Minimum points required to rank for private quota	Minimum number of points needed to be ranked in the private quota		
National quotas			
{Quota for ethnicity}	Is there an ethnic quota for the corresponding ethnicity for this study programme	Pair [Ethnicity name, Yes/No]	

6.6.3 Business rules

- Study programmes can exist on different places (dispersed studies) at the same university and different rules can apply for such cases even for the same study programme. Study programmes can be offered to full-time and/or part-time students.

6.7 Study programmes group / faculty

University units (Faculties / Institutes) often organize several study programmes of the same corresponding area, sharing the same enrollment prerequisites. In such cases they usually allow the candidates to apply for several study programmes at the same institution in the same enrollment term, in which case each candidate must specify precedence over his/her choices. In such cases, a group of study programmes eligible for multiple selections by the candidates must be defined. Since the prerequisites for the study programmes in the group must be shared, they are defined once for the whole group. In a case of a single (separate) study programme, a group consisted of the single study programme should be created.

In order to stimulate education of ethnic minorities, rules for positive discrimination for candidates of ethnic minorities are also applied. Additional so called "national quotas" are applied for the candidates of ethnic minorities that qualify for enrolment.

6.7.1 Fields

Field	Description	Mandatory	Possible Values
Faculty	Faculty where the SPs are accredited	Selection, optional	List of all Faculties + university for interdisciplinary studies
Cycle of studies	Which cycle of studies is the GoSP	Selection	1, 2, 3, other
Place	The place (town) where lectures are organized	Selection	If dispersed studies of the same SP are organized on several places - selection of places; otherwise hidden
Prerequisites			
{Type of high-school finished}	What type of HS the candidate must have completed in order to apply	Selection	MasterList
{Graduation type(s) eligibility}	What type of graduation the candidate must have taken in order to apply	Selection	State graduation; School graduation; Without graduation and International graduation
{Eligible external exam #2 subject}	What subject the candidate must have taken for external graduation exam	Selection	List of eligible subjects
Eligible internal exam #1 subject	What subject the candidate must have taken for internal graduation exam	Text	
Eligible internal exam #2 subject	What subject the candidate must have taken for internal graduation exam	Text	
First important subject	Important subject for point calculation for candidates without graduation	Selection	List of eligible subjects
Second important subject	Important subject for point calculation for candidates without graduation	Selection	List of eligible subjects
National quotas			
{Additional quota for ethnicity}	Additional quota for the applicants of the corresponding ethnicity	Structure [Ethnicity Name,	

		Number]	

6.7.2   Business rules

- all SPs in GoSP must be of same cycle of studies
- all SPs in GoSP must be organized in the same place (town)
- all SPs in GoSP must share same prerequisites
- SPs in GoSP are usually on the same Faculty
- Ethnic quotas are usually specified per faculty, not per SP (total number of candidates of corresponding ethnicity for all SPs on that faculty are specified regardless of their distribution among SPs), but in the same time for some SPs some ethnic quotas can be 0 (no additional ethnic quotas for some study programmes).

6.8   Student enrolment period

Student enrolments are usually organized in the certain periods of the year and last for a certain predetermined period of time. Different rules can apply for different enrolment periods resulting in different prerequisites for the candidates.

Each enrolment period is defined by several dates when certain activities of the enrolment process are taking place. The dates (including precise timing: hours+minutes) that define an enrolment period are:

- Inception date – after this date candidates can open accounts on the system and enter information in the enrolment form (but can not submit it)
- Submission start – candidates can start submitting their applications. Registration and application form filling is still active. However, after submitting the application, candidate's application is locked and he/she can not edit the application any more.
- Submission end - candidates can no longer register for account, fill in and submit the form
- Special exam – a specialized exam for the candidates if defined by the study programme
- Candidate list publication – the deadline to publish list of candidates that have completed the application process (with full documentation). Candidates are notified through info channel selected by each candidate about this event.
- Start of complaint period for applicant data - the date/time the candidates can start filling in and submitting a complaint about the data for their application entered in the system (misspelled name, wrong calculation of points, study programme precedence)
- End of complaint period for applicant data - the deadline for candidates to fill in and submit a complaint about the data for their application. After this moment the enrolment officers can review the complaints, produce a report and send responses to the applicants accompanied by corrections in the database (where approved by the enrolment commission).
- Preliminary ranking list publication – the deadline to publish preliminary ranking list of candidates. Candidates are notified through info channel selected by each candidate about this event.
- Start of complaint period for ranking - the date/time the candidates can start filling in and submitting a complaint about the ranking process according to the published preliminary ranking list.
- End of complain period for ranking - the deadline for candidates to submit a complaint about the ranking process. After this moment the enrolment commission can review the complains, produce a report and issue responses to candidates accompanied by possible corrections in the database (where approver by the enrolment commission)
- Final ranking list publication - the deadline to publish the final ranking list of candidates. Candidates are notified through info channel selected by each candidate about this event accompanied by information for the further steps they are expected to carry on the enrolment
- Enrolment start - the date/time when the enrolment of the accepted candidates starts. The accepted candidates are expected to submit additional documents, pay tuition fees, etc.

Rejected candidates can take their documents back or agree to apply in the next enrolment period (if available) on the same institution (possibly on different study programme)

- Enrolment end - the date/time when the enrolment of the accepted candidates ends. All accepted candidates that have successfully completed the enrolment are transferred to the "core module" defined in WP 1.2 and WP 2.1

Different rules can apply for different groups of study programmes and in different enrolment periods. The administrator should be able to configure the enrolment system with the actual rules for the institution (group of study programmes) for the enrollment period. This includes enrolment period dates, prerequisites to apply, tuition fee, number of candidates allowed to enroll in each quota (state, private, ethnic).

6.9   Ranking the candidates

6.9.1   Functionality

- Maintenance: Ranking points can be awarded to each applicant.
- Publishing: Ranking list can be published at University / Faculty web site
- Notification: Notifications (via email, SMS) can be sent to applicant containing the status of their application and position in the ranking list.

