

ERASMUS+ PROJECT 2023-1-RS01-KA220-HED-000156660

## **EPIR** | E-Procedure of Institutional Recognition of Foreign Higher Education Documents

### **WORK PACKAGE 3**

WP3 - Development and improvement of IT systems for the recognition process of foreign students' HE documents

<b>Progress Report</b>	
<b>Project:</b>	<b>E-Procedure of Institutional Recognition of Foreign Higher Education Documents</b>
<b>Work Package 3:</b>	<b>Development and improvement of IT systems for the recognition process of foreign students' HE documents</b>
<b>Focus Activity:</b>	<b>System analysis and system design</b>
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EPIR project partners:



UNIVERSITY  
OF NOVI SAD



UNIVERSITÀ  
POLITECNICA  
DELLE MARCHE



ROMANIA  
1 DECEMBRIE 1918  
UNIVERSITY OF ALINA IULIA



50 years of  
University  
of Split



REPUBLIC OF SERBIA  
Qualifications Agency

## 1. Introduction

Main objective of the EPIR project is to develop and advance digital and green capabilities in the higher education sector of Serbia, Romania, Italy and Croatia by enabling the process of recognition of foreign higher education documents to be carried out in a digitalised, user-friendly and accessible way through four specific objectives:

- To carry out the digital transformation of the recognition process at project partners through new and/or upgraded IT solutions;
- To adapt and innovate accompanying institutional regulations, policies and structures to the digitalised process of recognition at project partners;
- To develop digital skills and competences of staff and students involved for the process of recognition at project partners;
- To raise awareness of the advantages of using modern technology in the provision of HE services, from the point of view of access, efficiency, cost-effectiveness and environmental benefits.

The primary objective of the EPIR project Work Package 3 (WP3) is to develop new or improve existing IT systems that facilitate the recognition of foreign higher education documents at the EPIR project partner institutions. This process will be executed through the complete cycle of system development, starting from system analysis and design, programming, and testing, to the final implementation of new or upgraded digital tools. WP3 should ensure that each partner institution carries out a successful digital transformation of the recognition process, in line with their individual needs and levels of digitalization.

Since the University of Novi Sad (UNS) currently do not use digital tools in the recognition process, a new IT solution, designed to meet the UNS specific needs and requirements will be developed in the scope of this work package.

This software system should enable candidates to submit recognition requests and accompanying documents online, simplify the tracking of the recognition process for all participants, provide more efficient reporting for institutional and regulatory purposes, and reduce the number of paper documents. The introduction of this system is expected to benefit all stakeholders involved in the recognition process.

Activities within WP3 are structured to progress through essential phases of software system development life cycle and to support collaboration and exchange of experiences between partners:

- System analysis and system design
- Exchange of IT experiences
- Programming
- Testing
- Implementing

The first activity of Work Package 3 focused on system analysis and system design, both of which play crucial roles in the successful development and implementation of any software or IT system. The system analysis and design specifications, resulting from these phases, serve as a blueprint for developing the system.

At the early stages of the project, with the planned software development at the University of Novi Sad, the WP3 project team was established. It consists of two groups: a design team from the Centre for Information Technologies at UNS, primarily responsible for system analysis and design, and a development team from the University of Novi Sad Faculty of Technical Sciences, tasked with coding and software development.

In this Progress Report an overview of key actions carried out in the scope of the System Analysis and System Design project activity are presented. The main result of this activity - System analysis and system design specification (in serbian) is in the appendix of this report. This document will be used by the development team in next phases of software development. All presented results obtained from these actions, align with the goals and objectives outlined in Work Package 3.

## 2. Methodology

System Development Life Cycle (SDLC) framework has been used for managing the development of the system, encompassing the entire process from planning and requirement gathering to system analysis, system design, implementation, testing, deployment, and maintenance.

In requirement gathering, system analysis and system design stages of system development Object-Oriented Analysis and Design (OOAD) methodology has been used to analyze, model, and design a system using object-oriented principles. OOAD helps create a blueprint for implementing a system that aligns with user needs and software requirements, using techniques like UML diagrams for visualization.

Unified Modeling Language (UML) is a standardized visual language used in software engineering for modeling the structure and behavior of systems. It provides a set of structural (class, object and component) and behavioral (use cases, state machine, sequence and activity, etc.) diagrams to describe how a system works, how its components interact, and how data flows through it. It is commonly used in projects following OOAD methodology, and it supports various stages of the Software Development Life Cycle.

