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The Evolution of ISVU: 20+ Years of the National Student Management System in Croatia

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Abstract

The Higher Education Information System (ISVU) in Croatia is a complex national information system supporting higher education operations on multiple levels. It has been in operation for over 24 years, continuously evolving to meet the needs of its users. Currently developed and maintained by SRCE, the system initially started as only a fraction of the features it holds today. Over time, it expanded from a basic student management system to support a wide range of administrative processes, including student enrolment, curriculum management, exam tracking, and financial operations.

ISVU's modular architecture, which includes over 15 end-user applications, allows institutions to access and manage data securely based on user permissions. The system is highly interoperable with other national systems and integrates with various external applications. Furthermore, over the years ISVU has supported the digital transformation of Croatian higher education by enabling various automated processes.

The system is constantly evolving, following new technologies and adapting to functional and legal requirements. Significant upgrades have included the introduction of the ISVU REST API, support for lifelong learning programs and micro-credentials, and the integration of digital diplomas. The system's data warehouse, which facilitates decision-making through reporting and analytics, has been refactored to handle large volumes of data, supporting decision-making at institutional and national levels.

Thanks to continuous innovation, dedicated support from SRCE, and funding from the Government, ISVU has become one of the most modern and comprehensive business information systems in higher education, ensuring sustainability and success in the future.

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1 Introduction

The Higher Education Information System (abbreviated in Croatian as ISVU) is a national student management information system designed for the everyday administrative operations of higher education institutions (HEIs). It is owned by the Ministry of Science, Education, and Youth, while development, maintenance, and support are provided by the University Computing Centre of the University of Zagreb – SRCE. The Ministry ensures free access to the system for all HEIs in Croatia, as well as financing its maintenance and development through the state budget.

Today, ISVU is used by 117 (out of 129) HEIs in Croatia – all of the public ones (faculties, academies, universities) and several private ones. It is a complex and diverse system whose development began back in 1999 (Baranović, 2019). In the first phase, development was led by the Faculty of Electrical Engineering and Computing at the University of Zagreb, after which the development and management of the system were gradually transferred to SRCE. The first HEIs started using it in the pilot phase in 2001, and since then, all others have gradually been included. It is worth noting that HEIs themselves decide whether to use this system or another as its use is not mandatory, but it offers numerous benefits.

ISVU is a business system in which data changes daily. The system's users are administrative staff at HEIs, management, and faculty members (a total of over 16,000 users), as well as students (around 150,000). Key users are ISVU coordinators. These are employees of HEIs whose task is to organize the system's functioning at their institution. They handle the administration of other users at the institution, and their permissions in the system, report to the management, adjust various system options to suit the needs of their institution, and educate end-users. The ISVU coordinator is also the main link between the institution and SRCE, as support for the system's operation is provided through them. A total of about 300 ISVU coordinators have been appointed (larger institutions have more people performing this function).

ISVU is built as a modular system consisting of a central database and several independent applications. A simple overview of the applications is shown in Figure 1. All users access the applications for which they have permission, and there are no special applications for individual HEIs. Instead, the permissions for using the system are set up so that each user can only view the data they are authorized to access. For example, faculty members have the authority to view and modify data only for students in the courses they teach, while administrators have access to all data of the higher education institution where they are employed.

Community input is key to the sustainability of the system. Although the Ministry owns the system and plans for its further development are made on an annual basis, part of these plans always includes the needs that come from the system's users themselves. The ISVU support centre, established at SRCE, collects between 200 and 300 requests for changes and system adjustments each year, a significant number of which are accepted and actually implemented into the system.

