Integrating an Online Management System into Technical Schools: A Step Toward Digital Transformation

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Abstract. This article presents the implementation of the Unified Public Administration System (SUAP) in technical schools across the State of Mato Grosso, Brazil, as a key initiative in the state government's digital transformation strategy. Developed in collaboration with UFMT, IFMT and SECITECI, the project aimed to modernize educational governance by replacing fragmented, manual processes with a centralized, cloud-based platform. By integrating SUAP into school administration, the initiative enhanced transparency, streamlined workflows, and standardized digital services across urban and rural institutions, reinforcing social cohesion and reducing regional disparities in access to technology. The project addressed critical challenges such as infrastructure limitations, data security, and resistance to change. Custom solutions were implemented, including improved Moodle integration and enhanced SUAP functionalities for certificate management and user permissions. A collaborative, agile approach guided the development process, ensuring that technical teams, policymakers, and educators worked together to build a robust and scalable system. Additionally, a comprehensive capacity-building program equipped staff and students with the necessary digital literacy skills to maximize system adoption. Results demonstrated significant impact, with 719 students, 124 technical staff, and 190 teachers actively using the system, alongside the migration of over 800 historical records. By aligning with the State of Mato Grosso Digital Strategic Agenda (2023–2027), this initiative exemplifies how subnational governments can leverage digital transformation to optimize public services, enhance institutional efficiency, and foster digital inclusion. The success of SUAP in Mato Grosso provides a replicable model for other regional administrations seeking to modernize governance and ensure equitable access to digital public services.

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1. Introduction

Efficiency in public administration is inherently tied to the ability to deliver services effectively while optimizing resources. Digital transformation plays a crucial role in this process by integrating technologies that

enhance resource management and enable the development of more innovative services (Daßler et al., 2024). The implementation of digital systems allows real-time monitoring of service and project execution, thereby reducing inefficiencies and increasing transparency in public policies and resource management. However, the adoption of these technologies often faces resistance, particularly due to inadequate infrastructure and insufficient professional training, factors that may limit their expected positive impact on service quality (Silva et al., 2019).

In the context of public schools, the Unified Public Administration System (SUAP) was created in 2006. The Federal Institute of Rio Grande do Norte (IFRN) has continuously improved this software platform as a solution for digitizing administrative and academic management in public institutions. Over the years, SUAP has evolved to meet the needs of schools, universities, federal institutes, and other public organizations throughout Brazil. With a robust set of features, including approximately 24 modules designed to support institutional management, the system offers tools tailored to different user profiles, such as administrative staff, students, and contractors. By prioritizing usability, SUAP ensures an intuitive and accessible interface, establishing itself as an effective tool for institutions seeking to modernize their administrative and academic practices (Costa, 2016).

Due to its functionalities and efficiency in various institutions, SUAP was introduced into technical schools in the state of Mato Grosso as part of the project presented in this work. The SAEPT project aimed to modernize administrative and academic management through digital technologies such as cloud computing. Developed in partnership with the Institute of Computing (IC) at Federal University of Mato Grosso, Federal Institute of Mato Grosso, and the Mato Grosso State Department of Science, Technology, and Innovation (SECITECI), the project sought to improve the efficiency of school management activities, focusing on the organization of teaching and administrative processes.

This paper is organized into four main sections, in addition to this Introduction. The next section, titled *Research Methods*, outlines the objectives, methodologies, and processes used to implement SUAP and the associated technological improvements. *Background* provides an overview of the context and main challenges faced by the technical schools in the State of Mato Grosso, highlighting the need for modernization and improved management systems. In *Results and Discussion*, the outcomes of the project are presented, emphasizing the impact of SUAP on administrative efficiency and educational management. Finally, *Conclusion* reflects on the project's achievements, lessons learned, and its broader implications for the modernization of public administration and technical education.

2. Research Methods

The implementation project of the **Sistema de Gestão das Escolas Técnicas Estaduais (SAEPT)**, linked to the research project *"Application of Cloud Computing Technologies to Educational Management Environments"*, was initiated with its first meeting on January 8, 2024. This project aimed to enhance educational management through the integration of cloud computing technologies, focusing on the development and implementation of a robust Academic Management System tailored to the needs of technical schools in the State of Mato Grosso. The project was developed in partnership with the **Institute of Computing (IC)** at the **Federal University of Mato Grosso**, the **Federal Institute of Education, Science and Technology of Mato Grosso**, and the **Mato Grosso State Department of Science, Technology, and Innovation (SECITECI)**. The primary objective was to create a technological solution capable of streamlining administrative and academic processes while ensuring efficiency, scalability, and user satisfaction.

