

Digital Platform for Attestation of Academic Staff

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Abstract—The research describes the development process of the Electronic NAC, a digital platform for scientific and scientific-pedagogical personnel attestation across the Kyrgyz Republic. The system unites a public web interface with virtual workspaces for dissertation councils and applicants, standardized databases for dissertation tracking and artifacts, and BigBlueButton remote meeting functionality. A systems-engineering approach was used to identify necessary system functions and performance characteristics by studying current operational procedures. The system uses a centralized design with permission-based access management and protected audit records to store all data. The system operates through a paperless dossier pipeline running on NAC infrastructure. The system operates through three main components, which include the information model, access-control matrix, and end-to-end document processing from submission to order publication. The system demonstrates enhanced visibility and faster document processing times during standard academic operations, according to our pilot test results. This paper presents operational findings from the system while describing plans to link it with e-government platforms and data analytics systems.

Index Terms—Digital platform, information technologies, information system, technologies, web portal

I. INTRODUCTION

The Kyrgyz Republic implements digitalization programs that focus on updating public research management systems through scientific and scientific-pedagogical personnel attestation processes. The current system depends on multiple paper-based procedures spread between dissertation councils and sectoral ministries, which results in unconnected data records, duplicate information, and unclear handover processes. The current practices create difficulties with tracking information, extend both time requirements and expenses, complicate to follow official protocols, and reduce public ability to monitor degree and title award and revocation decisions.

The National Attestation Commission (NAC) launched the “Electronic NAC” platform, which serves as a unified digital system uniting essential databases with complete operational workflows. The system enables users to access virtual workspaces based on their roles and provides a controlled system for document validation and dossier management in standardized digital formats. The platform enables video conferencing for remote attendance during defense sessions and expert evaluation sessions, and maintains audit logs to enhance accountability through complete workflow stage tracking. Figure 1 shows the structural diagram of the Electronic NAC.

The system design follows a systems approach by defining all stakeholders and their roles and both functional

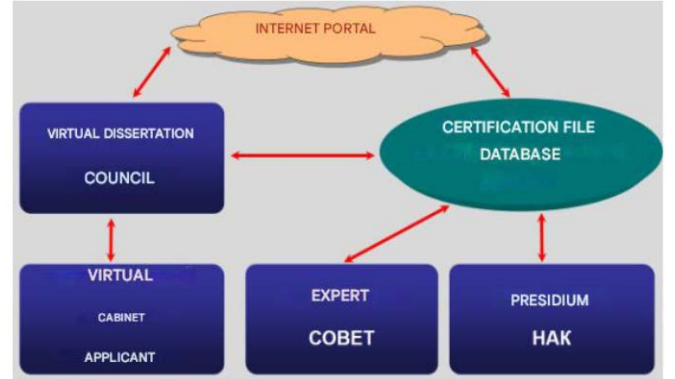


Fig. 1. Structural diagram of the system.

requirements and non-functional properties, including security, integrity, availability, and maintainability. The system maintains formal information flows from document submission through decision publication while creating standardized registries to achieve council data consistency throughout different time periods. The research describes the platform requirements, architecture, information model, security, and integrity measures, and NAC infrastructure deployment results, which demonstrate how unified role-based design enhances transparency, shortens processing times, and supports digitalization targets.

The NAC oversees dissertation councils, manages degree and title programs, selects expert panels, confirms their choices, distributes PhD and doctoral diplomas, and takes necessary action to reverse decisions when needed. The pre-digital system operated with separate data storage locations that used inconsistent documentation formats, lacked effective systems to verify applicant files and council choices, and issued orders. The public required access to searchable records that could be verified for authenticity purposes. The system transitioned from paper-based operations to digital, paperless workflows, which provided complete tracking capabilities and enabled public access to official information through legal channels.

II. RELATED WORKS

The platform’s development choices follow from previous research about web portals and dynamic content systems [1–3]. The platform’s threat model and monitoring system

derive from security engineering and intrusion detection practices [4,5]. The systems approach enables complete process design from start to finish [6]. E-government workflows implement formal role-based access control models to achieve duty separation [7] and security policy and audits follow ISO/IEC management requirements and baseline security controls [8,9]. The digital repository field discusses both repository-style registries and public access mechanisms [10] and user-acceptance models provide insights about adoption limitations [11].

III. METHODS AND IMPLEMENTATION

A. Requirements

The system needs authorization access for applicants, scientific secretaries, dissertation councils, editors, administrators, and members of the public. The system operates through five main functions, which include registries, e-submission of PDF files, e-queues, council scheduling, decision and order publication, and authenticity verification. The system needs role-based access control (RBAC) with additional security features for integrity protection, audit logging, availability, and maintainability, in accordance with baseline control guidance [8].

B. Process and Data Modeling

The system operates through a business process model and notation (BPMN)-style workflow, which progresses from draft to submitted and then to secretary-checked, expert-routed, council-decided, and order-published [12]. The system contains the following normalized entities, which include person, council, specialty, topic, abstract, defense event, decision, order, rejection, and attachment.