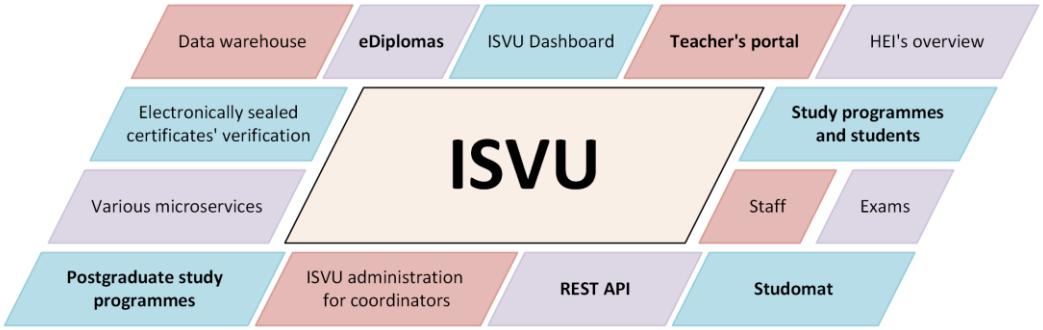

Figure 1 Overview of the most important ISVU applications

2 Supported Processes

ISVU supports the following processes related to undergraduate, graduate, and postgraduate studies:

- Teacher record-keeping
- Student record-keeping
- Describing the annual curriculum of study programs with courses
- Enrolment of students at HEIs
- Enrolment of students in study programs
- Enrolment of students in the academic year
- Student progress through the study program
- Course delivery management
- Exam management
- Calculation and record-keeping of tuition fees
- Student mobility
- Recording scholarships and awards for students
- Implementing lifelong learning programs and acquiring micro-credentials
- Record-keeping of final and graduate exams conducted, as well as details about final and graduate theses
- Issuing certificates and documents
- Generating reports and analyses
- Conducting student surveys
- Recording special activities in postgraduate doctoral studies

Each year, around 40,000 new students are enrolled in ISVU, and approximately 1.5 million exams are recorded. About 120,000 documents (diplomas and supplementary documents in two languages) are issued.

3 Technical Information

As already mentioned, ISVU is built as a modular system consisting of a central database and independent applications. In addition, there is a separate reporting system and data warehouse. The databases are hosted on the IBM Informix database management system, and the applications are built using the Java platform.

Some of the applications are implemented as desktop applications, while others are web-based applications. There are also multiple server-side applications without a user interface, with various purposes. One of these is the ISVU REST API, an interface designed for interaction with other systems, through which a large part of the actions can be performed, just like in the end-user applications.

SRCE ensures the system's availability 24/7. Development and maintenance of the system are supported by the use of several environments – development, testing, user trial, and production. Along with a large number of applications and services, this results in more than 70 virtual servers dedicated to ISVU. All of them are housed within two data centres at SRCE, ensuring redundancy and system availability. Additionally, the SRCE data centres provide disaster recovery mechanisms, backups, and all other services that are standard for modern information systems.

The central relational database of ISVU contains approximately 1,500 tables and 13,300 attributes. It also has an auditing mechanism built in to ensure the tracking of the history of all data in the system.

4 Interoperability

In Croatia, many information systems in the field of higher education are nationwide, which significantly facilitates the implementation of various processes in this area. ISVU is highly interoperable with other national systems in higher education and science, such as the Higher Education Registries, Student Academic Card System (Orel & Bajić, 2024), Student Nourishment System, Authentication and Authorization Infrastructure of Education and Research (AAI@EduHr), and similar systems.

Additionally, through the ISVU REST API interface, numerous other systems and applications can connect to this system. ISVU does not support all processes at HEIs, such as accounting, but it calculates the tuition fees that students need to pay. Therefore, HEIs often have their accounting software, which is interoperable with ISVU through the REST API interface. Other examples include external applications for libraries, class schedules, and similar systems. The ISVU REST API is currently used by about 200 other systems and applications, and in 2024 alone, it responded to nearly 1.5 billion queries.

In the context of emerging European university alliances, ISVU is also interoperable with some of the virtual campuses of alliances in which Croatian universities participate, such as UNIC Virtual Campus (Orel & Novosel, 2023).