The success rate of each candidate is given in points. The candidates are ranked by the number of points scored. The points are calculated from the candiate's high school marks adding the points scored on the qualification exam, if such exam is defined for the study programme (only for art, architecture, …). The points from the candidates high school marks are calculated in a slightly different way depending on the candidates type of graduation (explained in [3] "*УПАТСТВО за реализација на Конкурсот за запишување студенти на прв циклус студии во учебната 2010/11 година*")

Public universities are regulated by admission quotas for each type of studies on each study programme offered. Admission quotas are given as maximum number of students allowed to be enrolled on certain study programme in the so called "state financed quota" (students that pay lower fees) and additional quota for students that can be enrolled at the study programme if the state financed quota has been filled – these students pay higher fees. The process is carried out as follows: all candidates apply for the study programme and are ranked by their high-scholl and graduation marks; the first N students (where N is the state quota) on the ranking list are admitted while the next M students on the ranking list (where M is the private quota) are offered to be enrolled in the private quota (paying higher fee).

Depending on the enrolment term, candidates with different type of graduation may apply. The way the points are calculated is different depending on the type of graduation of the candidate (explained in [3]). Calculation of the points awarded to candidates is performed up to a certain precision (rounded to the 3rd decimal digit by default, should be configurable).

The candidates of the ethnicities that have scored enough points to be enrolled are enrolled in the additional quota for the corresponding ethnicity. If the number of the candidates of the corresponding ethnicity eligible for enrolment is bigger than the quota for that ethnicity (N) than the best N candidate are enrolled in the additional quota, while the rest are ranked with the others and the same ranking rules as for the rest of the candidates apply.

In case of study programmes group where candidates has appointed precedence to their choices the candidates are firs ranked according to their first choice. If the candidate has not scored enough points to be ranked for enrolment on his/her initial choice of study programme and the enrolment quota for the study programme that is his/her second choice is not filled up, the candidate is moved to the ranking list for his/her second choice SP, but after the candidates that are already ranked for enrolment on that study programme according their first choice. This means that no candidate that is moved to his/her second, third, etc. choice he/she can push out of the list a candidate that has been already ranked for enrolment on his initial choice SP (has scored the minimum points required for enrolment) regardless of the fact that this candidate may have less points. If the quota for the second choice is filled up,

the ranking system should try to rank the candidate to his/her third choice and so on. This procedure is continued until the candidate is not placed on a list that is not filled up yet, or all choices of the candidate are exhausted (in which case he/she is not ranked).

The candidates that have chosen different study programmes as their initial choice but did not have enough points to be ranked on the initial choice are ranked among themselves to some of their other choices in sequential order of their selected precedence without interfering with the candidates that had the corresponding SP as their first choice. After the ranking of all the candidates is finished every ranking list can be consisted of either:

- All candidates that have the corresponding study programme as their first choice; or
- All the candidates that have applied for the corresponding study programme plus the best N candidates (up to the enrolment quota for the study programme) among all the candidates that did not make to be enrolled to their first, second, etc. choice but have the corresponding study programme as their second, third, etc. choice.

The enrolment rules do allow especially gifted candidates to be enrolled at the university even if they have not finished formal education. Enrolment rules also allow some candidates in some special cases to be directly enrolled. However, even these candidates must appear on the admission lists that will clearly note the type of special case (circumstances) under which this was done. To enter such candidates in the system, a special form accessible only to admission officers should be created that will allow bypassing the prerequisites and ranking rules. This form should contain a mandatory field explaining the circumstances and noting the article / internal decision which was passed by the institution (commission) / approved by the management.

At state universities, candidates from certain schools (private) are eligible for application only in private quota. Also, at state universities foreign applicants and some other special type of applicants (ex. already graduated from similar faculty) can be enrolled out of the quota (up to a certain percentage) with co-financing. Some other special type of applicants ("деца на припадници на безбедносни сили") are enrolled out of the quota (state financed).

6.9.2 Fields

Following table gives a subset of the fields in the data model. The rest of the data model is defined textually in this section.

Name	**Type**	**Description**
Enrolment period	Date	End date of enrolment period
Publish date	Date	Date when the ranking list is published
{Student}	Int, FK	FK to the table of applicants (See section §Applicant)
{Rank}	Int	Position of the applicant in the ranking list
{Status}	Int $\in$ {Applied, Accepted}	Is the applicant accepted or rejected?
{Points}	Number	Number of points scored by an applicant

6.9.3 List of applicants

The list of applied candidates is the first list that is produced and published in the enrolment process. A separate list for every study programme group is created. It lists all the candidates that have applied on the particular study programme / group of study programmes. For each candidate the application number (ID), name, parent name, surname, points from high school, points from graduation, points from special exam (if needed for the study programme), total points, study programmes precedence, full-time/part-time studies (if available on the SP) and state/private quota enrolment (if available on the SP).

> Example:

бр.	презиме	име	студиска програма	избрано кофинан.	редослед на ст. пр.	успех	матура/ стручни пр.	вкупно
1214	Стојчева	Ленче	7	не	85691324	60,000	39,737	**99,737**
1215	Мицкоски	Илија	7	да		60,000	29,230	**89,230**
1216	Кицев	Кристијан	7	не	8	60,000	39,232	**99,232**
1217	Јаневска	Маја	5	не	78912346	60,000	39,488	**99,488**
1218	Стојановски	Александар	8	да	7	56,700	36,472	**93,172**
1219	Науновска	Катерина	7	не	8564	60,000	29,913	**89,913**
1220	Камова	Ивана	7	не	8	59,714	22,412	**82,127**
1221	Локоски	Александар	5	да	8763129	47,400	22,017	**69,417**

After the publication of this list the candidates have certain time to fill in a complaint and requesting correction/revision of their data.

The admission officers (commission) review the complaints and make the approved corrections. After this a document "answer to the complaints" is produced and published. This document lists all ref. numbers (IDs) of the candidates that have filled in a complaint followed by a table of the accepted complains and the correction that was made to the results.

6.9.4 Preliminary and final ranking list

A separate list is produced for the ranked and not ranked candidates, separate for every study programme, state and private quota, full-time and part time students. The list includes the application number (ID), name, parent name, surname, total number of points and is sorted by the total number of points in descending order.