C. Architecture and Security

The system functions as a single centralized application that runs on NAC servers and integrates a portal with a content management system (CMS), virtual offices, registries, and BigBlueButton videoconferencing [13,14]. The system uses least-privilege RBAC and implements CSRF protection, input validation, and immutable audit trails to comply with established security standards [7,8,11]. The system implements authentication through rotation and uses least-privilege RBAC and cross-site request forgery (CSRF) protection, input validation, and maintains an immutable audit trail.

The system protects file uploads through checksum verification and MIME validation, enables public order QR code generation, and performs daily backups and staged deployment. The system implements web-service hardening based on secure web-service guidelines [15], while operational monitoring could benefit from adding intrusion detection and prevention systems [16].

D. Evaluation Protocol

The system tracks five performance indicators, which include submission-to-decision time, resubmission frequency, publication duration, system availability, performance metrics for portal operations, and file upload success rates.

The “Electronic NAC” (e-NAC) operates as a single server-based system that runs on NAC infrastructure while implementing cloud-based practices for specific sections. The system combines five essential components, which include: (1) a public web portal, (2) a protected administrative subsystem (CMS), (3) virtual offices for councils and applicants based on roles, (4) the core information system with registries and workflows, and (5) BigBlueButton videoconferencing service.

This integrated approach was used to develop the design of the next-generation e-NAC system, with all components integrated to provide a single cohesive functioning digital platform. The creation of the “Electronic NAC” system represents a digitalization, characterized by a systematic approach that ensures a harmonious integration of various components into a single, cohesive digital platform.

E. Structural Design

The team established a complete digital platform architecture which identified its fundamental hardware and software components to achieve maximum system performance. The system design followed a modular approach which provided flexibility for expansion while maintaining compatibility with evolving business needs.

F. Functional Analysis

The system’s core functions underwent thorough examination to meet NAC operational needs. The system user roles include visitors applicants secretaries editors and administrators who receive designated responsibilities with corresponding access permissions for better teamwork and operational efficiency. Figure 2 shows the virtual room creation interface used by applicants.

G. Subsystem Integration

Our approach combined different subsystems through digital document management advanced role-based access control and virtual meeting capabilities. The system integration process merged separate databases into one digital platform which created an improved operational structure.

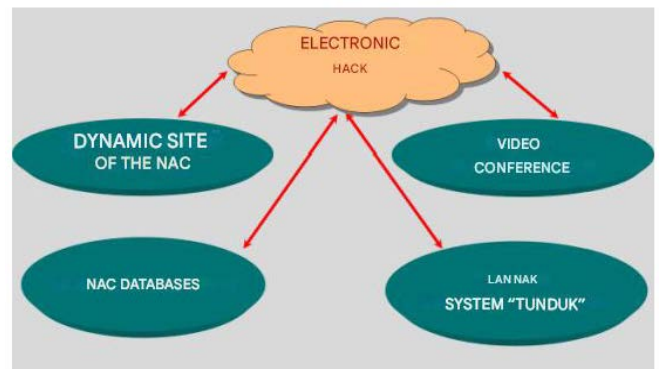


Fig. 2. Virtual room creation for applicants.

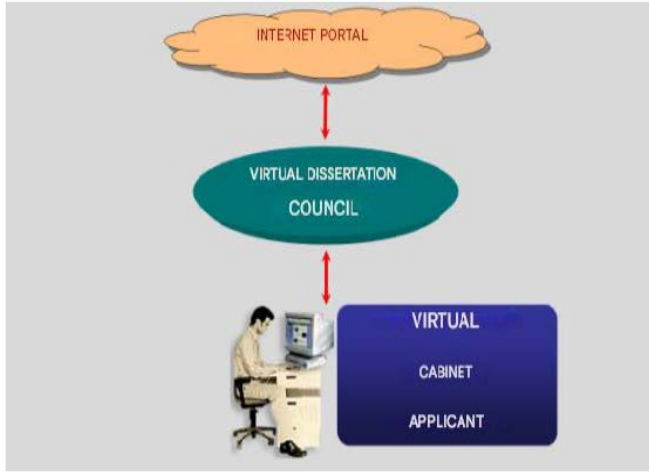


Fig. 3. “Electronic NAC” system structure.

H. Data Flow Optimization

We performed a complete analysis of data flow patterns and movements to achieve better operational performance. The implementation of automated processes decreased operational mistakes while boosting system performance and strengthening our security protocols for data protection.

I. Security Implementation

The system implements robust authentication systems that combine individual user accounts with password updates to create a protected environment for users. The system includes role-based access controls which protect data privacy while maintaining system integrity at all times.

Harnessing the power of cloud technologies for backend support, we have created a solution that prioritizes scalability and sophisticated data management capabilities. Our interface, developed using advanced frontend technologies, is not only user-friendly but also customizable, catering to the diverse needs of different user categories effectively. This comprehensive and deliberate approach guarantees that the e-NAC platform is positioned to achieve its goals of transparency, operational efficiency, and exemplary digital governance, setting a new standard in digital solutions. Figure 3 shows the overall system structure and main subsystems of the e-NAC platform.