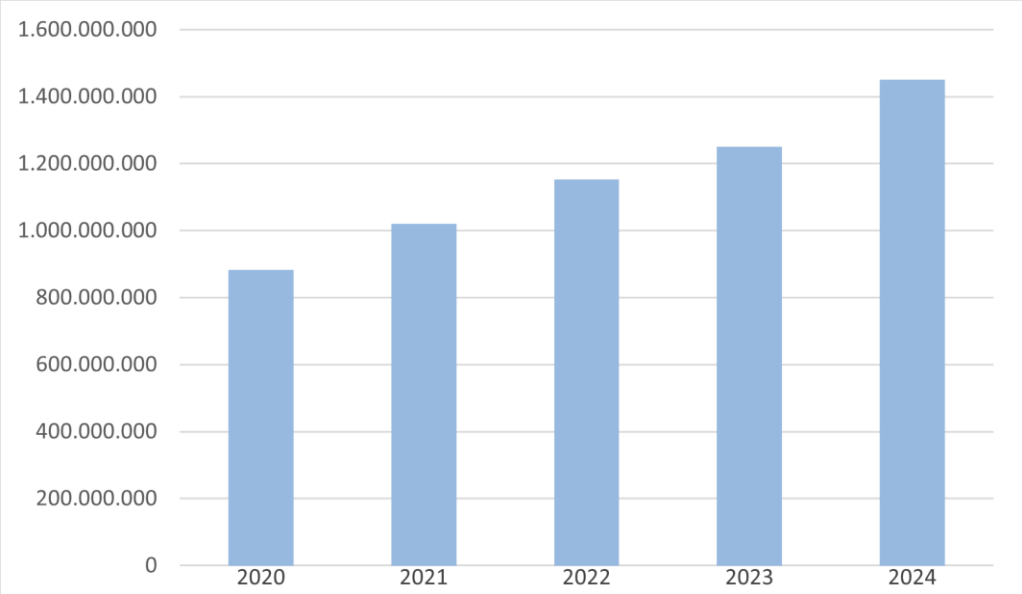

Figure 2 ISVU REST API requests over the years

5 Decision Support

From the beginning, ISVU has been recognized as a valuable source of data for decision support at the management level of HEIs. However, as a national system, it serves well in decision support at higher levels, university- or nationwide. ISVU has its data warehouse, the first version of which has been available since 2003, and was completely reimplemented in 2022. The data warehouse is built using a star schema model with numerous fact and dimension tables. The data warehouse interface allows for data exploration based on various measures and attributes, with standard features for filtering,

and creating complex tables, and charts. An example of a complex query into the data warehouse that yields a ranking of students with respect to their grade averages, grouped by study programs in which they are enrolled, for the academic year 2020/2021, is shown in Figure 3.

The reporting system, which includes the data warehouse interface, also contains pre-prepared reports for various purposes. The database hosting the data warehouse is refreshed once a day during the night through an ETL (extract-transform-load) process.

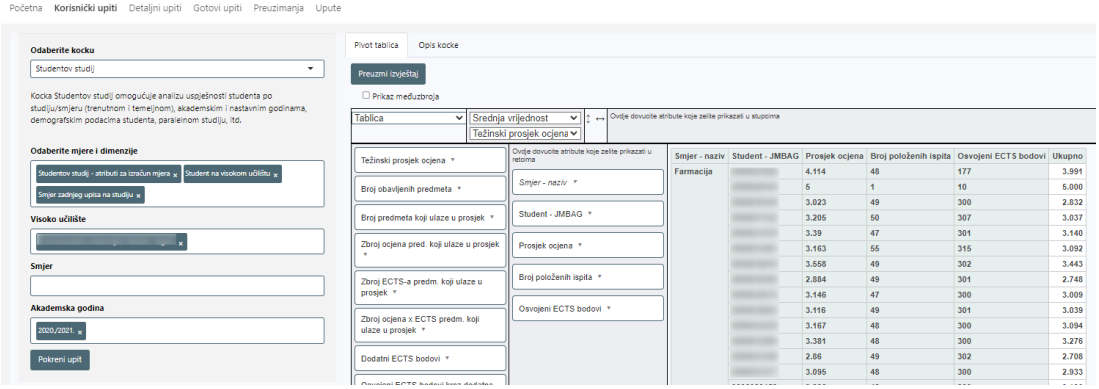

Figure 3 A custom query into the data warehouse

6 Continuous Innovation as a Guarantee of Success

The challenges of maintaining long-lived information systems are numerous, often relating to the obsolescence of technologies and techniques used to build individual software modules. Despite constant updates to software frameworks and platforms, it is sometimes necessary to rebuild certain parts of the system from scratch, as new technologies that have emerged in the meantime enable significantly easier operation, maintenance, and further development of the system. Over the past 24 years, entire applications that are an important part of the system, such as Studomat (used by students), the Teacher's Portal (used by teachers and professors), Staff (used by HR staff), and several other smaller software modules, have been completely rewritten from the ground up.

