

MULTIPLE-FUNCTION SYSTEM FOR APPLIED STATISTICAL ANALYSIS OF NATIONAL ENTRANCE EXAMINATIONS

Badalov T.A., Shelaginov O.E, Kazimov P.K.

Starting 1992, on a yearly basis the State Students Admission Commission conducts statistical analysis of applications and responses of applicants in accordance with the results of centralized admission to higher and secondary specialized education institutions.

Feedback is utilized for improvement of technology of admission examination, youth professional orientation and specialty selection, education system development, improvement of quality of training of different subjects, development of scientifically-based regulation of student admission, planning and other issues.

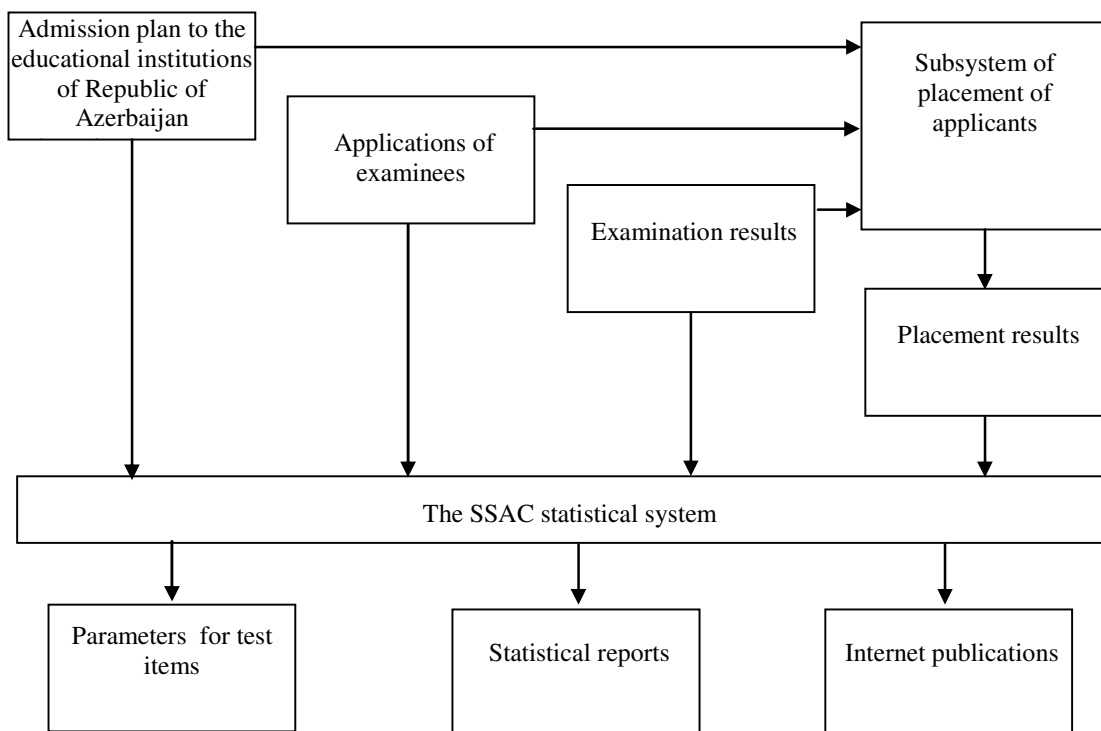
Computer system of multiple-profiled statistical analysis is a complex of program resources to process data that are created during development and implementation of examination campaigns such as admission examinations to educational institutions of the country.

Information database of the system includes admission plans for higher and secondary specialized institutions, database of applications for participation in admission examination and placement of students, database of examination results, supplementary information about secondary schools and higher educational institutions, expert judgments of test items and etc.

Applications contain personal data (last, first and middle name of the applicant, gender, ID number, region of residence, date of birth, phone number), information about education that applicant received (type of education-higher, secondary, secondary specialized, number of school-leaving certificate, information about educational institution, year of graduation, language of education, final school grades on subjects as well as application for participation in examination and placement (specialty group for which examinee applies and takes an examination, preference-based list of specialties in educational institutions).