2.1. Project Phases and Methodological Approach

The project was structured into nine distinct phases, each designed to ensure a systematic and comprehensive implementation of the SUAP system. These phases are outlined below:

1. **Data Collection and Requirements Analysis**: This initial phase involved gathering data and analyzing the specific requirements of the technical schools. It included understanding existing administrative and academic processes, identifying pain points, and defining the functional and non-functional requirements for the new system. Workshops and interviews with stakeholders were conducted to ensure a comprehensive understanding of institutional needs.

2. **System Design and Customization**: Based on the collected data, the team designed and customized the SUAP system to meet SECITECI's specific requirements. This phase included developing new modules, adapting existing features, and integrating the system with platforms such as Moodle for online learning.
3. **Cloud Service Deployment and Monitoring**: The core system was deployed on a cloud infrastructure to ensure scalability and reliability. This phase involved configuring virtual machines, setting up load balancers, and implementing continuous monitoring tools to track system performance and identify potential issues in real time.
4. **System Adaptation and Optimization**: The system was further adapted to address the unique needs of individual school units. This included optimizing the user interface for different roles (students, teachers, and administrative staff) and configuring specific features such as certificate management and user permissions.
5. **Data Migration and Security**: A critical phase involved migrating historical data from legacy systems to the new platform. This process required careful planning to maintain data integrity and security. Measures such as encryption and access controls were implemented to safeguard sensitive information.
6. **System Testing and Evaluation**: Comprehensive testing was conducted to evaluate the system's performance, usability, and reliability. This included functional testing, stress testing, and user acceptance testing (UAT) to ensure the system met predefined requirements and was deployment-ready.
7. **Training and Capacity Building**: To facilitate a smooth transition, comprehensive training sessions were organized for the SECITECI IT team and end-users, including teachers, students, and administrative staff. Training materials, such as manuals, video tutorials, and interactive workshops, were developed to support user adoption.
8. **On-Site Support and Troubleshooting**: The project team provided on-site support to resolve technical issues during the initial deployment phase. This included troubleshooting, bug fixing, and real-time assistance to ensure the system operated as intended.
9. **Final Reporting and Documentation**: In the final phase, a detailed project report was prepared, documenting all stages of the implementation process, lessons learned, and recommendations for future improvements. This report serves as a valuable resource for ongoing system maintenance and scalability.

To better illustrate the sequence of interactions between the State Government, researchers, cloud infrastructure, and end-users throughout the project phases, Figure 1 presents a structured workflow diagram.

2.2. Team Structure and Collaborative Approach

The project team was organized into three main groups, each with distinct responsibilities:

- **Mapping Team**: This team documented and structured the administrative and academic processes of the technical schools. Using the **HEFLO** tool, they created detailed flowcharts in BPMN (Business Process Model and Notation) format, providing clear visualizations of workflows and identifying areas for improvement. These flowcharts were crucial for aligning the SUAP system with the actual needs of the schools.
- **Training Team**: Focused on capacity building, this team developed instructional materials and organized training sessions for diverse user groups. They created comprehensive manuals, video tutorials, and interactive workshops. The team also leveraged the **Moodle** platform to deliver online training courses, enhancing accessibility and flexibility for users.
- **Infrastructure Team**: Responsible for the technical implementation of the system, this team managed server configuration, network setup, and security measures. They ensured the system was deployed on a robust and scalable cloud infrastructure, implementing features such as data backup, redundancy, and disaster recovery. The team also configured firewalls, SSL certificates, and external monitoring tools to guarantee the system's security and reliability.

2.3. Agile Methodology and Project Management

The project adopted an **agile methodology**, specifically the **Scrum framework**, to manage tasks and ensure timely delivery. Scrum was selected for its ability to foster collaboration, increase productivity, and adapt to