Example:

Универзитет [   ]
Факултет за електротехника и информациски технологии

Прелиминарна ранг-листа за прием на студенти на студиските програми на Факултетот [   ] за учебната 2009/2010

[   ] Студиска програма   Државна квота

рбр.	Пријава	Презиме	Татко	Име	Бодови
1	1281	Ташовска	Георги	Марија	96,418
2	1296	Алексовска	Зоран	Магдалена	88,234
3	1147	Николовски	Трајче	Васил	84,638
4	1029	Јовановски	Славе	Филип	84,298
5	1282	Јанев	Ристе	Лазар	83,844
6	169	Старковска	Насте	Ивана	82,948
7	1032	Спасиќ	Бране	Никола	81,638
8	1182	Тануровски	Перикли	Никола	78,067
9	1047	Клинчаров	Митре	Александар	77,834

The candidates that are ranked for enrolment on different study programmes, in the state and private quota, under different (special) circumstances and in the ethnic quotas are listed on separate lists.

Example:

Универзитет

Факултет

Прелиминарна ранг-листа за прием на студенти на студиските програми на Факултетот

за учебната 2010/2011

прв уписен рок (Националности)

Студиска програма | Државна квота

рбр.	Пријава	Презиме	Татко	Име	Националност	Бодови
1	1114	Крстеска	Тони	Паракева	Влав	96,949
2	1121	Таири	Скендер	Еркан	Турчин	95,960
3	490	Станојевиќ	Душан	Радослав	Србин	94,102
4	1326	Ахмедоска	Нагип	Елмедина	Турчин	90,453
5	1279	Реџеп	Хајдар	Ербил	Турчин	80,459

The candidates that are not ranked for enrolment are listed on separate list(s).
Example:

Универзитет

Факултет

Список на НЕРАНГИРАНИ кандидати за запишување во прва година на

Факултетот за учебната 2009/2010 (прв уписен рок)

бр.	презиме	име	студиска програма	избрано кофинан.	редослед на ст. пр.	успех	матура/ стручни пр.	вкупно
230	Бојковски	Александар	7	не	8	60,000	32,241	**92,241**
132	Божиноски	Марко	7	не	8	59,733	31,789	**91,522**
1007	Максимовски	Душко	7	не		60,000	31,257	**91,257**
301	Маркоски	Филип	7	не		60,000	30,031	**90,031**
243	Николова	Емилија	7	не		60,000	28,303	**88,303**
122	Ташонов	Мирослав	7	не		52,500	33,480	**85,980**
1125	Атанасов	Киро	7	не		50,100	34,173	**84,273**
1071	Кулаку	Муамеднафи	7	не		57,067	26,518	**83,585**
162	Тодоровски	Дејан	7	да	95	56,100	26,529	**82,629**
1220	Камова	Ивана	7	не	8	59,714	22,412	**82,127**
191	Јосковска	Емилија	7	да	958	50,700	30,884	**81,584**

After the publication of this list the candidates have certain time to fill in a complaint and requesting correction/revision of their data.

The admission officers (commission) review the complaints and make the approved corrections. After this a document "answer to the complaints" is produced and published. This document lists all ref. numbers (IDs) of the candidates that have filled in a complaint followed by a table of the accepted complains and the correction that was made to the results.

Finally the final ranking list (list of accepted candidates) is published. The final ranking list has the same form as the preliminary ranking list.

6.9.5 Reviewing the candidates' applications

The system should provide a way for the admission officers to review the data entered by the candidates, compare it with the paper documents provided, make any necessary corrections (if needed) and mark the application reviewed. An audit log should be kept for all activity during this process.

After all applications are reviewed the list of applied candidates can be generated and published.

6.9.6 Filling in a complaint

The system should distinguish among at least two complaint cycles: the first after the publication of the list of the applied candidates and a second one after the publication of the preliminary ranking list. Candidates can fill in a complaint form requesting a correction of different data in each cycle.

In the first cycle the candidates can request a change in the spelling of the name, the high school and graduation marks, ethnicity, type of school and the precedence of selected study programs.

In the second cycle the candidates can request a revision of the results of the special exam (if existing on the particular study programme).

6.9.7 Complaints revision and answering

The system should provide a form that the admission officers can use to list all the candidates that have filled in a complaint, review the complaint, accept it, reject it, make a revision and possibly enter additional explanation that can be sent to the candidate. Every change should be logged in the audit log including the record ID, the change made, date/time of change, and ID of the admission officer that performed the revision. After closing all complaints (either accepted or rejected) the system should enable a report of the complaint revision from the admission commission to be generated automatically.

6.9.8 Business rules and access rights

- Only the applications that were reviewed and validated by SAO staff are to be included in the ranking process.
- Enrolment Committee creates a ranking list of accepted students.
- At the end of the enrolment period, the ranking list is published at the University/Faculty web site, and all applicants are automatically notified via email and SMS.
- Ranking list is publicly available at the University/Faculty web site.

6.10 Admission officer applications review

The system should provide an interface for the admission officers that will enable them to easily check if the candidate has submitted all required documents, if the data entered in the system by the applicant corresponds to the data in the paper documents. The admission officers should be able to easily review the complaints submitted by applicants, generate a report to be published and send individual notes to the applicants that complained. The admission officers should be able to make corrections to all applicants' data in the database. Each change in the data for the candidate after the candidate's application has been submitted / list of candidates has been published must be accompanied by an audit log entry with details about the change.

The system should enable the admission officers to fill an application form for the candidates that supplied their documents by mail accompanied by filled and signed paper enrolment form.

6.11 Master data

Master data consists of the following lists (See List of Acronyms):
- List of subjects that applicants sit as part of the high school final year exam
- List of faculties
- List of study programmes
- List of contract types
- List of document types

- List of fess payable by applicants
- List of High schools

This data changes very rarely. Still, there is a need for the data to be maintainable.