In addition to this, several other related technologies that support the development of the complex system have been changed multiple times. For example, the system for storing and versioning source code has been replaced several times – from the initial Microsoft SourceSafe to CVS (Concurrent Versioning System), then to Subversion, and finally to Git. These changes also enable easier execution of related processes, such as creating new versions of applications, automated testing, and other processes related to the CI/CD paradigm.

However, aside from technological innovation and the constant resolution of technical debt, the principle of functional innovation is much more important. Without it, no system can survive in the long term. With the introduction of new approaches and priorities in the higher education system, the need for system expansions is constant. We present the chronological growth overview of ISVU noting some of the most important new system functionalities at the time.

ISVU growth over time

2001: Initial version of the system with support for tracking student progress and conducting exams

2001-2004: Introduced support for tracking completion of studies, surveys, business decision-making, issuing certificates, class schedules

2004-2010: Digital transformation of HEIs' operations through system expansion in the number of institutions (increased from 12 to 88), ISVU was integrated only with existing national systems in the field of higher education

2011: First version of the ISVU REST API, beginning of openness to the entire community

2012: Significant technological upgrades to the entire system

2013: Integration with the results of the state maturity exam and digitization of the enrolment process at HEIs after finishing secondary school

2014: Adjustment of web applications for mobile devices

2015: Introduction of support for postgraduate studies

2016: Standardization of all notification types sent from the system, introduction of public view of basic indicators (ISVU dashboard), introduction of support for lifelong learning programs

2017: Open aggregated data

2018: Enhancements for tracking mobility, new Studomat

2020: Introduced support for certificates with electronic seals; public display of curricula for all study programs in Croatia

2021: Standardization of operations (adjustments for reaccreditations)

2022: Support for alliances, adjusting tuition fees calculation after the introduction of the euro in Croatia, new data warehouse

2023: Expansion for micro-credentials, support for digital diplomas

2024: Significant expansion of monitoring capabilities for postgraduate studies

2025: Significant expansion of support for digital diplomas, new types of surveys, issuance of digital documents for lifelong learning and micro-credentials, alignment with the new Higher Education Registries Information System

7 Nation-wide Adoption

As mentioned earlier, ISVU is currently being used by 117/129 HEIs in Croatia. Both numbers vary over the years, as some HEIs merged with others and some new ones were founded. However, number of students on those 117 HEIs that are in ISVU is about 95% of all the students in Croatia.

All of the public HEIs are included in ISVU and some of the private ones, too. One of the main reasons for such high adoption is surely the cost of ownership – ISVU is being offered by the Ministry for free to all HEIs, both public and private ones.

Study in Croatia is free at public HEIs, so the number of private HEIs is rather small. Consequently, private HEIs have specific IT needs regarding their commercial activities in the market, that ISVU does not cover. Therefore, they use other specific solutions instead of ISVU.

Figure 4 shows the increase in HEIs using ISVU over the years.