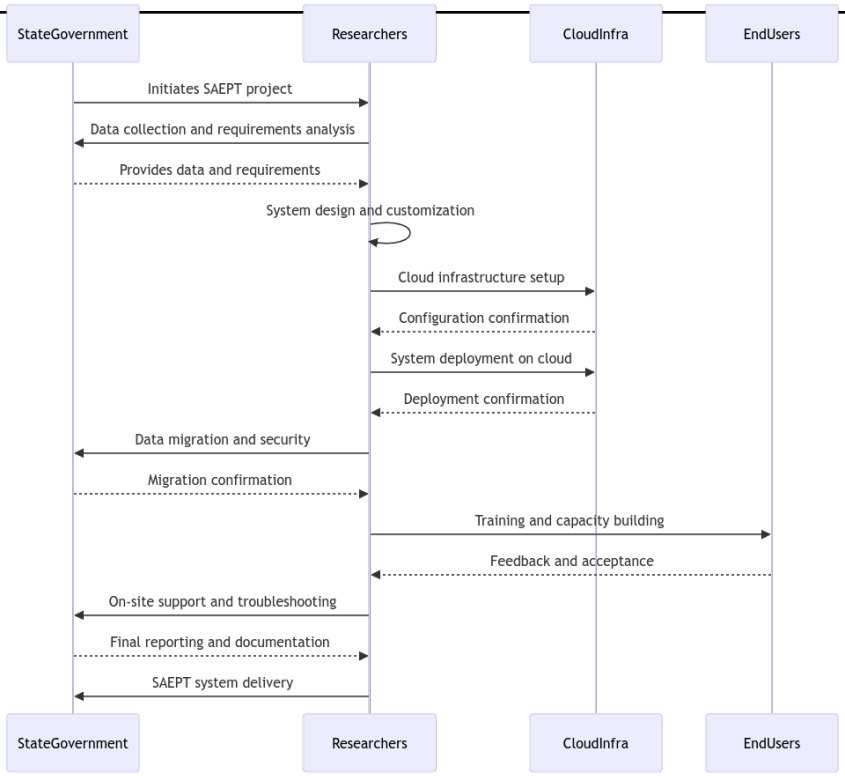

Fig. 1 – Sequence diagram of the SAEPT project phases and interactions.

changing requirements. The project was divided into **sprints**, each lasting two weeks, during which specific tasks were completed and reviewed. The use of **OpenProject**, a free software tool integrated with Scrum, facilitated task management, progress tracking, and communication among team members.

The agile approach allowed the team to quickly respond to feedback and make necessary adjustments throughout the project. Regular sprint reviews and retrospectives assessed progress, identified challenges, and implemented improvements. This iterative process ensured the final product met stakeholder needs and was delivered within the agreed timeline (Lages et al., 2024).

2.4. Communication and Project Management Tools

Effective communication and project management were essential for the successful implementation of the SAEPT project. Figure 2 illustrates the various tools and processes employed to ensure seamless collaboration and efficient management. **Meetings** were regularly scheduled to define objectives, establish actions, and record minutes, ensuring alignment among all team members. **OpenProject** was utilized to manage resources, control deadlines, and organize tasks, offering a comprehensive platform for tracking progress. For **training**, the Moodle platform facilitated certificate issuance, course delivery, and performance evaluation. Additionally, **Heflo** was employed to map workflows and monitor key performance indicators (KPIs). The **support team** played a vital role in maintaining infrastructure, providing technical assistance, automating processes, and managing the network. This structured approach was instrumental in maintaining project momentum and ensuring its successful completion.

2.5. Challenges and Solutions

One of the main challenges encountered during the project was **resistance to change** from some users, particularly those accustomed to manual processes. To address this, the training team developed tailored programs and provided ongoing support to help users transition to the new system. Additionally, a **support channel** was implemented to allow users to report issues, ask questions, and receive real-time assistance.

Another significant challenge was ensuring **data security and privacy**, especially given the sensitive nature of student and staff information. The infrastructure team implemented robust security measures, including

