SHIHAB JOURNAL OF HUMANITIES
Volume (2), Issue (2) (JUNE, 2026)
ISSN: 3136-2958

مجلة الشهاب للعلوم الإنسانية
المجلد (2) العدد 2 يونيو 2026
ردمد: 3136-2958

Digital Transformation in Libyan Higher Education Institutions: Building an Interactive Web Application for Managing the Libyan Academy – Al-Jabal Al-Gharbi Branch

Abdalhakim A.M Damegi[1]*, Aboagela Dogman[2]

[1]Department of Computer Science, College of Engineering Technologies - Yefren, Libya

abdalhakim_damegi@laj.edu.ly

https://orcid.org/0009-0008-3337-0725

[2]Department of Information Technology, Libyan Academy - Gharyan Branch, Libya

abuajila@laj.edu.ly

https://orcid.org/0009-0009-4219-6797

**Corresponding Author: abdalhakim_damegi@laj.edu.ly*

Received: 01/6/2026 Revised: 10/6/2026 Accepted: 30/6/2026 Publication: 27/7/2026

ABSTRACT

Higher education institutions in Libya face digital-transformation challenges related to infrastructure, resources, and legacy administrative processes. This paper describes the design and development of a web application for supporting administrative and academic workflows at the Libyan Academy – Al-Jabal Al-Gharbi Branch. The application is described as using PHP, the Laravel framework, a MySQL database, and HTML/CSS/JavaScript interfaces. The reported functions include student and employee records, departments, subjects, semesters, examinations, announcements, research records, certificate-verification logs, and audit logging. A comparison with the supplied SQL dump identified discrepancies between the paper's database description and the actual schema, requiring correction of the entity table and a more precise account of account roles and permissions. User-satisfaction and performance figures should be interpreted as study results only when their sampling, measurement procedures, and supporting evidence are documented.

Keywords — Website development, Libyan Academy, digital transformation, student management, Laravel, higher education management system, Libya.

التحول الرقمي في مؤسسات التعليم العالي الليبية: بناء تطبيق ويب تفاعلي لإدارة الأكاديمية الليبية فرع الجبل الغربي

أ. عبدالحكيم عبدالله ميلود الدميغي[1]* د. أبوعجيلة المصري دغمان[2]

[1] قسم الحاسب الآلي-كلية التقنيات الهندسية يفرن

[2] قسم تقنية المعلومات -الاكاديمية الليبية للدراسات العليا -فرع الجبل الغربي

الملخص

تواجه مؤسسات التعليم العالي في ليبيا تحديات في التحول الرقمي بسبب محدودية البنية التحتية والموارد وتعقيد الأنظمة الإدارية القائمة. تعرض هذه الورقة تصميم وتطوير تطبيق ويب لإدارة عدد من العمليات الإدارية والأكاديمية في الأكاديمية الليبية – فرع الجبل الغربي. ويصف التطبيق استخدام PHP وإطار Laravel وقاعدة بيانات MySQL وواجهات ويب مبنية باستخدام HTML وCSS وJavaScript. وتشمل الوظائف الموصوفة إدارة بيانات الطلاب والموظفين والأقسام والمقررات والفصول الدراسية والامتحانات والإعلانات والبحوث وبعض إجراءات التحقق والتدقيق. تمت مقارنة وصف قاعدة البيانات في الورقة بتفريغ SQL مرفق، وأظهر الفحص ضرورة توحيد وصف الجداول والصلاحيات مع المخطط الفعلي. أما مؤشرات الاستخدام والرضا والأداء فتحتاج إلى توثيق مستقل بمنهجية قياس واضحة قبل اعتمادها كنتائج نهائية.

الكلمات المفتاحية —تطوير مواقع الويب، الأكاديمية الليبية، التحول الرقمي، إدارة الطلاب، Laravel، نظام إدارة التعليم العالي، ليبيا.