The list is maintainable by the System Administrator, as depicted in the following use case diagram.
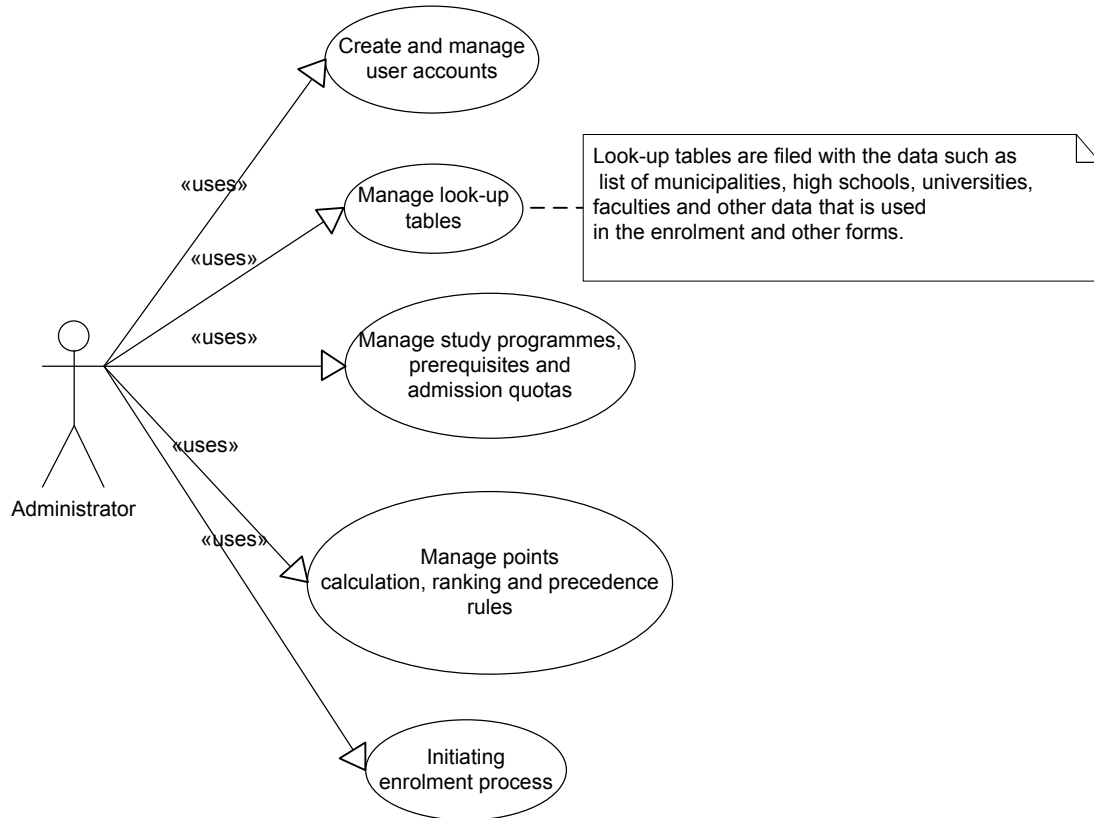
7 Interface with other system

7.1 Interface for web service with MoES

7.1.1 Functionalities of the web service

The web service should allow the specific end user of the Enrolment Module to access MoES EMIS system, and requesting the prospective student's data to be entered in the enrolment process of the University.

In the following text, the interaction with the EMIS system is elaborated as part of the complete admission procedure.

EMIS system stores all data for each high school student in *state high schools* in RM. At the end of the school year, a record in EMIS is created for every graduated high-school student including data on type of graduation, date of graduation, name of high school etc. There is a time window between the graduation date and the start of admission period at universities in RM during which the data can be entered into EMIS. At a state level, MoES defines three admission periods at state Universities. Then, during the admission period a prospective student can access the web service and transfer the data into the enrolment system of the University where he applies for enrolment.

Only candidates that finished high school in one of the state high schools can have records at EMIS. Other candidates must manually enter the data input in the enrolment application.

In this regard, the registration of prospective candidates will be possible only through electronic way, by filling in the appropriate electronic application. Candidates who do not exist in the internal system of MoES (candidates who do not take the graduation exam, foreign applicant, citizens of the RM with partially or fully completed secondary education abroad), also submit an electronic application, which differs from the electronic application that fill candidates described above, but for them is mandatory submission of written documents, the necessity of verification of data entered in the application.

7.1.2 Triggering EMIS by prospective students

Candidate accesses the enrolment system at the University. Using the enrolment system, he authenticates himself to EMIS, and allows the enrolment system to download his data from EMIS's web service.

This requires that there should be a level of integration between university's enrolment system and EMIS in terms of authentication.

In a specifically designed web form, end user fills two main groups of data:

- personal information not present in EMIS,
- information about the study program(s) he/she applies for.

Information about the finished high school is downloaded from EMIS.

In a specific form field, candidate enters his authentication details, which triggers the necessary web service for transferring his data from EMIS into the enrolment system.

7.1.3 Web service

Web service named *ExchangeData_EMIS* is consumed by the internal enrolment system of each University to get data for prospective students. Using the methods from this web service, the enrolment system of each University can obtain data for prospective students from EMIS system at MOES. Enrolment system has to implement a client for this web service.
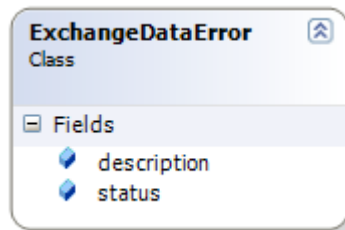
Following class diagram gives the list of web methods in the *ExchangeData_EMIS* web service.
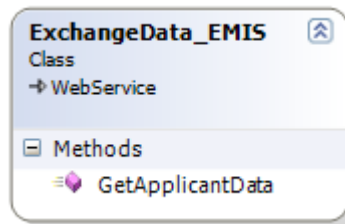
The only web method *GetApplicantData* returns an array of values from the type *ExchangeDataError*, which explains the reasons for exception while transferring data from EMIS system.