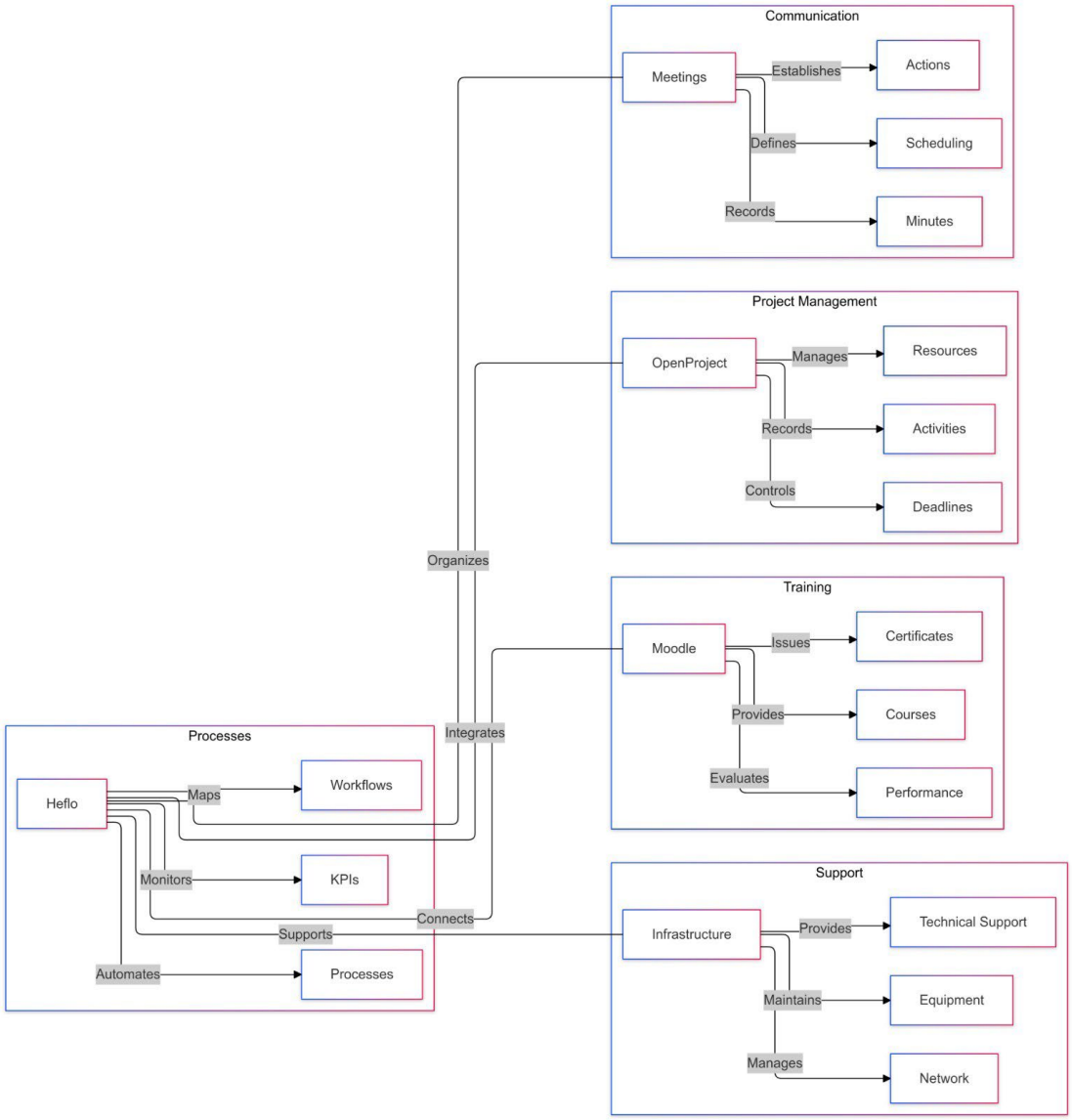

Fig. 2 – Diagram illustrating communication, project management, training, and support tools used in the SAEPT project.

encryption, access controls, and regular security audits, to protect data and ensure compliance with relevant regulations.

The methodological approach adopted in this project underscores the importance of a **collaborative and iterative process** in implementing complex technological solutions. By combining agile project management, detailed process mapping, and comprehensive training, the team successfully deployed the SUAP system in Mato Grosso's technical schools. This approach not only ensured the system's implementation but also established a foundation for future scalability and continuous improvement.

3. Background

The State of Mato Grosso, Brazil's third-largest by territorial extension, spans 903,357 km^2 in the central-west region. Its geographic and cultural richness is unparalleled, encompassing three globally significant biomes: the Amazon Rainforest, the Pantanal wetlands, and the Cerrado savanna. This biodiversity hotspot coexists with a multicultural heritage shaped by African, Portuguese, Spanish, Indigenous, and Chiquitano influences, fostering a unique socio-environmental identity (Prates, 2014). Despite efforts to preserve Indigenous traditions and ecosystems, the state's economic backbone—agribusiness and commodity exports—has driven

rapid urbanization and infrastructure demands. Between 2002 and 2022, Mato Grosso emerged as Brazil's fastest-growing state economy, increasing its share of the national GDP by 1.2 percentage points, a testament to its strategic role in national development (Instituto Brasileiro de Geografia e Estatística (IBGE), 2024).

However, this growth has exacerbated regional disparities. The state's vast territory, while economically productive, poses significant challenges for equitable access to public services, particularly in remote municipalities. Rural-urban divides are stark: while urban centers like Cuiabá (the capital) benefit from advanced infrastructure, rural areas struggle with limited connectivity and institutional support. These disparities extend to the education sector, where technical schools—Escolas Técnicas Estaduais (ETECs)—play a pivotal role in bridging workforce demands and vocational training.