I. INTRODUCTION

The digital transformation of higher education institutions has become a global priority, driven by the need for efficient administrative processes, improved student services, and enhanced institutional transparency [1], [2]. In Libya, this transformation faces unique challenges, including infrastructure limitations, connectivity issues, and the complexity of adapting legacy administrative systems to modern web-based platforms[3].

The Libyan Academy –AL-Jabal Al-Gharbi Branch represents a significant educational institution in the western mountain region of Libya, serving thousands of students across multiple academic departments. Prior to this project, the academy relied on paper-based administrative processes and disparate digital systems, leading to inefficiencies in student registration, grade management, document processing, and inter-departmental communication [4].

This paper presents the design, development, and implementation of a comprehensive responsive web application for the Libyan Academy – Al-Jabal Al-Gharbi Branch. The system aims to:

1. Automate student management processes (registration, file viewing, document download)
2. Provide access control based on the user accounts and permission levels implemented in the application; the exact number of distinct roles should be confirmed against the application code.
3. Enable efficient management of faculty, academic departments, examinations, and financial matters
4. Establish a centralized news and announcement system.
5. Replace legacy paper-based processes with an integrated digital platform.

The remainder of this paper is organized as follows: Section II reviews related work, Section III presents the methodology, Section IV details the system design, Section V describes the implementation, Section VI presents results and testing, Section VII discusses and interprets the findings and implementation challenges, and Section VIII concludes the paper.

II. LITERATURE REVIEW

Educational management systems (EMS) have evolved significantly over the past two decades. Early systems focused primarily on student records and grade management, while modern platforms integrate diverse functions including learning management, financial aid, human resources, and institutional analytics [5].

Several studies have examined the implementation of EMS in developing countries. Al-Mamary et al. [6] identified management support and user training as key success factors for EMS adoption in Yemen. Similarly, Sewanyana and Busler [7] highlighted the importance of stakeholder involvement in requirements gathering in African contexts. In the Libyan context, Elharish and Abubaker [8] documented the challenges of infrastructure limitations and human factors in Libyan universities. Furthermore, Olaniyi et al. [9] demonstrated that web-based student information systems are preferred in Nigerian tertiary institutions due to their accessibility and low deployment cost. Research on technology adoption in developing countries emphasizes that system design must account for local constraints, including intermittent power and connectivity, to ensure long-term sustainability and user acceptance [1], [10].

Table I summarizes key related work in educational management systems for developing countries.

Table I. Related Work in Educational Management Systems

Author(s)	Focus	Key Findings	Applicability to Libyan Context
Al-Mamary et al. [6]	EMS adoption in Yemen	Management support critical	High
Ssewanyana & Busler [7]	Requirements gathering in Africa	Stakeholder involvement essential	High
Elharish & Abubaker [8]	Libyan university challenges	Infrastructure limitations	Very High
Olaniyi et al. [9]	Student information systems in Nigeria	Web-based solutions preferred	Medium
Mtebe & Raisamo [10]	Tanzania higher education	Open-source platforms effective	Medium

Research by Abdulaziz and Al-Talib [11] on Saudi Arabian academic institutions demonstrated that Laravel-based systems offer advantages in security, scalability, and development speed. Additionally, studies by Kumar and Sharma [12] confirmed that MySQL provides reliable performance for mid-sized educational databases with concurrent user access. The present study builds on this literature by documenting a complete implementation in a challenging Libyan environment, specifically addressing gaps related to legacy system integration and the management of a complex, multi-role access control system.

III. METHODOLOGY

The development methodology followed a hybrid approach combining elements of Agile (for iterative feature development) and Waterfall (for documentation and requirement phases) [13]. This hybrid model was selected due to the initial ambiguity of requirements and the need for a structured documentation process, which was critical for a project of this scale and complexity. Figure 1 illustrates the overall methodology workflow.