ExchangeDataError is a class containing two fields as shown in the following diagram:


Web service *ExchangeData_EMIS* implements the following method:

Method Signature	Description
ExchangeData_EMIS.ExchangeDataError[] GetApplicantData(string applicantID, ref string surname, ref string maidenSurname, ref string fatherName, ref string name, ref string embg, ref DateTime birthDate, ref string birthPlace, ref string birthManicipality, ref string birthState, ref string sex, ref string citizenship, ref string nationality, ref string livingPlace, ref string livingAddress, ref string livingManicipality, ref string livingState, ref string sPhoneNumber, ref string mPhoneNumber, ref string email, ref string nameSurname, ref string profession, ref string employment, ref string schoolName, ref string schoolProfile, ref string schoolManicipality, ref string schoolAverage, ref string fSchoolYear, ref string studyingLanguage, ref ExchangeData_EMIS.GraduationType graduationType, ref string scholarship, ref string scholarshipProvider, ref int externalExam1, ref double percentileRank1, ref int externalExam2, ref double percentileRank2, ref int internalExam1, ref int internalExam2, ref int projectTaskStG, ref int firstSubject, ref int secondSubject, ref int projectTaskSG, ref int importantSubject1, ref int importantSubject2, ref int importantSubject3, ref int importantSubject4, ref int importantSubject5, ref int importantSubject6, ref int projectTaskIG)	The method returns the personal data, address information, contact information, information related to the previous education, data for the parent/guardian, other data and data for state/school/international graduation type (depending of the type of graduation taken by the candidate) for the prospective student with applicantID. Otherwise the method's return value of type *ExchangeDataError[]* gives a list of reasons why the method can't transfer the requested data.

7.1.4 Activity and sequence diagrams

This section shows update version of the diagrams shown in sections 1.13.2 and 1.13.3 in coordination with the web service ExchangeData_EMIS for exchange applicant data between the MoES and systems for admission and ranking of universities.
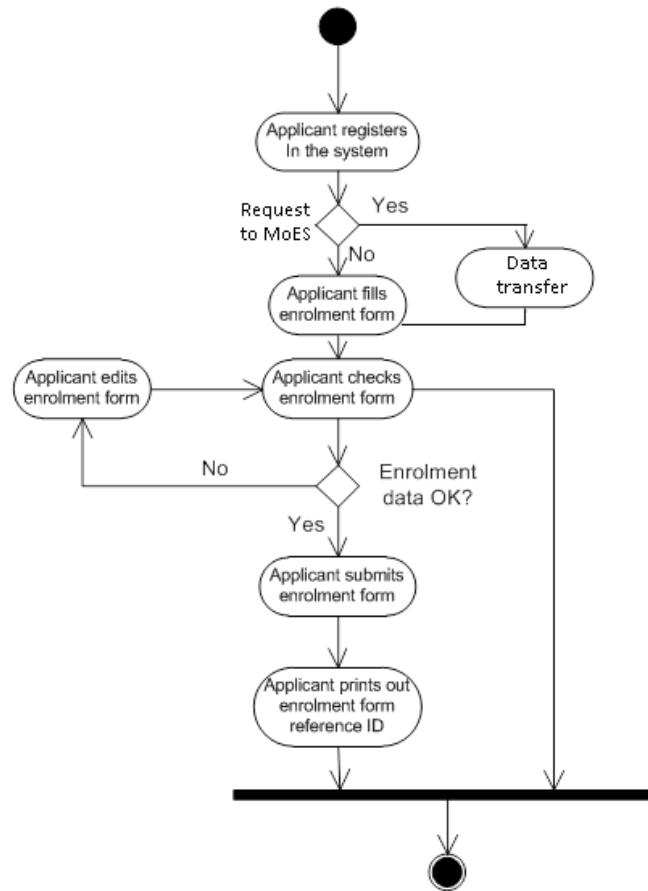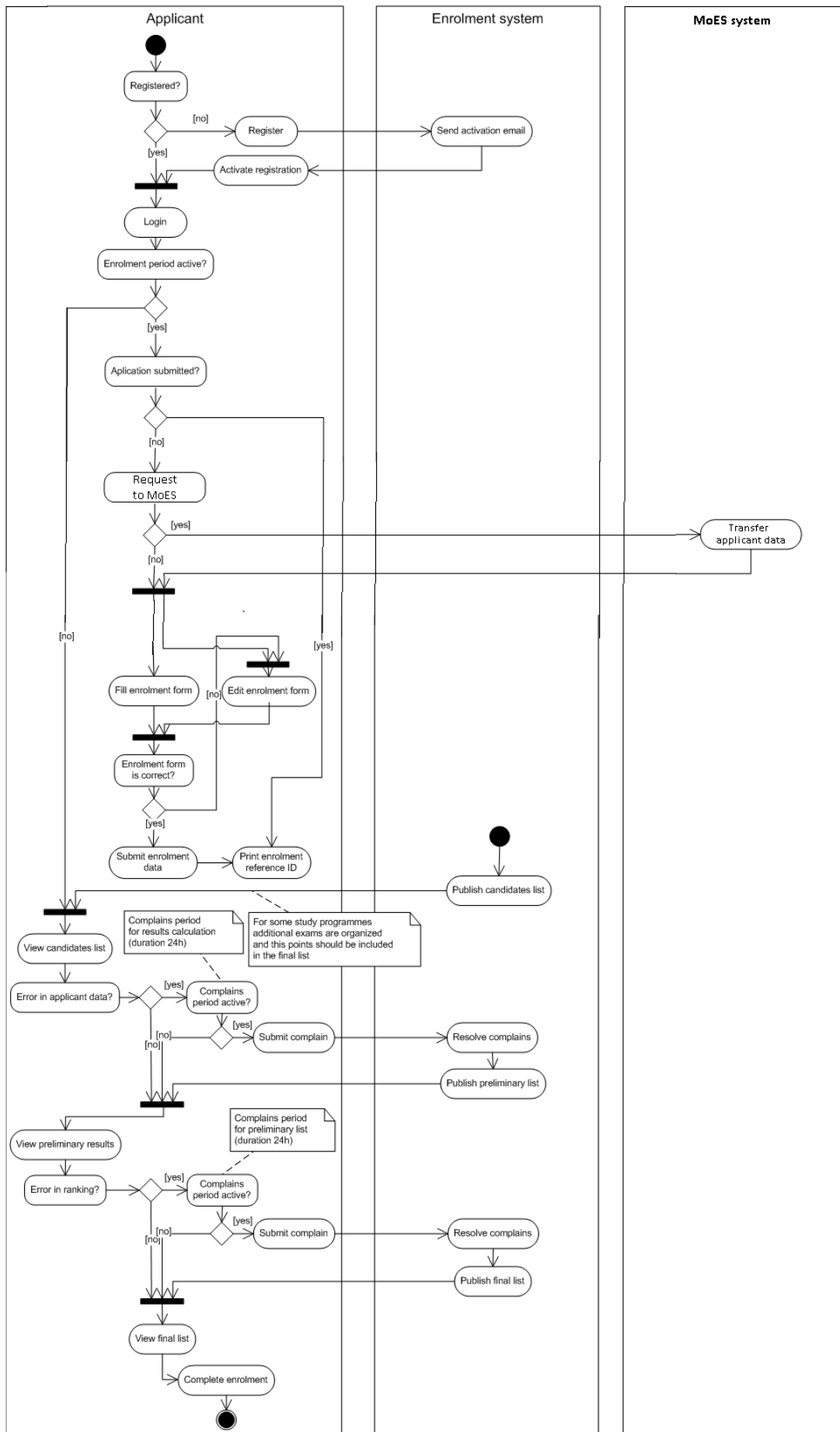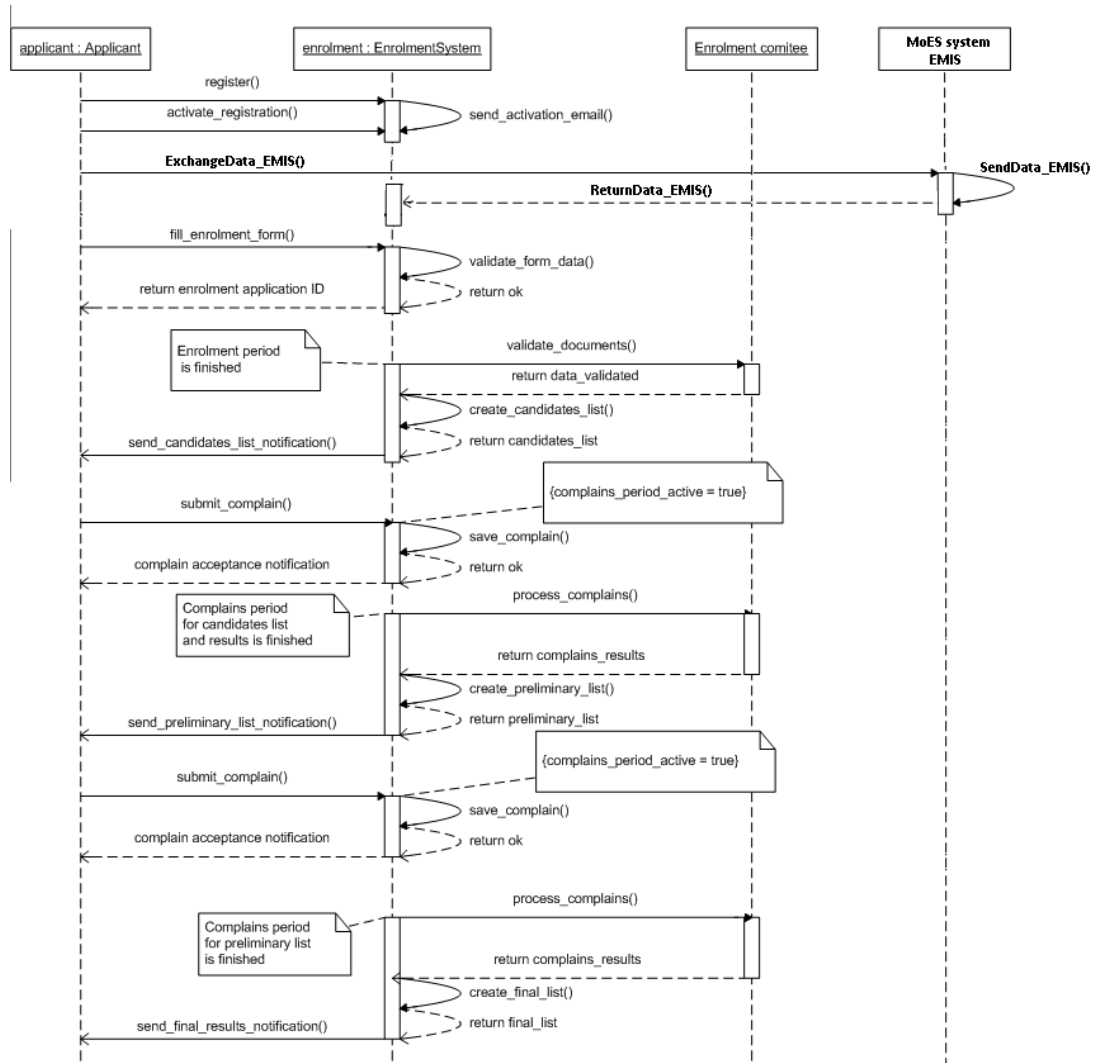
7.1.5 Security