Fig. 3 – State Technical Schools of Mato Grosso: Contrasting infrastructures. Left: ETEC Poxoréo (rural focus on agriculture); Right: ETEC Cuiabá (urban courses in IT, healthcare, and administration). Adapted from (Secretaria de Ciência, Tecnologia e Inovação de Mato Grosso (SECITEC), 2024).

As illustrated in Figure 3, the dichotomy between rural and urban ETECs reflects the state's socio-economic contrasts. ETEC Poxoréo, located 250 km from the capital, prioritizes agricultural and animal husbandry programs tailored to local agrarian needs. In contrast, ETEC Cuiabá offers advanced courses in Information Technologies, Nursing, and Occupational Safety, supported by modern IT infrastructure. This disparity underscores the need for adaptable administrative systems capable of addressing diverse regional requirements while maintaining statewide coherence.

The 17 ETECs across Mato Grosso currently serve approximately 1,750 students through partnerships between the State Department of Science, Technology, and Innovation (SECITECI) and the State Education Secretariat(SEDUC). By 2025, the network aims to expand to 4,000 enrollments across 25 courses, including integrated high school programs and post-secondary vocational training (Téo Meneses, 2024). Yet, until recently, administrative practices lagged behind these ambitions. Manual processes, such as spreadsheet-based student record-keeping, dominated operations, leading to frequent errors, data fragmentation, and inefficiencies in interdepartmental coordination. These limitations hindered scalability and contradicted the state's modernization goals.

To address these challenges, the Government of Mato Grosso launched its Digital Strategic Agenda (2023–2027) through Decree No. 338/2023. This policy framework prioritizes digital transformation in pub- lic administration, emphasizing bureaucracy reduction, innovation, and cross-sectoral technological integration (Governo de Mato Grosso, 2023). Within this context, the Unified Public Administration System (SUAP) emerged as a cornerstone for modernizing technical education management. Originally developed by the Federal Institute of Rio Grande do Norte (IFRN) in 2006, SUAP's modular design and focus on usability align with Mato Grosso's objectives to streamline workflows, automate certificate issuance, and centralize data across geographically dispersed institutions. By adopting SUAP, the state aims to harmonize its dual identity: preserving regional specificity while advancing toward a digitally unified governance model.

4. Results and Discussions

The team, divided to meet the project's demands within the agreed timeline with the institution, carried out its activities in an integrated and focused manner to achieve the project's objectives. Each team played specific yet complementary roles that were essential to the initiative's success.

With the deployment of all software tools, the teams adopted an agile methodology akin to Scrum to carry out the overall activities. The workflow was structured into groups of sprints, with each sprint spanning two weeks. Each team developed a backlog listing all deliverables, which were then prioritized and allocated to specific sprints. New requests were added to the backlogs as they arose and followed the same process.

The Mapping team was responsible for creating detailed workflows using the Heflo software tool, mapping the steps for utilizing the system's functionalities, such as adding sectors, enrolling students, and other activities. Figure 4 illustrates one of these workflows, detailing the process of enrolling in a school diary. The process begins with navigating through the "Teaching" menu, followed by searching for and selecting the student, and culminating in the confirmation of the enrollment. Complementing this work, PDF manuals enriched with images were created to clearly explain the system's features. These initiatives not only facilitated user understanding but also enabled the team to perform system testing, ensuring its functionality and alignment with the project's requirements.

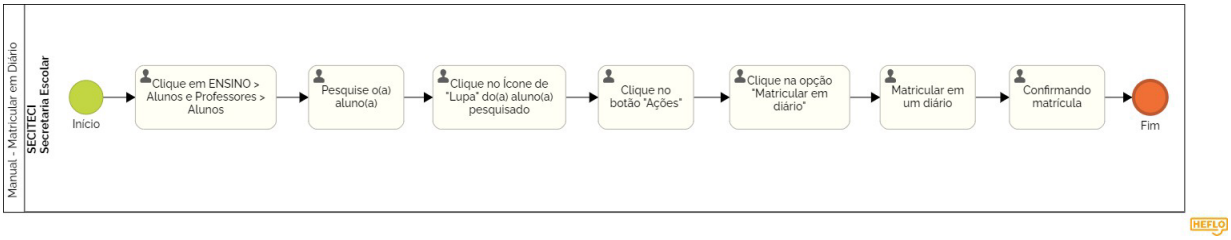

Fig. 4 – Example of process mapping: Enrollment in a course

Additionally, the team developed a website with the goal of centralizing and providing support materials in a practical and accessible manner. In Figure 5, it is possible to see that the homepage of the site presents tutorials and workflows detailing the system's functionalities, providing easy access to essential information. The platform organizes PDF manuals, tutorial videos produced by the training team, as well as news related to the training sessions. The site was structured into specific sections covering administrative features, teachers, students, training, and process workflows, allowing intuitive navigation and targeted support for the different needs of users.