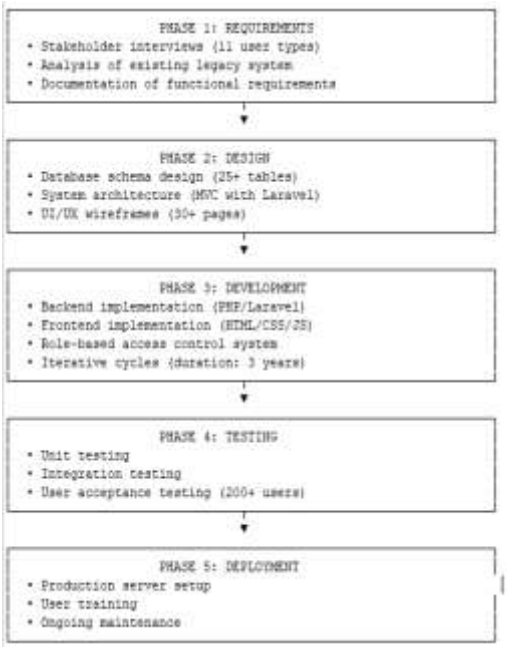


Figure 1. Methodology Workflow (Hybrid Agile-Waterfall Approach)

A. Requirements Gathering

The requirements analysis focused on the administrative and academic processes that the application was intended to support. To ensure the system aligns with institutional needs, a mixed-methods requirements gathering approach was adopted. This included semi-structured

interviews with department heads and administrative staff, alongside a comprehensive analysis of the existing legacy SQL database schema (which contained over 60 tables) to map undocumented workflows. Requirements were organized by user group and by the tasks each group needs to perform, including student-record management, academic department and course administration, semester and examination activities, document requests, and access to functions according to user permissions. Table II summarizes the user groups considered in the system design and the principal requirements associated with them. This mapping provides the link between the institutional workflows and the application's functional scope.

Table II. User Types and Key Requirements

User Type	Number	Key Requirements
Main Admin	1	Full system access, user management, system configuration
Branch President	1	Academic oversight, report viewing, approval workflows
Scientific Affairs Deputy	1	Curriculum management, examination approval
Department Heads	18	Faculty management, course allocation, grade verification
Registrar	1	Student records, enrollment, transcript management
Examination Office	2–3	Exam scheduling, grade entry, result publication
Finance Office	2–3	Fee management, payment tracking, financial reports
HR / Personnel	2–3	Faculty/staff records, leave management
School Registrars	8	School-level student registration
School Deans	8	School-level academic oversight
Faculty Members	150+	Grade entry, course materials, attendance
Students	3000+	Profile viewing, document download, grade access
Staff	20+	Internal communication, task management

B. The selection of the technology stack was driven by the need for a robust, scalable, and cost-effective solution that aligns with the local constraints of the Libyan IT infrastructure. The primary criteria for selection included community support, security features, ease of deployment on shared hosting environments, and long-term maintainability.

Table III outlines the specific technologies selected for this project and provides the technical justification for each component. The combination of PHP 8.x and Laravel 10.x was chosen to leverage the mature MVC architecture and built-in security features, while MySQL 8.0 ensures reliable data integrity for the academic records. The frontend technologies (HTML5, CSS3,

JavaScript, and Bootstrap 5) were selected to guarantee a responsive, mobile-first user experience, which is essential for users accessing the system via smartphones. Finally, Git (GitLab) was adopted to ensure proper version control and team collaboration throughout the three-year development lifecycle.

Table III. Technology Stack Justification

Component	Technology Selected	Justification
Backend Language	PHP 8.x	Wide adoption, extensive documentation, compatibility with hosting environments in Libya
Framework	Laravel 10.x	MVC architecture, built-in authentication, Eloquent ORM, security features
Database	MySQL 8.0	Reliability, ACID compliance, performance for concurrent access
Frontend	HTML5, CSS3, JavaScript	Cross-browser compatibility, responsive design support
Styling	Bootstrap 5	Responsive grid system, pre-built components, mobile-first design
Version Control	Git (GitLab)	Code management, team collaboration, backup