## 3. System Analysis

### Current Recognition Process Overview

Currently, at the University of Novi Sad the process of recognition foreign higher education documents is not digitalized. Candidates must submit their documentation in person or by post office, the process involves a lot of mandatory documents, communication with stakeholders is often slow, and the procedure can take several months. Additionally, there is no comprehensive digital record of recognition procedures. These factors contribute to increased costs, excessive use of paper, and significant time consumption. The current procedure is lengthy, costly, inefficient, not environmentally sustainable, and not user-friendly.

### Stakeholder Analysis

One of the first steps in capturing scope of the future software system was recognizing stakeholders involved in the recognition process and their roles and requirements.

The key stakeholders involved in the recognition process include candidates, legal office staff, faculty staff involved in recognition process, and the ENIC/NARIC center.

- **Candidates** are responsible for submitting the required documents and adhering to the recognition procedure.
- **Legal office staff** manage the process of document verification, conducting of the recognition process, communication with candidates, and coordination between different parties.
- **Faculties staff** contribute by providing academic expertise, by evaluating the academic credentials submitted by foreign students.

- The **ENIC/NARIC Center** evaluates foreign institutions and qualifications and provides recommendations about accreditation status and study level based on national standards and international guidelines.

### Requirement Gathering

To accurately define the system's expected functionality, extensive stakeholder consultations were conducted. Over the course of the process, 14 meetings and interviews were held, along with numerous short consultations with the EPIR UNS legal team. These sessions were crucial in understanding the specific business processes the new system would need to support.

In addition to direct consultations, a thorough review of existing legal regulations and several recognition documents was undertaken. Documents such as *the Law on Higher Education*<sup>1</sup>, *the Statute of the University of Novi Sad*<sup>2</sup> and *the Regulation on evaluation of foreign study programmes and recognition of foreign higher education documents for the purpose of continuation of education*<sup>3</sup> were examined to ensure that the new system would be compliant with current laws and policies governing the recognition of foreign education documents.

By the end of July 2024, the EPIR UNS legal team complete initial version of the User Requirement Specification Document, which served as the basis for further requirement analysis by the UNS design team. This document describe recognition process and outlined some functional requirements, providing the foundation for the system analysis document.

To ensure the project would benefit from existing good practices, several presentations of software solutions were held. These sessions allowed the team to explore various systems and their applications in similar scenarios.

On April 23rd, 2024, the EPIR UNS legal and design team visited the ENIC/NARIC Center in Belgrade. The ENIC/NARIC Center already use an IT system that partially supports the recognition process, and this visit proved highly beneficial. The insights gathered from the ENIC/NARIC Center's practices provided valuable lessons that could be applied in the development of the UNS's own software solution.

On June 3rd, 2024, the EPIR UNS development team presented their software solution for managing student applications to the competition for admission to studies. Some of the features demonstrated in this system were recognized as potentially useful for the future software solution that would handle the recognition process, particularly in terms of document submission and tracking.

Finally, as part of WP3's second activity, the EPIR UNS design team participated in a study visit to Ancona, where system designers and IT experts from partner institutions exchanged experiences, best practices, and approaches. During this visit, the challenges encountered during the system analysis and design phases were discussed and the results of the work done to this moment was compared.

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<sup>1</sup> The Law on Higher Education, ("Official Gazette of the RS" No. 88/2017, 73/2018, 27/2018- other law, 67/2019, 6/2020- other laws, 11/2021- authentic interpretation, 67/2021, 67/2021- other law and 76/2023)  
<https://www.uns.ac.rs/index.php/univerzitet/javnost-rada/dokumenti/zakoni/send/57-zakoni/56-zakon-o-visokom-obrazovanju>

<sup>2</sup> The Statute of the University of Novi Sad, (adopted on March 8, 2018, changed: on April 5, 2018- correction, on February 13, 2019, on September 29, 2020, on January 28, 2022, on December 5, 2023)  
<https://www.uns.ac.rs/index.php/univerzitet/javnost-rada/dokumenti/aktiuns/send/34-statut/289-statut-univerziteta-u-novom-sadu>

<sup>3</sup> The Regulation on evaluation of foreign study programmes and recognition of foreign higher education documents for the purpose of continuation of education, (adopted on September 20, 2018, changed: on April 27, 2023.)  
<https://www.uns.ac.rs/index.php/univerzitet/javnost-rada/dokumenti/aktiuns/send/35-pravilnici/130-pravilnik-o-priznavanju-stranih-visokoskolskih-isprava-2>

In addition to these in-person exchanges, the EPIR UNS design team also studied several online software solutions related to document recognition and student application systems. These additional studies provided broader insights into potential technical solutions and features that could enhance the future system.

