

A PROPOSAL OF NATIONAL HIGHER EDUCATION STUDENT INFORMATION SYSTEM INFRASTRUCTURE

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Abstract - *Many applications have become interoperable in the world and in Turkey today together with the development of internet services that are called as third generation internet. Interoperability has considerably important incontrovertible advantages on institutions in terms of technical, organizational, and semantic aspects. It is remarkable that our Higher Education Institutions, which are obliged to use the technology at the highest level in Turkey, use many different information system softwares and it is not possible to reliably and accurately manage the information from a single central source in cases that require both sharing the information and providing statistics. This study investigates possibility of the interoperability of softwares by technically examining the student information system softwares of Higher Education Institutions in Turkey and the Turkish Republic of Northern Cyprus and exchanging data with a central database server under the roof of e-state. In this context, the study presents a sample infrastructure scheme that will enable the softwares to operate in parallel with a central database, as well by examining the structure that is formed for similar softwares around the world and using the student information systems of universities in Turkey as they are.*

Key Words: *Higher Education Student Information Systems, Interoperability*

1. INTRODUCTION

Information, the indispensable element of today, is a phenomenon that does not diminish as long as it is used, multiples when it is shared, protects its value so long as it is used and empowers its users. Production of information, its transmission to users, and needers' easy and rapid access to information at any time are an essential condition for being a powerful society to access information easily and quickly if needed. Transmitting and sharing information at any time and rapidly become

possible by means of the computer and communication technologies.

Various softwares are used for information management in universities as the main centers where information is produced. Major ones of these softwares are student information system, staff information system, estate information system, archive information systems and library information systems and also many different information systems can be used depending on the universities' infrastructure and technological adaptation. Using different softwares, the universities implement the same transactions with different tools and the processes show changes either due to the operation or the needs. These changes occurring in the processes do not cause any problem when considered in micro basis; every university thinks that their solution in hand meets the needs and is the best solution. However, this condition brings along a lot of problems when considered on macro (national) basis.

Firstly, when statistical data is needed concerning the Council of Higher Education or governmental institutions, and universities, procurement of these data becomes time-consuming with an error band. It is another process that creates a significant problem in the operations that each unit has to do separately, such as the military discharge operations of the male students who are not exempt from the military service. Still, getting the university students to have the social security under the scope of social security institution is another important transaction to be executed by the units. Moreover, the documents such as the diploma, transcript, and curriculum required during new enrollment, lateral transfer, and vertical transfer are still communicated through papers between the universities that are supposed to use the highest technology in Turkey.

These problems show the necessity to provide the communication of student information in an electronic

environment through the use of a common database among higher education institutions. This condition was also referred in the Information Society Strategy Action Plan, published in 2006 by the State Planning Organization (SPO). The articles 36 and 39 mention this purpose and also the article 71 sets the framework of this condition [1].

In this study, researches were carried out on the technical aspect of the interoperability of student affairs information systems, used at the universities, under e-government and the infrastructure of the information system allowing the interoperability was suggested.

The study consists of 4 main sections. While the section 2 mentions the principles of interoperability of the systems, the section 3 mentions the scheme of the infrastructure offered for national student affairs information system software. The section 4 involves the discussion and conclusion parts, where the advantages to be provided by the proposed system and possible limitations to occur during formation of the system were assessed.

2. INTEROPERABILITY

In the digital world of today, people need and use the interoperability in numerous subjects in the daily life. These services require the transfer of personal and sensitive information between the systems. The broadest definition of interoperability, which can be described as capability to use and transfer the information between the institutions and in the information systems, is the efficient information sharing [2].

2.1 THE PRINCIPLES OF INTEROPERABILITY

The needs for interoperability can be examined in three aspects; technical, organizational, and contextual.

In the technical aspect, technologies rendering the availability of information sharing between different applications are focused. Additionally, the principles structured in this aspect provide advantages such as allowing to implement interoperability at the application level through minimum common standards to be obeyed by the institution, presenting the instruments to be used to meet the needs in higher levels (organizational and contextual), and determining the minimum common standards to be obeyed in the investments [2]. While there are many models for the interoperability of the systems in the technical sense, the primary ones of them are as

follows: Levels of Information Systems' Interoperability (LISI) [3], the Nato Interoperability Standards and Profiles (NISP) internationally defined and documented [4].