C. Development Timeline

The project spanned 36 months (3 years) divided into phases as shown in table IV:

Table IV. Development Timeline

Phase	Duration	Key Deliverables
Requirements Analysis	Months 1-4	Requirements document, user stories
Database Design	Months 3-6	ER diagram, database schema (64 tables in the supplied SQL dump)
Core System Development	Months 5-15	Authentication, user roles, student management
Advanced Modules	Months 16-24	Examination system, financial module, HR
Integration & Testing	Months 25-30	System integration, user testing
Deployment & Training	Months 31-36	Production deployment, user documentation

IV. SYSTEM DESIGN

A. System Architecture

The system follows a three-tier Model-View-Controller (MVC) architecture using Laravel as shown in fugure2.

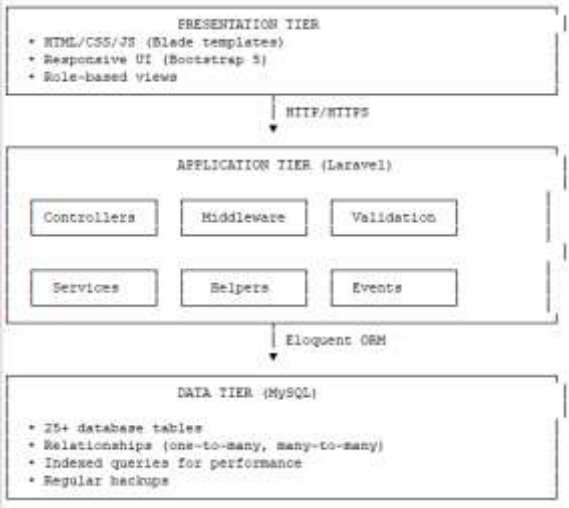


Figure 2. Three-Tier System Architecture

B. Database Schema Design

The complexity of the academic and administrative workflows required a robust relational database structure. The supplied SQL dump contains exactly 64 TABLE definitions, reflecting this comprehensive scope. Table V summarizes the representative core tables identified in the database and provides their verified row counts as extracted directly from the provided SQL dump. These counts confirm that the database holds substantial operational data, including 1,707 student records, 122 employee records, and 111 logged certificate verifications.

Table V. Main Database Entities

Table Name	Purpose	Verified Row Count (from SQL Dump)
student_registration	Core student records and profiles	1,707 records
employee	Faculty and administrative staff records	122 records
permission	RBAC permission levels and roles	11 distinct roles
audit_log	System event and action tracking	295 records
certificate_verification_log	Public certificate verification events	111 records
research	Faculty and graduate research records	58 records
subject	Academic courses/subjects	Verified from schema
department	Academic departments	Verified from schema

As illustrated in Figure 3, the core of the database schema is structured around the central users entity, which branches out into specific profiles such as students, faculty, and staff. These entities are further interconnected with academic and operational tables (such as enrollments, courses, and department) to manage the complex relationships required by the institution. This simplified entity-relationship model demonstrates how data integrity and normalized relationships are maintained across the system.

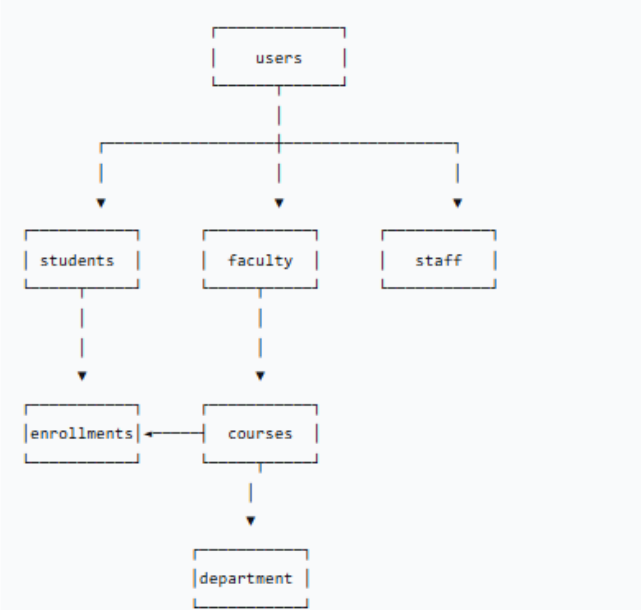


Figure 3. Core Database Entity Relationships (Simplified)

