

USE ICT IN TEST EXAMINATIONS' PREPARATION AND CONDUCTING

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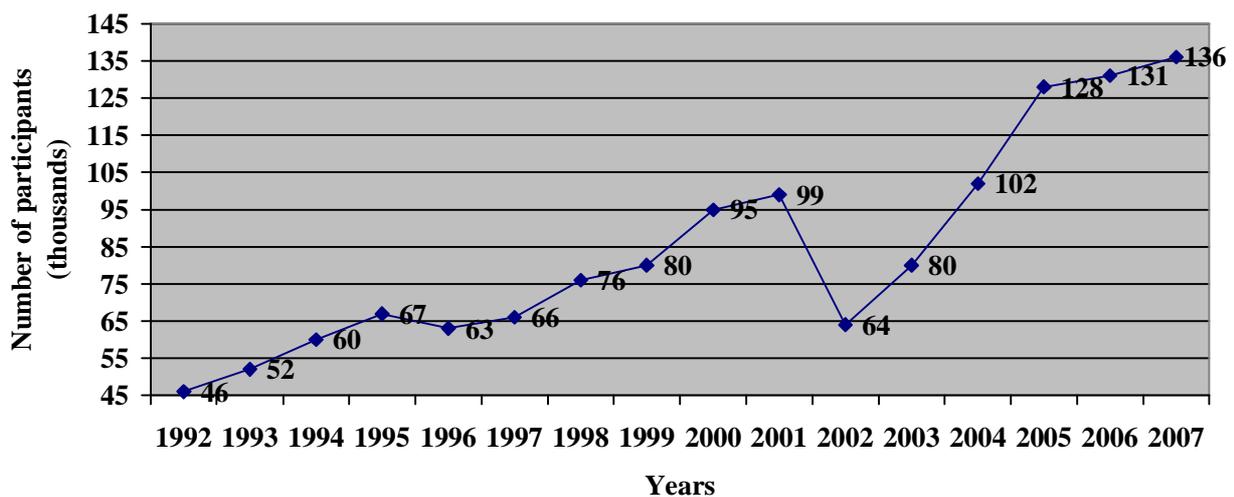
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Introduction

The State Students Admission Commission (SSAC) was established with the purpose of organizing and conducting of the centralized test entrance examinations to higher and secondary specialized schools. Every year the sphere of our activity extended, the number of citizens served by us grew. Admission of students to master degree of higher schools, testing of those who wish to work on civil service, selection of students for training abroad – this is not the full list of the new duties assigned to us. Dynamics of growth of number of applicants taking part in test examinations for admission to higher and secondary specialized schools is indicated in figure 1.

Figure 1. Number of examination participants in the years 1992-2007



It is necessary to note that reduction of number of participants in the years 2002 and 2003 is connected with reform in the system of primary and secondary education and

with the war imposed to Azerbaijan by separatists in Nagorno Karabakh and Armenia at the end of the 80th and beginning of the 90th years of the last century.

It is natural that in order to cope with processing of escalating stream of documents, mass process, to react to inquiries of citizens operatively and to inform them in due time, qualitatively, in short terms and without system errors, we are obliged to search for effective, modern approaches for the solution of worthwhile tasks. In our daily activity we pay great attention to use of computer hardware and technologies. Otherwise, it would be meaningless the existence of the organization assigned to hold test examinations in centralized order in short terms, but not obtaining the minimal possibilities to realize these functions.

Therefore, without long arguments about advantage of implementation of ICT in preparation and management (administration) of mass processes, I shall proceed to the description of technologies and tools used by us.

All the process of conducting of examinations can conditionally be divided into the following stages:

- Pretest examinations.
- Preparation for the announcement of the beginning of admission campaign.
- Reception of entrants' applications.
- Preparation for official examinations.
- Processing of examinations reports (minutes).
- Scanning of answer sheets and the analysis of information.
- Calculation of scores, conducting of competition and distribution on specialties.
- The report (announcement) of results of exams
- Use of archival database.

1. Pretest examinations

Pretest examinations have been held by SSAC annually since 1998 in which ten thousands of boys and girls take part every year. They help exam participants:

a) to check their knowledge in different subjects and, probably, to correct tactics of preparation for exam,

b) to adapt to examination environment psychologically,

c) to work with test books and answer sheets similar to real ones.