Fig. 5 – Home page of the website of the project, where tutorials and workflows detailing the system's functionalities are readily available.

I record the administrative and pedagogical processes of the institutions, such as school registration actions, teachers' activities, and the organizational structure of schools and the SECITECI headquarters. These assessments were crucial in adjusting the system to the specificities of each institution, ensuring that the main routines were taken into account. Furthermore, the team created detailed flowcharts of the planned interactions for the new system, using the Heflo tool to generate BPMN-format mappings. These diagrams documented steps such as the student's first access to the system, overall grade history, and teachers' use of the class journal, among others. The flowcharts played a strategic role, serving not only to validate the system but also as training material for users, facilitating the understanding of functionalities by both students and staff.

The training team devoted itself to the capacity building of different user groups, including managers, teachers, students, and administrative teams from state technical schools and SECITECI. Their activities focused on creating instructional materials, manuals, and in-person and online training sessions to ensure a smooth transition and mastery of the system's functionalities by the involved parties. The manuals developed included

detailed, step-by-step guides for various system operations that are essential to the daily routines of technical school units, as can be seen in Figure 6. These operations included ticket submission, grade entry, transfers, enrollments, and the issuance of certificates and diplomas, among others. Additionally, the team produced materials specifically tailored for students, covering actions such as system access, grade consultation, and credit recognition requests.

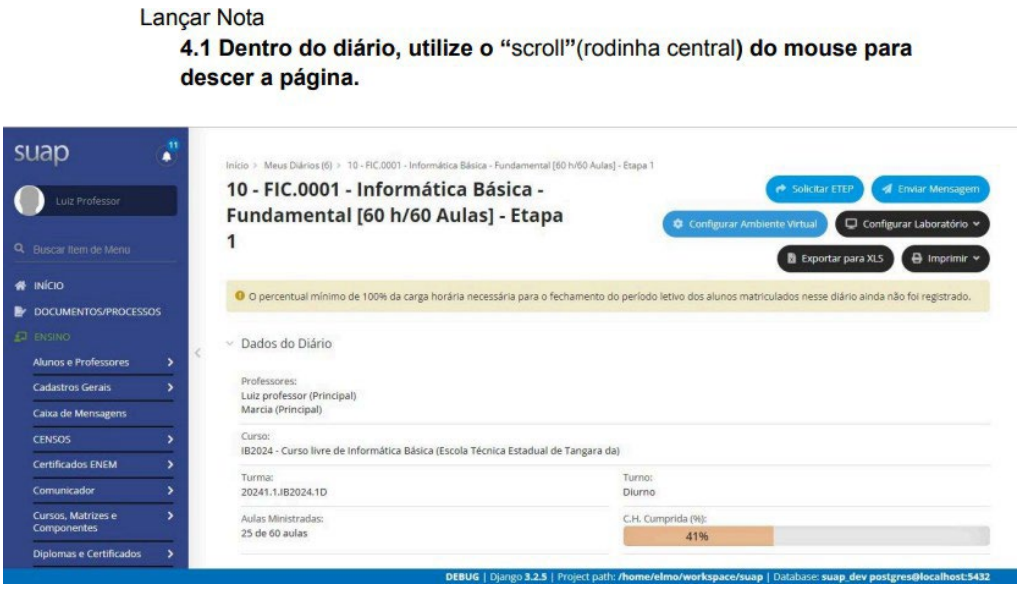

Fig. 6 – Example of PDF Manual: How to Enter Grades.

A notable highlight was the creation of multimodal content, including tutorial videos and diagrammed presentations, which significantly facilitated the assimilation of information. The team developed scripts, recorded and captioned video lessons, and configured a Moodle platform for course delivery. These materials were further enriched with asynchronous content, available in both video and PDF formats for future reference. Interactive resources, such as Kahoot quizzes, were also employed to provide a dynamic and engaging learning experience. This combination of synchronous and asynchronous learning formats enables a more personalized educational journey, catering to the individual needs of students and fostering self-directed learning (Chernov et al., 2021). As illustrated in Figure 7, an example of a video tutorial published on YouTube by the training team showcases this approach. In total, 47 tutorials were produced, combining text and video formats, covering the main functionalities of SUAP. These resources were designed to train users and ensure the efficient use of the system (Universidade Federal de Mato Grosso & Núcleo de Tecnologia da Informação (NUTI), 2024).