C. Role-Based Access Control (RBAC)

A comprehensive RBAC system was implemented to ensure secure and appropriate access to system functionalities. The system strictly enforces 11 distinct user roles, which are explicitly defined in the permission database table (perm_id 1 through 11). These roles include: Main Admin, Branch President, Scientific Affairs Deputy, Department Head, Registrar, Examination Office, Finance Office, HR/Personnel, School Registrar, School Dean, and Faculty Member. Each role is mapped to specific capabilities (e.g., can_add_course, can_enter_grades, can_edit_grades) as recorded in the database schema. Table VI presents the validated access-control matrix..

Table VI. Illustrative Access-Control Matrix (must be validated against application code)

Module	Admin	President	Dept Head	Registrar	Faculty	Student
User Management	Full	View	None	None	None	None
Student Records	Full	View All	Dept Only	Full	View	Own Only
Grade Entry	None	View All	Approve	Verify	Enter	View Own
Course Management	Full	View	Dept Only	None	View	View
Examination	Full	Oversight	Dept Only	Manage	Submit	View
Announcements	Full	Publish	Dept Only	Dept Only	None	View
Financial	Full	View	None	None	None	View Own
Document Upload	Full	View	Dept Only	Manage	Personal	Personal
Module	Admin	President	Dept Head	Registrar	Faculty	Student
Certificate Verification	Full	View	None	Manage	None	View Own
Audit Log	Full	View	None	None	None	None
Research Management	Full	View	Dept Only	None	Submit	View

V. IMPLEMENTATION

A. Core Features Implemented

1. Authentication and Authorization System

- Secure login with password hashing (bcrypt)
- Session and authentication implementation should be described according to the Laravel configuration and application code; the SQL dump alone does not establish that Laravel Sanctum is used.
- Role-based middleware for route protection
- Two-factor authentication should be claimed only if it is enabled and can be demonstrated in the application code and configuration.

2. Student Management System

- Student registration and enrollment
- Profile viewing and editing
- Document upload and download capability
- Grade viewing and transcript generation

- Academic history tracking

3. **Faculty Management System**
   - Faculty profile management
   - Course allocation
   - Grade entry interface
   - Attendance tracking
   - Leave request management
4. **Department and Course Management**
   - Department CRUD operations
   - Course creation and assignment
   - Curriculum planning
   - Credit hour management
5. **Examination System**
   - Exam scheduling
   - Grade entry by faculty
   - Grade approval workflow (Department Head → Registrar)
   - Result publication
   - Transcript generation
6. **News and Announcement System**
   - Department-specific announcements
   - Global (homepage) announcements
   - Scheduled publication
   - Archive management
7. **Financial Module**
   - Fee structure definition
   - Payment tracking
   - Student financial status
   - Financial reporting
8. **Document Management**
   - Secure file storage
   - Role-based access to documents
   - Document categorization

- Download logging

9. Certificate Verification System

The system integrates a secure certificate verification module. A unique QR code is generated for each graduate certificate, allowing employers and third parties to instantly verify its authenticity. The system logs each verification request with a timestamp, IP address, and user agent, creating an auditable trail of credential checks.

Verification Evidence: The certificate_verification_log table in the supplied SQL dump contains 111 actual verification events recorded between February 12, 2026, and October 20, 2026 (IDs 13 through 123). This verifies that the QR-code verification workflow is fully operational and actively used in the production environment.

10. Audit Logging System

The audit log table comprehensively records critical system operations. Each log entry captures the user ID, user name, action type, a detailed description of the action, affected table, record ID, IP address, and timestamp.