The organizational aspect is based on engineering methodologies such as process modeling languages and object-oriented software engineering rather than the technologies. Within the scope of organizational interoperability, the modeling of the work processes of the institutions is involved in such a way that it will include the other institutions and integrity, in other words business processes formed to provide the alteration of the shared information more effectively and accordingly institutional structuring are aimed between the goals of institutions and applications and systems shaping the technical infrastructure. Additionally, this includes matters such as reengineering of the processes, workflow management within and between the institutions, and determination of the needs for the processes and services. This aspect of the interoperability is related to the definition of business objectives. Modeling the work processes and providing the cooperation of the managements ensure the exchange of information and management of different work processes. In addition, goal of the organizational association is that the needs of the users be easily defined and accessed. [5]

The contextual aspect involves the works pertaining to the accurate understanding and interpretation of the data by the institutions other than the institution producing it. This aspect of the interoperability makes the comprehensibility of the shared information possible in terms of the applications that are not developed for the same purpose at the beginning [5].

2.2 INTEROPERABILITY OF EDUCATIONAL PRACTICES

Education is also a field of activity that is not different from other industries and that requires systems that are compatible with each other. In this field, the harmonization activities for the educational processes such as Bologna Process are carried out; whereas, the providing of automatic and safe data transmission among the information systems is also needed.

Several studies regarding the interoperability of the systems in the field of education have started to be conducted in the world and in Turkey. Schools Interoperability Framework Association (SIFA) [6] and

Postsecondary Electronic Standards Council (PESC) [7] are the organizations founded for providing the interoperability of the systems in the field of education. SIFA is a non-profit organization founded in 1997. In this project which was initiated under the guidance of the Microsoft, almost 20 student information system software, library software, transport and food services software were made interoperable at the beginning. On the other hand, PESC is a non-profit organization founded in 1997 for gathering the colleges and universities, professional and commercial organizations working in the field of education, data, software and service providers, non-profit organizations, the government and federal institutions under a single umbrella. It aims to accelerate the performance and services between the data systems with the open and clear participation of its members, facilitate the data access and research, and increase the quality of data in higher education process. While PESC determines the data exchange standards, it does not pursue any policy related to security and privacy. Also, the studies related to the interoperability of SIFA and PESC applications are also conducted [8].

The only study concerning the central or inter-operability of the student information systems of higher education systems in Turkey is the student document that is given within the scope of e-government. The services such as military service document, curriculum and transcript documents are not provided, yet. For the primary and secondary school students, the e-school system developed by the Ministry of Education has been used as a central internet application as from the academic year of 2007-2008. Grades and various information of approximately 15 million students were also entered to this system and this system still provides service under the roof of the e-government. One of the most important applications on interoperability carried out in Turkey is the e-registry system. Thanks to this system, student registrations in the public primary schools throughout Turkey as from the school year of 2011-2012 have been implemented based on the address and population registry information in the National Address Database [9].

3. NATIONAL HIGHER EDUCATION STUDENT INFORMATION SYSTEM

In this study, a suggestion for a common infrastructure has been provided for the technical interoperability of the student information systems, used in Turkey. The suggested infrastructure is a system that continues to use the universities' student information systems and enables their parallel operation through a central database. There

are many institutions and organizations that are the partners for the interoperability of the system. The advantages and the partners of the system to be formed in this regard would be as follows.

3.1 THE ADVANTAGES OF INTEROPERABILITY OF HIGHER EDUCATION STUDENT INFORMATION SYSTEMS

It is thought that the interoperability of the higher education student information systems would bring advantages in terms of decreasing especially the data input load in the institutions, making the process of student registrations faster, increasing the data quality in general, and making faster and more efficient decisions by the decision makers. These advantages are explained below in detail.

- **Decreasing the Load of Data Input in the Institutions:** When the students begin studying at a school, many data about them are registered to various information systems. These can be many systems such as student information system, refectory information system, library information system or special services where detailed personal and academic data about the students are registered. Owing to the interoperability, these data are input at school where the student was registered for the first time and these data are only transferred during the transfer of the student to other schools.
- **Making the Process Faster:** The delays in entering data of new students to the information systems delay many services and this situation decreases the effectiveness of school programs. The interoperability enables to access the data at any time. As from 2006; immediately after the students are placed in a program by OSYM (Student Selection and Placement Center) the personal information of the students is retrieved from the student information systems of the higher education institutions and this situation makes the registration process very faster. Realizing this situation in the transfers between the higher education institutions requires the interoperability. Similarly, by entering the academic information of the students, the initiation and continuation of other activities depending on these information (accommodation, scholarships, curriculum, extracurricular activities, etc) would be faster.
- **Enhancing the Data Quality:** While manually entering the data, there is always an error risk. Similar risks also exist among the systems while

manually transferring the information. The interoperability of the systems reduces this risk considerably.

- Increasing the Effectiveness of Decision-making: Good and correct decisions can only be made with the data obtained at the right time and in the accurate manner. Thanks to the interoperability of the systems, a faster and more accurate data transmission is provided for the decision-makers.