Fig. 7 – Example of a video tutorial published on YouTube by the training team.

Tr ts, including in-person sessions, online synch hese varied formats allowed the training to

reach a diverse range of users effectively. Thus, the methodology was tailored to meet the specific needs of each group, with personalized training for managers, teachers, and administrative staff. In Figure 8, one of the in-person training sessions held with school managers is highlighted. The environment fostered direct interaction between participants and the training team, creating a conducive space for addressing questions and collaborative learning. During these sessions, participants received guidance on critical functionalities and had the opportunity to ask questions about the use of the SUAP system. The Moodle platform was used as the main training environment. This included creating specific courses for each audience, preparing classes with test student data, organizing content into stages, and adding explanatory videos and PDFs. This effort ensured that all users had access to clear and accessible resources, promoting autonomy in using the system.

Fig. 8 – One of the several training sessions conducted with the school managers.

hnological architecture was functional and
the initial configuration of servers to the
continuous monitoring and maintenance of the virtual machines (VMs) that support the system. Among the first actions carried out, the requirements gathering and the configuration of the production environment stood out, including the installation of SUAP and auxiliary servers such as Moodle and OpenProject. This stage involved complex adjustments, such as the configuration of Django servers with Gunicorn and PostgreSQL databases, in addition to the creation and testing of DNS entries for the various services used.

The team focused its efforts on adapting and optimizing the technological environment, performing tasks such as firewall configuration, SSL certificate management for secure system access, and external server monitoring. Furthermore, specific configurations were customized, such as adjustments to the upload capacity of the Moodle training environment and modifications to SUAP to meet institutional needs, including certificate issuance and user permission management. As illustrated in figure 9, it is possible to see one of the pages of the Moodle platform, essential as an asynchronous teaching tool, enabling a flexible learning experience tailored to the users' needs (Archan & Egger, 2023). Regarding technical support, a support channel was created to clarify user questions, solve technical issues, and identify and correct system bugs.

To ensure the continuity of the project and the protection of data, backup systems, redundancy and failure recovery solutions were implemented and new servers were configured, creating a robust and reliable infrastructure, enabling the system to withstand adverse situations.

The implementation of SUAP in the technical schools of the State of Mato Grosso was achieved through the collective efforts of the project teams, representing a milestone in the modernization of administrative and academic management in the state's technical education system. As a centralized platform, SUAP streamlines processes, enhances user experience, and addresses the specific needs of these institutions. With 719 students, 124 technical staff members, 190 teachers, and 800 records of previous courses already registered, the impact and scope of the system are evident (Universidade Federal de Mato Grosso & Núcleo de Tecnologia da Informação (NUTI), 2024). By fostering more efficient management, SUAP directly benefits administrators, teachers, and students, laying a solid foundation for future improvements and expansions in educational infrastructure. As shown in Figure10, the SUAP login screen provides secure access to different users, facilitating

Fig. 9 – Web page of the Moodle platform, where online training and activities were made available for managers and students.

their interaction with the platform.

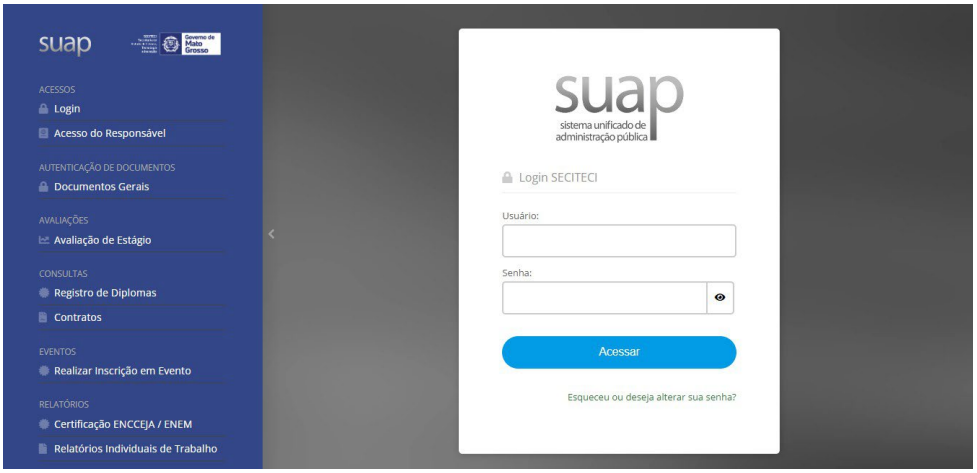

Fig. 10 – Login screen of the SUAP system

Additionally, the homepage (Figure 11) centralizes administrative and academic functions. This initiative reinforces the state's commitment to modernizing public administration, contributing to efficiency and innovation in the educational sector (Governo de Mato Grosso, 2023).

