MODERNIZATION OF THE UNIVERSITY DIRECTORATE'S INFORMATION SYSTEM FOR PROCESSING STUDENT APPLICATIONS ON THE GOOGLE WORKSPACE PLATFORM

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Abstract

The article analyzes the critical inefficiency of manual administrative processes within Ukrainian higher education institutions, a problem significantly amplified by the post-2022 remote-learning context which demands urgent modernization. It presents the development of a cost-effective, scalable information system for managing student applications, which uses the Google Workspace platform as a strategic alternative to expensive corporate software. The methodology is grounded in Business Process Re-engineering (BPR), utilizing "As-Is" and "To-Be" modeling to redesign existing workflows. The system's architecture leverages the synergy of Google Forms for data collection, Google Sheets as a dynamic database, and Google Apps Script for low-code automation logic. The key outcome is the creation of a resilient, automated, and data-centric workflow that significantly reduces processing times and error rates, offering a replicable model for enhancing institutional resilience and operational efficiency in resource-constrained academic environments.

Ukraine's modern higher education is at a stage of strategic transformation, with a key vector being integration into the European educational space. The success of this process is inextricably linked to the depth and quality of digital transformations within the higher education institutions (HEIs) themselves. Universities are under dual pressure: on one hand, external expectations from students, who are digital natives and demand seamless, prompt online services similar to what they receive in other areas of life. On the other hand, internal imperatives force them to seek ways to improve operational efficiency amid limited funding and rising costs.[2]

Against this backdrop, the problem of outdated administrative processes, historically oriented toward paper-based document flow and manual operations, becomes acute. The student application process is a clear example of systemic shortcomings: it is characterized by decentralization, lack of transparency, a high probability of errors, and significant time delays.[4] The full-scale invasion in 2022 turned this operational inefficiency into a critical vulnerability. With a significant portion of students learning remotely, located in other regions of the country or abroad, the availability of reliable and accessible digital processes becomes a matter not just of convenience, but of institutional survival and the ability to fulfill its educational mission. Thus, the development of an automated, cloud-based system, independent of the participants' physical location, is a direct strategic response to the challenges of our time, aimed at strengthening the university's operational resilience.

The central thesis of this work is that using common and cost-effective platforms, such as Google Workspace, combined with Business Process Re-engineering (BPR) methodology, offers a pragmatic and powerful model for achieving significant digital transformation in a resource-constrained environment. This approach is not just a technical solution but a strategic choice in favor of "frugal innovation." Unlike the implementation of expensive corporate systems (CRM/ERP), which can cost $30,000–$50,000 per year, the proposed model utilizes existing assets: the zero license cost of Google Workspace for Education and the high level of staff familiarity with its tools. This makes the model not only realistic to implement but also easily replicable for other public institutions facing similar budget constraints.

A detailed analysis of the existing application process, conducted during the pre-diploma internship, revealed its fundamental architectural flaws. The process lacks a single point of entry; requests arrive at a general directorate email inbox, where they wait until noticed by any available employee. The absence of a clearly defined "process owner" leads to chaotic, situational routing, duplication of effort, and a high risk of information loss.

To visualize and document these shortcomings, qualitative modeling methods were applied. Using IDEF0 notation, a high-level functional decomposition of the process was carried out, while BPMN notation allowed for a detailed mapping of the workflow, identifying key problem areas: bottlenecks, redundant communication cycles with students to

collect a full set of documents, and the initial sorting stage, which is effectively a "black box" where a request can remain unattended for an indefinite time.

The qualitative analysis was reinforced by quantitative data collected during the monitoring of key performance indicators (KPIs) in periods of low (October) and high (July-August) load. The results, shown in Table 1, objectively demonstrate the system's inability to scale.

Table 1. Key Performance Indicators of the "As-Is" Process

Indicator	**Status in July-August (high load)**	**Status in October (low load)**	**Description**
Time to first reaction	90 min	20 min	Interval from receiving the email to the moment an employee read it.
Applications with incomplete document packages	25%	5%	Percentage of requests requiring additional communication to gather documents.
Employees processing requests	1	3-4	Number of employees actively checking the inbox.