3.2 THE PARTNERS OF THE SYSTEM

- **UNIVERSITIES:** Universities are the primary partners of the system. It is required for the universities, where the cornerstone data of the system are obtained, to intend to be integrated to the system, and for those producing their own software, to carry out technical works for the integration to the system.
- **SOFTWARE COMPANIES:** Since some of the student information systems used at the universities are prepared by the commercial software companies, these companies are required to make integration works.
- **COUNCIL OF HIGHER EDUCATION:** Despite the fact that the universities are autonomous institutions, it is the Council of Higher Education(YOK)'s role to plan, organize and manage the education of these higher education institutions as is stated in Turkish constitution. In this context, the encouraging role of the YOK is needed for integration. Besides, it is a preferred solution to establish the system's center at YOK since it is an organization located in the center of the universities.
- **THE MINISTRY OF TRANSPORT/TÜRKSAT:** The roles and responsibilities of foundation, operation, management of the e-government gateway are under the authority of the Ministry of Transport. Reviewing the work processes for a citizen oriented presentation of public services in a common electronic platform as well as content management, standards concerning the integration and works related to the legal regulations required are carried out by the TÜRKSAT under the coordination of the Ministry of Transport and with the active participation of the related public institutions and organizations. Within this scope, TÜRKSAT has a significant role in definition of the system integration standards and interoperability with the other e-government applications. In this context, the system providing the transmission and storage of the personal information and the grade information

concerning the students between the center and ends is suggested and shown in Figure 1.

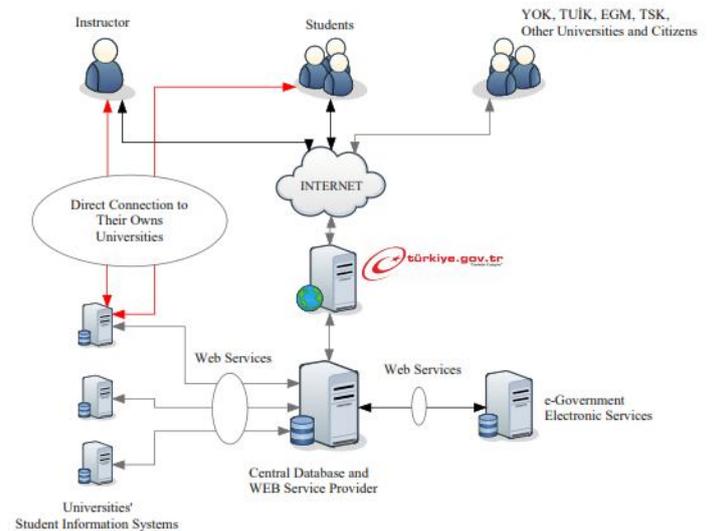


Figure 1. Suggested National Higher Education Student Information System

In the suggested structure, the universities would continue to use their existing student information systems and the students and instructors of every university would directly connect to their own universities through internet/intranet connectivity.

In order to enable to access the student information systems of a university within the authorities of the government institutions, other universities and citizens, all the key information stored in the student information systems of all universities are transferred to a server founded within the body of Council of Higher Education (YOK). This structure is already available as an application called as MEDULA [10], which is also used between the Ministry of Health and organizations offering healthcare services. For the transfer service, web services, which are one of today's third generation internet technologies, would be used.

The stages of transition to the system are suggested as follows:

- Determining the data models and web service structures through making coordination meetings
- Performing the central hardware and database design

- Providing the integration of the student information systems to the system
- Performing the performance and security tests
- Establishing the authorization policies
- Making transitive or pilot application of the system
- Putting the system into service

Discussion and Conclusion

The following benefits are expected from the system that is considered to operate according to the principle of interoperability and is suggested in this regard:

- Providing the equal access possibilities of all students throughout Turkey to the student information systems,
- Providing the security of the critical information in the student information systems through backups,
- Providing the access to the information and statistical data within the authority of the institutions and organizations such as YOK, TUIK, EGM, and TSK,
- Providing the universities' access to the personal and graduation information of the students during lateral/vertical transfers or recruitments of other public institutions and organizations,
- Extending the e-government services.

In addition, the following problems are predicted in the foundation and operation stages of the suggested system:

- The problems likely to be encountered regarding providing the coordination required in the foundation stage of the system
- The problems likely to be encountered regarding updating of systems by the universities and commercial software companies as well as providing the related supports continuously
- Security and authorization problems likely to be encountered in the operation stage of the system

In conclusion, this study suggested the possibility of the technical interoperability of the student information systems in Turkey's higher education institutions through a central database server under the roof of the e-government by making data exchange and also presented the scheme of the infrastructure required to be established for this. In the structure suggested, the universities would still continue to use their existing student information systems and the students and instructors of every university would directly connect to their own universities through internet/intranet connectivity. In addition, it is considered that the data

involved in the student databases in the suggested system and required by various institutions and organizations would be obtained instantly and with high accuracy.

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BIOGRAPHIES



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