5. Conclusions

The successful implementation of SUAP in the technical schools of Mato Grosso highlights the role of digital government in fostering social cohesion and reducing inequalities through technological innovation in public administration and education. By modernizing administrative processes and integrating digital tools, this initiative has not only enhanced efficiency in school management but also contributed to a more equitable and inclusive education system, particularly in a geographically and socioeconomically diverse state like Mato Grosso.

One of the most significant impacts of this project has been its ability to bridge the digital divide between urban and rural technical schools. Historically, schools in remote areas have faced challenges such as limited administrative support, fragmented student records, and inefficient communication channels. The deployment of SUAP has mitigated these issues by centralizing data, automating processes, and providing digital access to educational and administrative resources, ensuring that all institutions—regardless of their location—operate under the same robust governance framework. This harmonization of school management practices directly

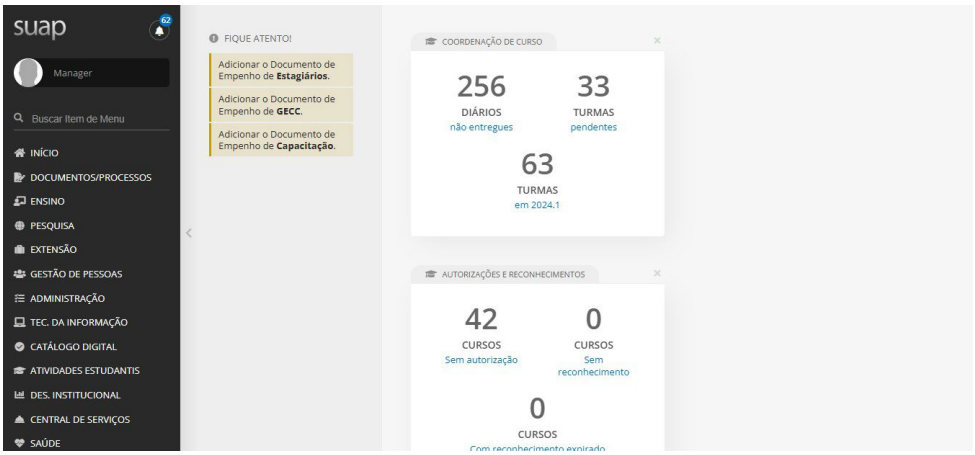

Fig. 11 – Home page of the SUAP system.

contributes to reducing educational disparities and promoting social cohesion by guaranteeing equal access to high-quality institutional support.

Beyond improving internal efficiency, SUAP has also fostered greater transparency and accountability in educational governance, reinforcing public trust in digital government initiatives. The integration of cloud computing, secure authentication mechanisms, and real-time monitoring has enhanced data security and accessibility, empowering both educators and policymakers to make informed decisions. Moreover, by streamlining bureaucratic processes and minimizing administrative inefficiencies, the system has allowed technical schools to focus more on their core mission: providing students with the skills and knowledge necessary for their social and professional development.

This initiative aligns with Mato Grosso's broader Digital Strategic Agenda (2023–2027), which prioritizes digital transformation as a tool to enhance public services, reduce bureaucracy, and foster innovation. The success of the SAEPT project underscores how digital governance can drive institutional modernization, facilitating the delivery of more effective and people-centered services. Furthermore, this case study demonstrates how public sector digitalization can be leveraged not only to optimize workflows but also to create more inclusive policies that address systemic inequalities.

The lessons learned from this project provide a replicable model for other regions seeking to implement digital solutions in education and beyond. Future developments should focus on further expanding SUAP's functionalities, integrating predictive analytics for decision-making, and incorporating adaptive learning tools to support students from diverse backgrounds. Additionally, sustained investment in digital literacy programs for educators and administrators will be essential to ensuring the long-term sustainability and effectiveness of the system.

Ultimately, this project reaffirms the transformative potential of digital government in fostering social cohesion and reducing inequalities in public education. By leveraging technology as a mechanism for inclusion, transparency, and efficiency, SUAP serves as a concrete example of how digital governance can empower communities, strengthen public institutions, and create more equitable educational opportunities. As digital government continues to evolve, initiatives like this will play a crucial role in ensuring that technological advancements serve as a catalyst for social and economic development, reinforcing education as a fundamental pillar of a just and cohesive society.

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