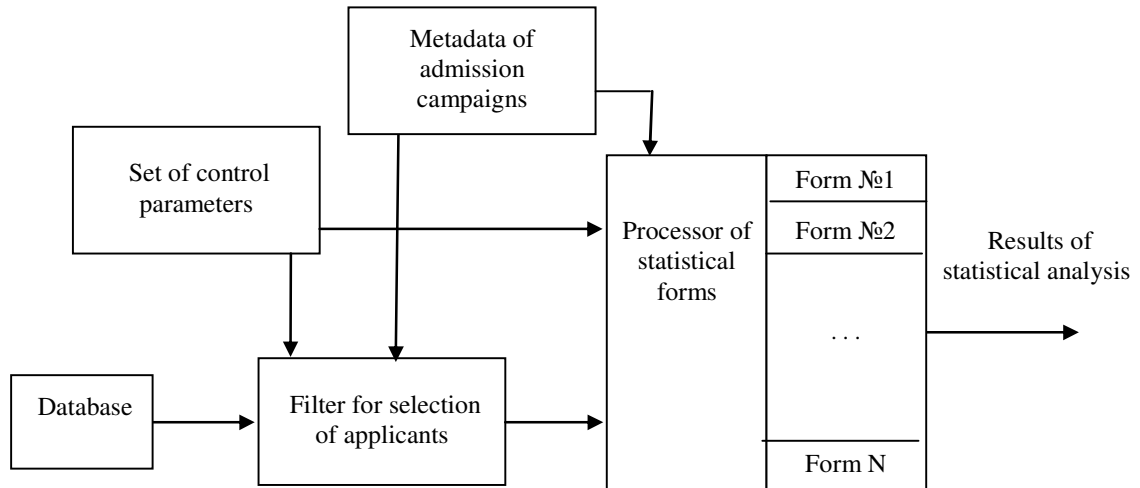
Information about examination includes examination building and room codes, version of the test, responses to the test items and results. Placement results contain data about competition on all specialties, who was admitted on which specialty, and about minimal admission requirements.

As a result of data processing system defines parameters of test items for pretests and operational tests and develops various statistical reports and internet publications.



Picture. Plan of information flows

Plan of system functioning is displayed on the picture



Picture. Schematic diagram of system functioning

The main element of the system is a statistical form. Form includes program and information instruments for study of a particular aspect of admission campaign. The form includes set of instruments to obtain certain information as well as instruments to demonstrate results of analysis. System-supported graphical forms enable to visually display and compare statistical results.

Metadata of admission campaigns describes specific examination campaigns, presenting information about structure of test, description of groups and subgroups of specialties (number, set of testing subjects, weight coefficients of subject subtests), procedure of calculation of total score, procedure of defining minimal requirements for participation in competition etc. Metadata have used by filter for selection of sub-samples as well as by executive modules of statistical forms for providing of unification of data processing.

Parameters of statistical analysis define necessary sample and identify the type of analysis (general, specialty-group based, specialty-subgroup based). Certain characteristics of various types of system database such as education sector (Azerbaijani or Russian), gender, age, region of residence, number of school, year of graduation, school grades, type of education received, index of admission campaign, admission status (admitted students, competitors etc.), version of test, selected specialties are utilized to filter sample. Flexible system of control parameters enables to conduct analysis for any sub-sample of applicants or specialties. For example, the system provides DIF-analysis of examination results of male or female applicants, applicants from urban or rural areas, Azerbaijani or Russian education sector. Moreover, the system enables to conduct statistical analysis of applicants who select or have been admitted to the particular specialties etc.

Analysis of data from admission campaigns is conducted in several main directions:

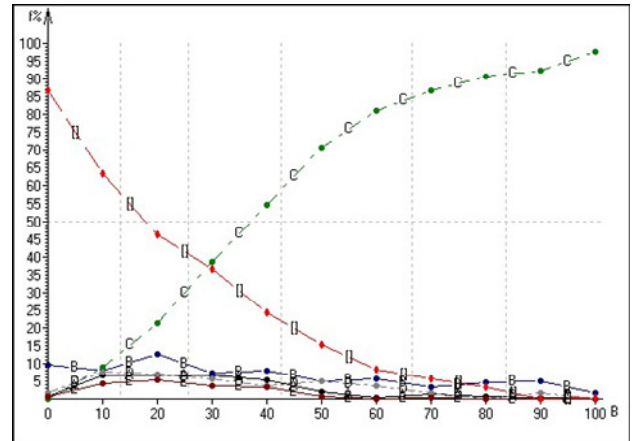
- 1) analysis of test items and subject-based subtests, which identifies the main characteristics of test items such as complexity and discrimination power, examines every distracter {incorrect answer} of multiple choice items and plots characteristic curves of the item. In addition, system allows conducting correlation analysis and analysis of reliability, and to assess behavior of whole subject subtest or specific test items for different groups of applicants, for example males and females. The picture displays an example of test item analysis obtained by using statistical system. Analysis is conducted in accordance with a classical test theory. To obtain IRT characteristic of test items the procedure of exchange with BILOG-MG program is utilized, i.e. request files and raw data files for BILOG-MG program are created and outcome files produced by the program are used.