### **Requirement Analysis**

Based on the gathered requirements and the initial User Requirement Specification Document, the UNS design team conducted a detailed requirement analysis. The team prioritized and refined the requirements to ensure they were clear, complete, and feasible. In multiple iterations with stakeholders, user needs and potential conflicts were identified and resolved. The requirements were classified into categories (e.g., functional, non-functional) and aligned with overall business goals. Risks associated with specific requirements were also addressed. During this process, it was recognized that the recognition procedure should be adapted to better align with technological advancements and digitalization.

Throughout the system life cycle requirements will be tracked and managed, ensuring they remain relevant and achievable as the project evolves. This is important because the defined system requirements are the starting point for testing and validation of the system.

### **System modeling**

After gathering and analyzing requirements, the requirements are documented in a structured format within the System Analysis document. This document follows the OOAD methodology and uses UML diagrams to visually represent the system. Key UML diagrams used include high level use case diagrams, use case descriptions, activity diagrams and state machine diagram.

Use case diagrams model the behavior of the system and capture the interactions between users (actors) and system. They are accompanied by use case descriptions that provide detailed explanations of each use case. Different use cases and scenarios recognized in requirement gathering and analysing the recognition process are presented on diagrams together with their relationships with prominent actors. Some of use cases are application submission, application verification, managing the recognition process, generating report on recognition, sending notifications to candidate or faculty staff, etc.

Activity diagrams model the workflows and the data flows of the system. In the System Analysis document an activity diagram is used to present workflow of the recognition process as the most important workflow of the system.

State machine diagrams model how the system transitions between different states based on events.

System Analysis document has been reviewed with stakeholders for feedback. This document was the base for system design stage of the software development life cycle.

## **4. System Design**

System Design follows the System Analysis phase and focuses on how the system will be structured and implemented to meet the requirements identified during the analysis. It transforms the abstract models and requirements into detailed technical solutions, specifying how each component of the system will work together.

In the System Design Document a high-level description of the system architecture was given. The proposed system is a web-based application designed to be accessible from both desktop and mobile devices. The system will handle candidate applications, store associated metadata and files, and support procedure tracking and email notifications to users and faculty staff etc. System architecture of web application has

several layers such as user layer (frontend), application layer (backend), database layer, email service layer, file storage layer, security layer etc.

Also, detailed design of the system is performed using UML diagrams such as class, sequence and component diagrams. Class diagrams describe the system's structure, with key classes representing different elements (e.g., users, application, documents). Sequence diagrams show interactions between system components during key processes (e.g., application submission and verification). Component diagram shows the physical components of the system and how they are organized, illustrating the modular structure of the software.

Using the System Design Document as a guide, developers will develop a software - design a database, create user interfaces and write a programming code of system components.

## 5. Conclusion

The first phase of Work Package 3, which focused on system analysis and system design, laid the foundation for the development of the new IT solution tailored to the needs of the University of Novi Sad. By applying the System Development Life Cycle (SDLC) framework and Object-Oriented Analysis and Design (OOAD) methodology, the project has established a solid framework for future system development and implementation.

The comprehensive system analysis have been performed by conducting stakeholder consultations, identifying key requirements, understanding current challenges. This analysis ensured that the future software solution would address inefficiencies in the existing manual process and provide a streamlined, digital solution that aligns with institutional and legal regulations.

In the system design phase, the architecture of the proposed web-based application was defined to support the recognition procedure. The use of UML diagrams to model system components ensured a clear understanding of system structure and functionality, which will guide the development process.

With the completion of system analysis and design, the project will now move into the implementation phase of IT system development. This next stage will involve the actual coding, database design, and integration of system components, followed by testing, and deployment. Close collaboration with stakeholders will continue to ensure the system meets their needs and performs effectively in real-world conditions.

It is important to emphasize that the System Analysis and Design specification have not yet resolved all design decisions identified during the analysis. Additionally, there are certain issues that could impact the system design in the future, such as the use of digital document signing and the introduction of mandatory electronic registries at the national level. Some decisions will be made during the implementation phase in collaboration of the design team, the development team and stakeholders and will be included in the system documentation afterward.

## 6. Appendices

The System Analysis and System Design documents are combined in ***The System Analysis and System Design specification*** in serbian language which is a part of this report.