The SSAC also receives dividends working certain technologies and techniques through and perfecting them. For participating at pretest exams it was necessary to apply to one of the examination centers and buy coupons for those exams till 2006. However, the coupons for suitable time and examination place might be unavailable. Processing and implementation of the web-application in 2006 gave opportunity to be registered via Internet for any pretest exam and for any place from the offered list in online regime and to receive electronic coupon, and it met the requirements of our citizens. Within 3 months of 2007 about 63000 people took advantage of this service and participated at pretest exams.

2. Preparation for the announcement of the beginning of admission campaign

At this stage, alongside with other activities, read-out forms are projected and printed (on technologies Optical Mark Read and Intelligent Character Recognition). It should be mentioned that OMR forms were projected and printed abroad till 2002. The technological challenges made it possible to place the described technological chain in the building of our organization thanks to putting into operation in 2002 the program software prepared by us providing for visual projection of OMR, ICR and printed forms, also exploitation of offset printing machine. Consequently, the efficiency of implementation of new ideas, preparation for and conducting of examinations increased. About 70 types of various forms have been worked out since 2002. Numbering and personification of forms are made on high-speed printers of industrial type.

Creation and regular (annual) actualization of databases "Educational Institutions", "List of specialties and directions", " List of the announced specialties", "Examination buildings and halls", "Examination managers (officers)", "Invigilators of examination halls", etc. are of no small importance for qualitative conducting of examination process. As opposed to previous years, when the information from the database "List of the announced specialties" was transferred into the printing house on paper carriers, currently this material is prepared for the publication by software. This could be said about information base "Educational institutions", too.

3. Registration of applicants

Application forms of applicants contain the necessary information about them with the biographic data, the information about their education, the chosen specialties, etc. The information indicated in applications undergoes certain logic control (for example, the presence of a surname and a name in the reference list, accordance of surname to the gender of the applicant, accordance of the candidate's age to reasonable age limits) with the use of corresponding programs for further visual analysis and making corresponding decision.

In the years 1992-1993, because of the lack of equipment and technologies, we used ordinary hand-written forms for manual input. Operators entered the information into memory of a computer. The entered information was printed out, and then visual verification, updating, etc. with the original information was conducted. In the year 1993 high-speed OMR-scanners were acquired. In the year 1994 the first OMR-application forms of the applicant have been worked out. Scanning of forms has allowed to reduce terms of creation of a database with the information about applicants and to increase authenticity of the information.

The software system was applied on the basis of technology ICR in 2003. It gave an opportunity to use ICR-forms at certain types of exams. The information is entered by the respondent into corresponding fields of the form using "hand printing" symbols. Use of this technology has allowed respondents to save time at filling in the form.

Scanning photos from applications, we create a database of applicants' photos. Formerly we took photos from applicants' application forms with the help of video cameras connected to computers, and programs of capture of video images. This process demanded considerable number of human resources, time and additional arrangements. After the identification number of graphic representation on each image was digitized with the help of the program of recognition of symbols developed by us and the received number was compared with the file name. At detection of inaccuracies it was necessary to hold visual verification.

Currently the database of photos is created by scanning applications on industrial scanners and recognition of previously printed bar-codes. Alongside with improvement of quality of images, this technology allows to save time and human resources.

The decision about electronic applications of the candidates willing to get education

on master degree of higher schools was made in 2007. Making such decision, alongside with desire to simplify the procedure of submission of applications and to exclude logic mistakes in applications, had also the purpose to perfect technology of registration of applications for its further implementation at larger-scale examinations. The web-application developed by us demands the input of identification number and the confidential PIN-code, available on a card of payment. Further, the required information is entered into the fields of the form which undergoes logic control. With the purpose of application to be finally registered in the database, it should be confirmed by the official of a university. If there are any mistakes in the application, it will not be confirmed. Thus, "purity" of the database was achieved which excluded the necessity of long-term mechanical work. The photos database was created by photographing candidates with the help of the web-camera and sending of the received graphic file to our server via Internet.

4. Preparation for official examinations

After completing submission of applications and creation of a corresponding database, there comes the stage of direct preparation for examinations. At this stage, on the basis of the information available in databases "Applicants", "Examination buildings and halls", "Examination managers (officers)", "Invigilators of examination halls", programmed distribution of applicants over examination halls is performed, buildings are determined for the managers (officers) of examination, and halls for invigilators, in which they will control examination. Pseudorandom numbers are used in the process of distribution. In the procedure of placement of candidates the algorithms are used which eventually, positively affect fairness of exam results. For example, the graduate cannot take an exam in his/her own school, graduates of high schools of the current year are separated from graduates of the previous years, and candidates with higher certificate marks are separated from the applicants with lower marks.