IV. RESULTS

The systematic design of the system, known as e-NAC guaranteed that individual components can be linked into a single efficient digital platform that works seamlessly. The e-NAC system development followed a structured methodology that merged all system components into a unified digital platform. The system used frontend technologies to build an interface that supported users from different categories. The e-NAC platform reached its objectives of digital governance through transparency and efficiency because of its systematic development approach.

The e-NAC system development followed an extensive, structured process to build an integrated digital solution.

The system integration method brought together all system elements while meeting user requirements.

The digital platform architecture received a thorough examination to establish a strong framework through hardware and software components. The system adopted a modular structure to achieve flexibility and scalability, enabling it to handle changing requirements. The system underwent a detailed evaluation to determine its essential operations, focusing on NAC-specific operational requirements. The system established specific user roles for visitors, applicants, secretaries, editors, and administrators, who received tailored access permissions to boost system performance and security. The platform incorporated multiple subsystems, including an advanced digital workflow system, role-based access control, and universal virtual meeting communication tools.

The system integrated all separate databases into one unified digital framework, which enhanced data accessibility and maintained data consistency. The system developers studied data flow patterns to create efficient operational processes that boosted system performance.

Automation was implemented to improve accuracy, significantly reduce the likelihood of errors, and enhance data security. Advanced secure authentication mechanisms with unique logins and regular password updates, were implemented to protect user information. Role-specific access controls were established to ensure data confidentiality and system integrity, allowing users to access only the information necessary to perform their functions.

This thorough and systematic approach not only ensured the successful establishment of the e-NAC platform, but also enabled it to achieve its objectives of transparency, efficiency, and a solid foundation for digital governance.

V. DISCUSSION

The main purpose of the e-NAC system is to enhance visibility throughout operational procedures. The system enables digital workflow management through its centralized platform, which delivers instant updates to users at all stages of certification processing. The system provides complete visibility, which reduces corruption risks and ensures fair decision-making processes.

The role-based access control system enhances traceability through its ability to distribute access permissions and task assignments to users at different authorization levels. The system separates duties to protect data accuracy while blocking unauthorized access to sensitive information for specific users.

The e-NAC system functions as a digital governance example that demonstrates how to implement modern administrative systems in scientific and educational sectors. The system proves that complex administrative operations can successfully move to digital platforms. The system functions as a regional pioneer that establishes performance standards for countries working to update their certification management systems (<https://vak.kg>). Figure 4 shows the main services provided by the digital platform.

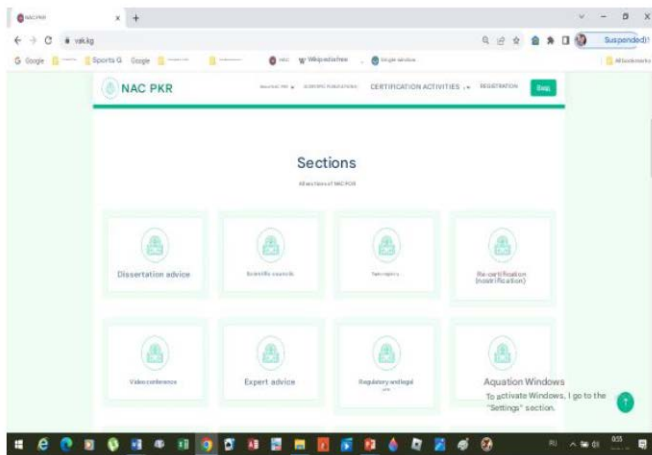


Fig. 4. Main services of digital platform.

VI. CONCLUSION

The concept of the digital platform “Single Window: the System of attestation of scientific staff” has been developed, the model of this platform in the form of a single Internet portal was proposed, and the mechanism for implementing this project based on new cloud technologies and new information systems was created.

We formalized the digital platform, initially defining its hardware component. It is deployed on NAC KR servers. A new cloud-based centralized (monolithic) service architecture was developed. Within the framework of the work plan, the backend of the digital hardware-software platform was designed, and appropriate infologic models were developed, along with virtual offices for dissertation councils, scientific councils of universities, and research institutes. Having developed infologic models, the backend was designed and the frontend digital platform was developed. The Internet portal was developed on the basis of backend and frontend, and all NAC databases were created and modified.

A. Video Conference Service

The video conference service was designed and implemented based on available IP telephony technologies. Video conference technology using BigBlueButton provides all the necessary services, including audio and video calls, video recordings, chats, and more.

Especially the last fact should be noted, as in the sphere of attestation of scientific and scientific-pedagogical staff of higher qualification, no analogs of such a digital platform among CIS member countries are currently represented.

Electronic NAC—a model of digital governance in science and education. Such success proves it is doable to move complex administrative functions into the digital space. It serves as a case study for other countries looking to update their certification frameworks, making it a first in the region.

Finally, the launch of the e-NAC system has helped to solve age-old problems in the certification of scientific staff, and

these include ensuring transparency, avoiding bottlenecks in work, preventing corruption, and establishing accountability during the certification process. Despite the challenges it faces, this foundation of quality in its platform has a strong basis for both improvement and future extensions. Web portal address: <https://vak.kg/>.

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