These data indicate not just a slowdown under pressure, but a non-linear collapse of the system. During the peak load period, when the number of applications increases 4-8 fold, the number of employees involved paradoxically decreases by 67-75% due to the vacation season and involvement in the admissions committee. The result is a 350% increase in the time to first reaction. This points to a fundamental design flaw: in a low-load state, the system operates with huge redundancy (multiple people checking one inbox), and at high load, it shifts to a crisis mode where a single employee becomes a critical bottleneck. This proves the system is not scalable and is inherently unstable.

The choice of Google Workspace as the technological foundation for the new system was justified by the results of a comparative analysis of alternative platforms. The solution was deemed optimal based on a combination of criteria: zero licensing cost for educational institutions, full integration into the university's existing digital environment, and a high level of user familiarity with the tools, which minimizes training costs and resistance to change.[3]

The architecture of the proposed system is built on the synergistic interaction of key Google Workspace components, where each performs a clearly defined role :

1. Google Forms: Serves as a structured, user-oriented interface for data collection and uploading of supporting documents.
2. Google Sheets: Functions as a flexible, real-time database, serving as the central repository for all application data, tracking their status, and acting as an information dashboard for staff.
3. Google Apps Script: Is the low-code automation engine that implements the system's business logic. It connects the components, handling data routing and automated notifications.
4. Google Drive: Provides secure, centralized storage for all submitted documents, with scripts automatically creating a structured folder hierarchy.
5. Gmail / Telegram: Form the communication layer, responsible for sending automated, event-driven notifications to both students and staff.

The logical flow of information in the system is visualized using a Data Flow Diagram (DFD), which illustrates the interaction between components.

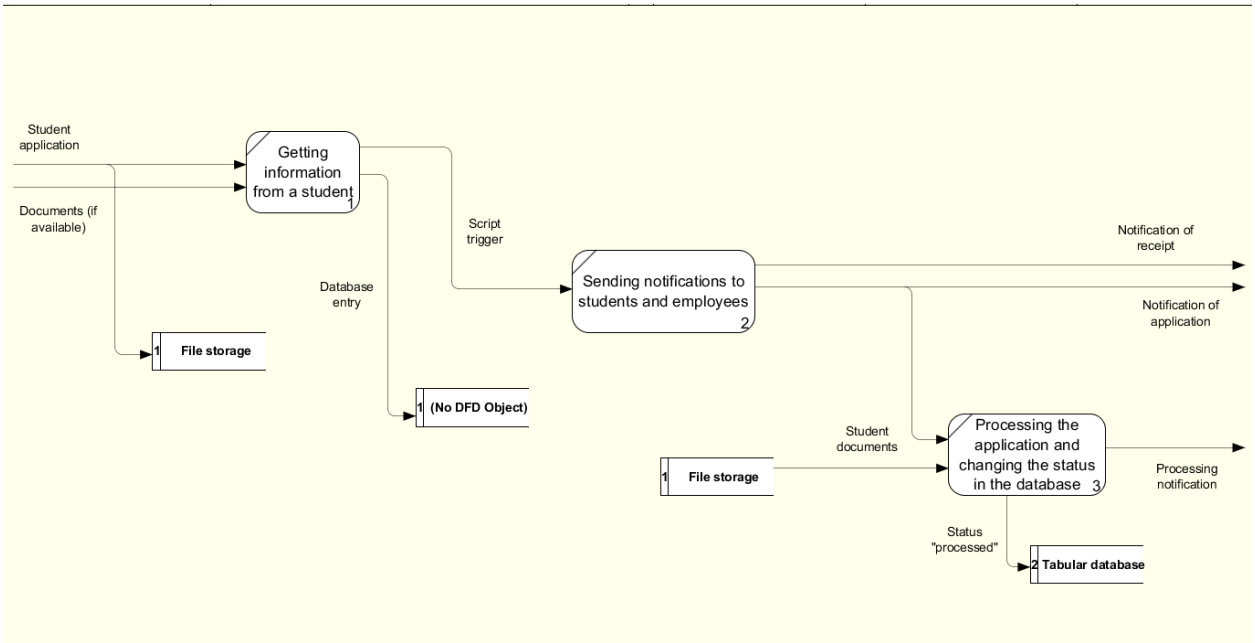

Fig. 1. Data Flow Diagram (DFD) of the Proposed System

This architecture marks a fundamental paradigm shift. While the outdated process was communication-oriented (unstructured emails, inquiries, forwarding), the new system is data-oriented and state-oriented. The process is initiated by the creation of a structured data record in Google Sheets. All subsequent actions—notifications, status updates, final decisions—are automated triggers that fire in response to a change in the state of this data record. Communication becomes a result of the process, not the environment in which it occurs. This fully aligns with Michael Hammer's re-engineering philosophy, which urged "don't automate, obliterate" outdated processes, rebuilding them around data and outcomes, not disparate tasks.[1]