Test item #7

Correct answer: C
 Number of respondents: 3932
 Correct answers (%): 2081 (52.92%)
 Incorrect answers (%): 734 (18.67%)
 Omit answers (%): 1117 (28.41%)

	Answers					Omits and errors
	A	B	[C]	D	E	
Answers distribution	3.99	7.50	52.92	4.48	2.59	28.51
Answers distinguishability coefficients	-0.063	-0.071	0.749	-0.065	-0.048	

Delta coefficient: 12.71
 Coefficient of difficulty: 37.04
 Coefficient of discrimination : 0.756
 Correlation with a total score : 0.608
 Contribution to reliability: 0.003



- 2) General analysis of composite multiple-subjects tests, which used for defining of characteristics of total scores distributions and comparing distributions of various groups of applicants.
- 3) Pre-examination statistics. This category includes thorough analysis of admission plan, distributions of applications by specialty groups and subgroups, educational institutions, and certain specialties, current competitive situation, regional structure of applicants, preferences for specific subgroups of specialties.
- 4) Post-examination statistics. This category involves analysis of the situation after admission. Admission is conducted by subsystem of placement of applicants on the base of testing results and sequence of specialties indicated in application form. Statistical forms of this category determine indicators for fulfillment of specialties, groups, subgroups, educational institutions, and enable comparison of minimal and average scores of admitted applicants by specialties. The system enables to conduct multiple-profiled analysis of student contingent within different educational organizations and groups of specialties. The goal of one of the statistical forms of this category is an identification of ranking of universities based on admission results. Ranking is based on such characteristics as competitive situation for complete sample and sample of competitors (applicants met minimal requirements), average scores of admitted students, and frequency of selection of specialty of the university at the first position in the application.
- 5) Regional analysis. This category examines the scores of applicants based on regional representation. The analysis involves comparison of responses to test for certain subjects, admission information, distribution of admitted students upon educational institutions, distribution of scores of applicants from various regions.
- 6) Statistics by schools. Utilized for comparative analysis of secondary schools based on applications and examination scores of school graduates. This category includes forms for comparison of responses to different subject subtests, admission indicators, and aggregated statistics for several years.

Statistical system supports the contents of specialized web site “My school” (www.mekteb.edu.az) that contains statistical information about examination results of graduates from all schools of the country in all admission campaigns starting 1994. The web site has information about participation of every school in particular admission campaign, e.g. subject-based results and admission results as well as dynamics of their change. The used procedure of equating of parameters enables comparison of schools as well as dynamics of change by year.

Subject-based indexes enable assessment of quality of responses of graduates during admission examination. Admission results indexes enable assessment of outcomes for certain school based on percentage of graduates that continue education at the higher education institutions as well as average examination scores. These characteristics are assessed in absolute and comparative values that enables to make conclusions about deviation of school outcomes from average republican level. Additionally, information on web pages describes preferences of graduates for specialty groups and admission results for specific specialty groups.

System also has additional forms to retrieve lists of applicants in accordance with a given task, for example applicants that choose certain specialty and etc.

System has a user-friendly interface where selection of required forms and control parameters is conducted in an appropriate menu. Existence of mechanism of context-dependent help support, that includes assistance and feedback on current situation enables even a novice user to work with a system.

System has been utilized and upgraded by the SSAC since 1994. SSAC uses information obtained with assistance of statistical system to accomplish the organizational goals as well as displays data at the yearly scientific-methodological conferences in regions and publishes it in statistical reports in “Abiturient (Applicant)” journal, in the SSAC official website (www.tqdk.gov.az) and the website “My school” (www.mekteb.edu.az).