Data transfer between University and EMIS needs to be secured (e.g. SSL or VPN) to protect the privacy of candidate's data.

With regards to the authentication mechanism, there are two options:

- University is authenticated, and all transfers of candidate's data are logged. If a fraud is detected e.g. university requested data for a non-aplying high school graduate, then one can later on prove that the data was requested.
- Student is authenticated, and requests that his data is entered into the enrolment system of a University.

7.2 "Enrolled candidates" Web Service

Manual data entry needs to be minimised. For example, data from the student application form is checked and approved by SAO. Once the applicant is succesfully ranked and paid the necessary fees, his data is migrated to the database of enrolled students. The same data is used to create student's e-document. This data migration from the enrolment module to the Core Functionality Module (CFM) is provided by means of a web service.

This web service will allow the CFM to import the data on enrolled candidates from the Enrollment module.

Enrollment module will make all data on successfully enrolled candidates available to CFM via web service. It is the responsibility of CFM to decide which data fields are imported into its database.

Web service named *EnrolledCandidates_WS* is part of the enrolment module. It is consumed by the internal CFM, as part of iKnow, to get data on enrolled candidates.

Following class diagram gives the list of web methods in the *EnrolledCandidates_WS* web service.
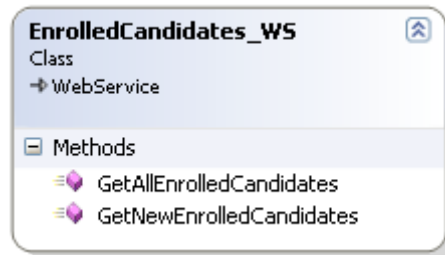
Web methods *GetAllEnrolledCandidates* and *GetNewEnrolledCandidates* return an array of successfully enroled candidates during an admission period specified in an input parameter. In order to avoid double export of student data, it is the responsibility of the methods *GetAllEnrolledCandidates* and *GetNewEnrolledCandidates* to mark the already exported records.

Method Signature	Description
`public EnrolledCandidate[] GetAllEnrolledCandidates(string admissionPeriod)`	The method returns all the data on all enrolled candidates during an admission period. Returned records on enrolled candidates are marked as exported.
`public EnrolledCandidate[] GetNewEnrolledCandidates(string admissionPeriod)`	The method returns all the data on newly enrolled candidates during an admission period. Only records which haven't been exported yet are returned. Returned records on enrolled candidates are marked as exported.

Data structure *EnrolledCandidate* contains all the data defined in the data model sections §6.1 Applicant and §6.9 Ranking the candidates.

7.3 Migration of existing data

Enrolment module has to enable migration of data from legacy systems into the iKnow system. Data migrated from legacy systems is not imported into the Enrolment database; it is rather imported into CFM database. Data migration from legacy systems is expected to run as a batch process.

It is required that the iKnow solution supports an Extract-Transform-Load (ETL) process. In its simplest form, ETL process consists of export of data from the legacy system into a commonly used format e.g. MS Excel. Then, exported data is imported into CFM's database using the import capabilities of the database, or the CFM application. For example, MS SQL server provides Data Transformation Services (DTS).

8 Reporting

This section defines the reports that are required to be generated by the application. In addition, the system should allow generation of reports which show all the records for a given data entity in tabular format. These reports are configurable in two ways:

- Displayed data can be filtered by all fields shown in the reports
- User can chose the fields shown in the report

All reports should be exportable in the following formats: PDF, Excel, XML and CSV

8.1 Reports

At the end of every enrolment period, the system allows for generation of reports displaying various statistics on the enrolled candidates.

Reports need to display the following data in tabular format:

For every study programme show the number of enrolled candidates (by ethnicity and total) that:

- have applied
- were tested (if testing was required)
- have passed the test
- are accepted for enrolment in state quota
- are accepted for enrolment in private quota (full-time + part-time + total)
- are accepted for enrolment in ethnicity quota
- are accepted for enrolment under special circumstances (for every type)
- are accepted for enrolment (total – sum of previous)

The report also displays total number of enrolled candidates for faculty, group of faculties (natural sciences, engineering, humanities, arts, …), and the number of avaliable places for the next enrolment period (separately for the state quota, private quota and ethnic quotas,

C:\Documents and
Settings\Dejan\My Dc

full-time and part-time). Following is a sample report   .

Another report shows the number of "applied candidates", "ranked candidates", "not ranked candidates", and "not enrolled ranked candidates", where candidates are grouped according to the following criteria: full-time, part-time, ethnicity, special circumstances (every type) and the municipalities the candidates are coming from. Following is a sample report:

Elektrotehnika.xls

9 General Business Rules

This delivery aims to design a system that satisfies the following requirements

- Uses one centralised database to keep data on applicants and the enrolment procedure.
- Allows online access to all actors.
- Uses role-based authorisation.
- Implements customisable notification functionality on change in the status of their application, missing document, pending events, due payments etc.
- Supports multiple notification mechanisms: SMS, email, social networking sites.
- Provides grading system and selection methodology. Allows Enrolment Committee to define ranking parameters.
- Implements web based enrolment application.
- Implements the "single point of data entry" principle.
- Administrator should be able to configure the system.

10 List of Acronyms

EMIS	Education Management Information System
EC	Enrolment Committee
SAO	Student Administration Office
MoES	Ministry of Educagtion and Science

11 Appendix A

Ethnicity:	
1.	Македонец
2.	Албанец
3.	Турчин
4.	Ром
5.	Србин
6.	Бошњак
7.	Влав
8.	Друго

Type of high-school / occupational profile	
01	гимназиско образование
02	електротехничка струка
03	машинска струка
04	сообраќајна струка
05	хемиско-технолошка струка
06	графичка струка
07	геолошко-рударска и металуршка струка
08	градежно-геодетска струка
09	економско-правна и трговска струка
10	здравствена струка
11	земјоделско-ветеринарна струка
12	текстилно-кожарска струка
13	угостителско-туристичка струка
14	уметничко образование
15	лични услуги
16	шумарско-дрвопреработувачка струка

List od municipalities in Macedonia	
01	Аеродром
02	Арачиново
03	Берово
04	Битола
05	Богданци
06	Боговиње
07	Босилово
08	Брвеница
09	Бутел
10	Валандово
11	Василево
12	Вевчани
13	Велес
14	Виница
15	Вранештица
16	Врапчиште
17	Гази Баба
18	Гевгелија
19	Ѓорче Петров
20	Гостивар
21	Град Скопје
22	Градско

23	Дебар
24	Дебарца
25	Делчево
26	Демир Капија
27	Демир Хисар
28	Дојран
29	Долнени
30	Другово
31	Желино
32	Зајас
33	Зелениково
34	Зрновци
35	Илинден
36	Јегуновце
37	Кавадарци
38	Карбинци
39	Карпош
40	Кисела Вода
41	Кичево
42	Конче
43	Кочани
44	Кратово
45	Крива Паланка
46	Кривогаштани
47	Крушево
48	Куманово
49	Липково
50	Лозово
51	Маврово и Ростуша
52	Македонска Каменица
56	Македонски Брод
54	Могила
55	Неготино
56	Новаци
57	Ново Село
58	Осломеј
59	Охрид
60	Петровец
61	Пехчево
62	Пласница
63	Прилеп
64	Пробиштип
65	Радовиш
66	Ранковце
67	Ресен
68	Росоман
69	Сарај
70	Свети Николе
71	Сопиште
72	Старо Нагоричане
73	Струга
74	Струмица
75	Студеничани
76	Теарце