The technical implementation of the workflow automation was carried out using Google Apps Script—a platform that uses JavaScript to create custom logic and integrate Google services. A key element of the system is the use of event-driven triggers, which automatically execute predefined actions in response to specific events :

1. onFormSubmit Trigger: This function is activated automatically every time a student submits a new application via Google Form. The script reads the type of application submitted (e.g., "Reinstatement," "Withdrawal"), consults a pre-configured correspondence map (emailMap), and instantly sends a notification to the corporate Gmail of the specific employee responsible for that application type.
2. onEdit Trigger: This function continuously monitors the Google Sheets table for changes. When the responsible employee manually changes the application status in the corresponding cell (e.g., from "In Progress" to "Completed"), the trigger fires and automatically generates and sends a final message to the student, informing them of the review outcome. This ensures transparency for the end-user.

As an innovative element, an additional notification channel for staff via a Telegram chatbot was integrated. Given the extraordinary popularity of this messenger in Ukraine, this approach provides instant push notifications, minimizing reaction time to new requests. Technically, this is implemented via the Telegram Bot API, integrated into Google Apps Script. At the same time, the implementation of this channel is considered optional and requires alignment with the university's internal information security policies.

Importantly, the implementation of such a system has not only a technical but also a cultural effect. It acts as a "Trojan horse" for digital literacy, compelling staff to move from a reactive, chaotic work style to structured, process-oriented thinking. Interacting with the dashboard in Google Sheets and understanding concepts like "status" and "trigger" gradually builds new digital competencies and contributes to increasing the institution's overall "digital maturity," preparing it for more complex transformation projects in the future.

Demonstrating academic maturity, the project considers the potential risks associated with the chosen platform. An analysis of scientific sources indicates vulnerabilities in the Google Workspace ecosystem, particularly risks stemming from third-party add-ons, overly broad access models granted by users, and the potential for metadata leakage.[3,5]

To minimize these risks, a comprehensive approach combining technical measures and administrative policies is proposed. Technical measures include centralized management of allowed applications via the Google Admin Console. Policy measures involve implementing a "zero-trust" policy for unverified applications and conducting regular training for staff on the principles of secure permission granting and phishing attack recognition.

In conclusion, this work presents the development and validation of a practical, scalable, and economically justified model for optimizing administrative processes in higher education institutions. The projected results include a radical

reduction in application processing time, minimization of human-factor errors, and increased transparency of the process for students. The project serves as a successful example of applying business process re-engineering principles in the public sector and offers a reproducible template for other Ukrainian universities seeking to accelerate their digital transformation in a sustainable and cost-effective manner.

References

1. M. Hammer, "Re-engineering work: Do not automate, obliterate," Harvard Business Review, vol. 68, no. 4, pp. 104–112, 1990.

2. O. Gryvnak, O. Lytvyn, et al., "Digital transformation of higher education as a driver of Ukraine's integration into the European educational space," BRAIN. Broad Research in Artificial Intelligence and Neuroscience, vol. 17, no. S4, pp. 232–245, 2024.

3. L. Wang, et al., "Is It Safe to Share Your Files? An Empirical Security Analysis of Google Workspace," Proceedings of the ACM on Programming Languages, 2024. Accessed: [Online]. Available: https://doi.org/10.1145/3589334.3645697.

4. J. Valverde-Ibañez, et al., "Managing the procedures of a higher education institution using google workspace," in ICERI2022 Proceedings, 2022, pp. 1–8.

5. Google, "Google Workspace Service Level Agreement," 2025. Accessed: [Online]. Available: https://workspace.google.com/terms/sla/.