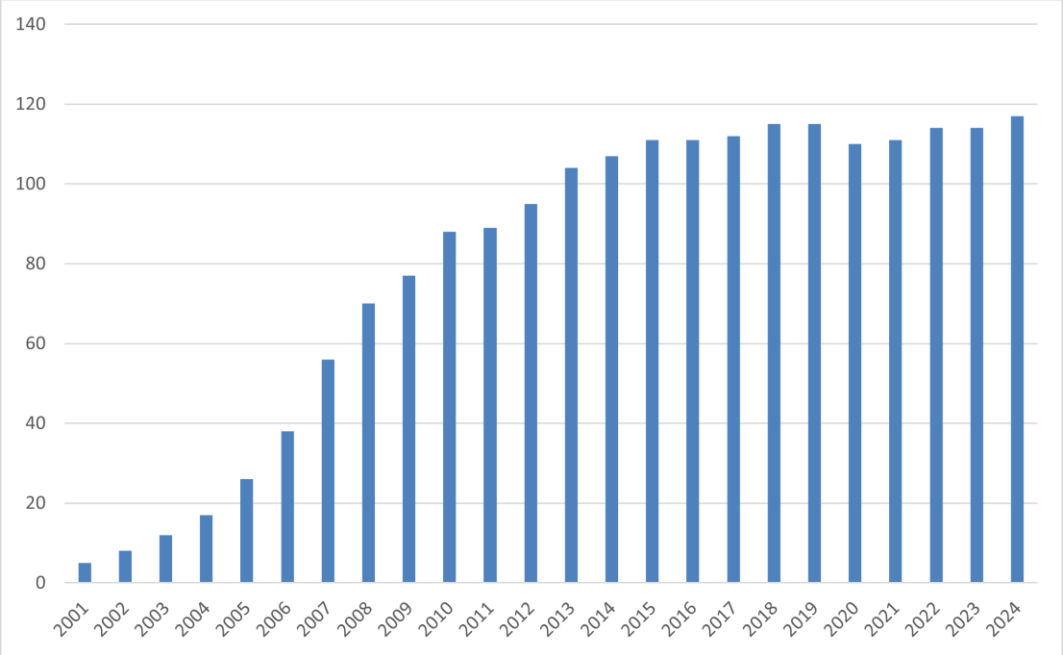

Figure 4 Number of HEIs using ISVU over the years

Another crucial role in the adoption of ISVU is the fact that users, both on an institutional and personal level, can influence its future. There is a mechanism in place that allows users to ask for RFEs (Requests for Enhancement) which are all recorded in SRCE's task management system. Approximately, 200 to 300 such RFEs are collected over one year. ISVU support centre works each month on the deduplication and classification of those requests. Requests are also publicly visible to anyone and it is transparently communicated which ones will be implemented in the following period. Those are usually requests with the highest number of users proposing them or ones that align with the global development plans of the Ministry, but there are others as well.

8 Conclusion

The Higher Education Information System (ISVU) in Croatia is a national system that has been in production for 24 years. During this time, it has been continuously maintained and expanded by SRCE, in very important collaboration with the academic community. Compared to the initial version that was available to users, ISVU today is many times larger in all system complexity parameters, such as database structure or the number of applications and functionalities.

Over the years, ISVU has emerged as the main source of information about HEIs. As the new national Higher Education Registries System (ISeVO) is being built within the e-Universities project funded through the Recovery and Resilience Facility (Milanović & Kranjčina, 2023), ISVU plays a crucial role for public universities. All the important information for those registers will be automatically collected and transferred from ISVU.

The sustainability and success of the system have been crucially supported by the establishment of a permanent and dedicated team at SRCE and ensuring continuous funding by the Ministry. As a result, ISVU is now one of the most modern and up-to-date business systems in higher education.

Bibliography

Baranović, M. (2019). 20 years since the beginning of the development of the Information System of Higher Education Institutions - ISVU. *Godišnjak Akademije tehničkih znanosti Hrvatske 2019 : Hrvatska tehnička i industrijska baština*, 19-35.

Milanović, N., & Kranjčina, M. (2023). Building an Information System for a Higher Education Register in Croatia. *Proceedings of European University Information Systems Congress 2023*, 199-208.

Orel, O., & Bajić, F. (2024). Improving the Quality of Student Cards Using AI. *Proceedings of EUNIS 2024 annual congress in Athens*, 39-48.

Orel, O., & Novosel, A. (2023). Virtual Campus as a Core Information Infrastructure of the European University. *EPiC series in computing*, 58-67.

9 Author Biographies

Ognjen Orel is the deputy director of SRCE. He has over 20 years of experience in modelling, building, implementing and maintaining national information systems mainly related to higher education and research. He holds a PhD in Computer science and teaches advanced databases and business intelligence at the University of Zagreb. His research interests are focused on data models, analyses and algorithms, information systems architecture and security. Ognjen is an institutional representative at EUNIS and a board member of euroCRIS.

Matija Kranjčina is the Head of the Department for Information Infrastructure of Higher Education at SRCE. He has over 10 years of experience designing and developing applications for higher education. Since 2024 he has been in charge of ISVU support centre and his current work focuses on digital diplomas and diploma supplements**.**

Mirna Imrović is a developer and member of the ISVU support centre. Having joined SRCE as a student associate and continuing as a full-time employee after graduating, she has gathered a total of 3 years of experience in the design and development of software used by higher education institutions and their students.