77	Тетово
78	Центар
79	Центар Жупа
80	Чаир
81	Чашка
82	Чешиново
83	Чучер-Сандево
84	Штип
85	Шуто Оризаре

List of high schools in Macedonia	
БЕРОВО	
01	ОСУ „Ацо Русковски"
БИТОЛА	
02	СОУ „Јосип Броз Тито"
03	СОТУ „Ѓорѓи Наумов"
04	СОУ „Таки Даскало"
05	СОЕУ „Јане Сандански"
06	ДСЗУ „Кузман Шапкарев"
07	ОСМУ „Д-р Јован Калаузи"
08	Државно музичко училиште - Битола
БОГДАНЦИ	
93	СОУ „Богданци"
БРОД МАКЕДОНСКИ	
09	СОУ „Св. Наум Охридски"
ВАЛАНДОВО	
10	ОСУ „Гоце Делчев"
ВЕЛЕС	
11	УСО „Кочо Рацин"
12	УСО „Јовче Тесличков"
13	ССОУ „Коле Неделковски"
14	УСО „Димитрија Чуповски"
ВИНИЦА	
15	СОУ „Ванчо Прке"
ГОСТИВАР	
16	СОУ "Гостивар" ("Панче Попоски")
17	ОСТУ „Гостивар" ("Злате Малакоски")
18	СЕОУ „Гостивар" ("Чеде Филипоски")
ГЕВГЕЛИЈА	
19	СОУ „Јосиф Јосифовски"
ДЕБАР	
20	ЦСНО „Здравко Чочковски"
ДЕЛЧЕВО	
21	СОУ „Методија М. Брицо"
ДЕМИР ХИСАР	
22	СОУ „Крсте П. Мисирков"
КАВАДАРЦИ	
23	ОСУ „Добри Даскалов"
24	СОУ „Киро Спанџов - Брко"
25	СОЗШУ „Ѓорче Петров"
КИЧЕВО	
26	ОСУ „Мирко Милески"
КОЧАНИ	

27	ОСУ „Љупчо Сантов“
28	СОУ „Гошо Викентиев“
КРАТОВО	
29	СОУ „Митко Пенџуклиски“
КРИВА ПАЛАНКА	
30	СОУ „Ѓорче Петров“
КРУШЕВО	
31	ОСУ „Наум Наумовски - Борче“
КУМАНОВО	
32	СОУГ „Гоце Делчев“
33	ССОУ „Киро Бурназ“
34	СОУ „Перо Наков“
35	ОСТУ „Наце Буѓони“
НЕГОТИНО	
36	СОУ „Св. Кирил и Методиј“
ОХРИД	
37	ОСУ „Св. Климент Охридски“
38	ОЕМУЦ „Св. Наум Охридски“
39	ОУТУ „Ванчо Питошески“
ПРИЛЕП	
40	СОУГ „Мирче Ацев“
41	СОУ „Ѓорче Петров“
42	СОУ „Орде Чопела“
43	СОЕПТУ „Кузман Јосифовски-Питу“
44	СОУ „Ристе Ристески-Ричко“
ПРОБИШТИП	
45	СОУ „Наум Наумовски-Борче“
РАДОВИШ	
46	СОУ „Коста Сусинов“
РЕСЕН	
47	СОУ „Цар Самуил“
СВЕТИ НИКОЛЕ	
48	СОУ „Кочо Рацин“
СКОПЈЕ	
49	СУГСГ „Раде Јовчевски-Корчагин“
50	СУГС „Никола Карев“
51	СОУ „Зеф Љуш Марку“
52	СУГСГим. „Јосип Броз Тито“
53	СУГСГ „Орце Николов“
54	СУГС „Кочо Рацин“
55	СУГС „Панче Арсовски“
56	СУГС „Браќа Миладиновци“
57	СУГС „Георги Димитров“
58	СМУГС „Д-р Панче Караѓозов“
59	СЕПУГС „Васил Антевски - Дрен“
60	СЕПУГС „Арсени Јовков“
61	СУГС „Цветан Димов“
62	СУГС „Лазар Танев“
63	СУГС „Марија Кири Склодовска“
64	СГГУ „Здравко Цветковски“
65	СУГС „8-ми Септември“
66	СУГС „Владо Тасевски“
67	СУГС „Димитар Влахов“
68	АСУЦ „Боро Петрушевски“

69	СЕТУГС „Михајло Пупин"
70	ДМБУЦ „Илија Николовски-Луј"
71	ДСУПУ „Лазар Личеноски"
72	ДУФК „Методи Митевски Брицо"
73	ЦОР "Партенија Зографски"
74	ДУРДМОВ "Димитар Влахов"
75	ДСУРО "Св. Наум Охридски"
СТРУГА	
76	СОУ „Нико Нестор"
92	СОУ „Д-р Ибрахим Темо"
СТРУМИЦА	
77	СОУ „Јане Сандански"
78	СОУ „Димитар Влахов"
79	СОУ „Никола Карев"
ТЕТОВО	
80	СОУГ „Кирил Пејчиновиќ"
81	СОМУ „Никола Штејн"
82	СОЕУ „8 Септември"
83	ССОУ „Моша Пијаде"
84	СТОУ „Гоце Стојчески"
85	СМУ „Тодор Скалоски-Тетоец"
ШТИП	
86	СОУ „Славчо Стојменски"
87	СОУ „Коле Нехтенин"
88	СОУ „Димитар Мирасчиев"
89	СОУ „Јане Сандански"
90	ДСМУ „Сергеј Михајлов"
91	ЦССНО „Искра"
ПРИВАТНИ УЧИЛИШТА	
95	ПСУ „Jaxja Кемал"
96	ПСУ „Петта приватна гимназија"
97	ПУСО „САБА"
99	**ДРУГИ приватни и странски училишта**

Special circumstances	
0	Normal application (no special circumstances)
1	деца без родители
2	лица со прв степен на инвалидност
3	воени инвалиди
4	лица од дом за напуштени деца
5	припадници на безбедносни сили
6	деца на починати учесници во мировни операции