High-speed industrial printers allow us to personify forms of the invitation to examination, answer sheets, lists of participants, and reports (minutes) of conducting of examinations for each examination hall within several days.

Photos of applicants are also printed for use during examination as one of complex methods of struggle against fraud.

Test items are automatically selected by using the program of generation of tests. The program receives a random number, the list of sections in each examination subject, from which items will be selected from the structured and classified item bank, and also requirements for the level of their complexity. The selected test items ready for printing are delivered to the printers.

5. Processing of examination reports (minutes)

After examinations, the examination reports pass careful processing. Formerly the information taken from reports was entered into a database manually. However, currently, this information is scanned by high-speed scanners and recognized with the help of the programs developed on the technology of ICR (Intelligent Character Recognition). Within 3 hours we get a file with the information about what happened in thousands of examination halls.

6. Scanning of answer sheets and analysis of the information

In the years 1992-1993 answer sheets were scanned abroad. After putting into operation of OMR (Optical Mark Read), scanning of answer sheets is being held in our technical base. With the purpose of excluding probability of mistakes, each sheet is exposed to double scanning on different scanners. Both received files are verified for identity. Insignificant distinctions in optic ability of scanners allow to reveal presence of uncertainly painted circles, blots. Depending on the character of difference, the sheet is exposed to scanning for the third time in the most appropriate mode of vigilance of the scanner. Further, the checked information is analyzed by logical control program, the information which is the result of presence of blots on forms is excluded, and the list of applicants who did not participate in examination, etc. is formed. It allows to receive 100 percent reliable information in the result. Besides, the program analysis of the data allows to reveal the cases of copying (cribbing).

7. Calculation of scores, holding of competition and distribution by specialties

The scoring of answers, holding of competition and distribution of applicants by the specialties are realized simultaneously by some programmers. The information bases of

applications, answers, reports and correct answers (the key) are used. With the purpose of prevention and exception of mistakes, the results of all three distributions are verified.

8. The announcement (reporting) of exam results

In the first years of functioning of the commission all necessary information for examination participants was given by mass media. The above said also concerns the announcement of exam results. By acquiring of high-speed printers the detailed information on applicants' answers, obtained scores and final results for each examination participant is printed. Since the year 2001, participants of examinations has had an opportunity to learn the results via the Internet. The project on the creation of a system allowing to obtain results of entrance examinations on mobile phone via SMS (Short Message Service) was realized in 2002 in cooperation with the mobile communication operator. Now, the participant is able to get information about his (her) exam results and learn alternatively and directly, regardless of location and time, whether he has been admitted to the university or not.

9. Use of the archival database

After the announcement of examination results, the information on exam participants and their results are added into the archival base which saves the information about participants of all examinations since 1992. Thanks to existence of this base we annually answer thousands of inquiries of citizens, various organizations, concerning this or that person.

Our technical infrastructure

In addition to personal computers and widely applied devices, our technical infrastructure includes:

- OMR-scanners with productivity of 6000 forms at an hour.
- High-speed image scanner with productivity of scanning 6000 forms in an hour and the software for recognition and streaming input of hand printed information.
- High-speed industrial printers.
- The offset printing machine for printing on fanfold paper.

- The Internet - channel with the throughput 100 Mbit / sec.
- Digital communication link E1.

Alternative ways of distribution of the information

We attach great importance to alternative ways of distribution of the information in our activity. Along with dynamical Internet – site where the information is regularly renewed, the following services are provided by the SSAC:

- The WAP-version of our site allowing to get necessary information via mobile phone.
- The automated telephone information service (141) working on the principles of choice of the elements of multilevel voice menu. Information on a concrete type of examination is correlated to each button of the phone's digital keyboard.
- System allowing to get operative notification on results of entrance examinations on mobile phone via SMS.

Perspective ICT-projects for the next years

The SSAC plans realization of the following ICT-projects for the next years:

- Reception of applications via the Internet for persons wishing to participate in the mass test examination conducted by the SSAC - admission examinations to higher and secondary specialized educational institutions.
- Registration and conducting of records of participants' results in examinations on revealing special creative abilities.
- To inform candidates about their examination results only by use of means of telecommunication, without use of paper carriers.
- Use of special computer techniques for blind and short-sighted children while preparing for and participating in examinations.
- Publication in the Internet and organization of full text search in information bases "Educational institutions", "List of directions of specialties and specialties", "List of the announced specialties".