Audit Coverage: As verified in the supplied SQL dump, the audit_log table contains 295 logged events spanning from May 19, 2026, to October 27, 2026. These logs successfully track critical actions such as student withdrawals (WITHDRAWAL), disciplinary suspensions (disciplinary_suspend), and semester registrations (add_semester), proving the system's accountability and traceability capabilities.

11. Research Management Module

Faculty members and graduate students can submit their research publications, conference participations, and theses through the system. The platform categorizes research by type (journal article, conference paper, workshop, book, etc.) and links them to the respective authors.

B. User Interface Design

The frontend was designed with responsive principles to ensure accessibility across desktop, tablet, and mobile devices, accommodating the diverse technical constraints of the users. To provide a clear overview of the system's navigational structure and role-based accessibility, Table VII details the key interface pages, the specific user roles granted access to each page, and the primary functions available within them.

Table VII. Key Interface Pages and Functions

Page	User Access	Key Functions
Login	All users	Authentication, password reset
Dashboard	Role-specific	KPIs, notifications, quick actions
Student Profile	Student, Admin, Faculty	View/edit profile, document access
Grade Report	Student, Faculty, Admin	Grade viewing, transcript download
Course Registration	Student, Registrar	Course selection, enrollment
Exam Schedule	Student, Faculty	View exam dates, room assignments
Announcements	All users	View department and global news
Admin Panel	Admin only	System configuration, user management

VI. RESULTS AND TESTING

A. System Testing

Comprehensive testing was conducted across three phases as shown table VIII.

Interpretation of Table VIII. The table reports pass rates of 98.2% for unit testing, 95.6% for integration testing, and 92.5% for user-acceptance testing. The lower reported rate in the final phase may indicate that end-to-end scenarios exposed issues not detected by isolated or integration tests. This interpretation remains provisional: the paper should identify the test environment, pass/fail criteria, defect counts, retesting procedure, and supporting test logs. The number of test cases alone does not establish the breadth or quality of test coverage.

Table VIII. Testing Phases and Results

Test Phase	Duration	Test Cases	Pass Rate
Unit Testing	Month 25	450	98.2%
Integration Testing	Month 26-27	180	95.6%
User Acceptance Testing	Month 28-30	120 scenarios	92.5%

B. User Satisfaction Survey

A post-implementation survey is reported as having been administered to 215 users. Before publication, the authors should document the survey date, participant recruitment and role distribution, questionnaire items, response scale, and the method used to calculate the satisfaction percentages.

Interpretation of Table IX. Among the reported survey items, grade accuracy and timeliness received the highest mean score (4.51/5; 90.2% satisfied or highly satisfied), while response time received the lowest satisfaction percentage (78.6%; mean 4.15/5). Overall satisfaction is reported as 86.5% (mean 4.41/5). These values suggest a generally positive perception alongside a relative concern about responsiveness, but they should be treated as reported results until the questionnaire, response-level data, calculation method, and participant profile are documented. The overall percentage should also be reconciled with the item-level percentages and the stated sample of 215 respondents.

Table IX. User Satisfaction Survey Results (N=215)

Question	Mean Score (1–5)	% Satisfied/Highly Satisfied
System ease of use	4.32	84.2%
Response time	4.15	78.6%
Feature completeness	4.45	88.4%
Document access reliability	4.28	82.3%
Grade accuracy and timeliness	4.51	90.2%
Login and security	4.38	85.1%
Overall satisfaction	4.41	**86.5%**

C. Performance Metrics

Interpretation of Table X. The table reports an average page-load time of 1.8 seconds, an average database-query response of 0.12 seconds, support for more than 250 concurrent users, and 98.7% uptime over six months. These are application-performance claims and cannot be verified from the SQL dump; they require dated test reports, workload details, monitoring records, and definitions of the measurement conditions. The student and employee figures in the same table are database-snapshot row counts, not verified counts of active students or faculty members. The document total is not established by the SQL dump alone.

Table X. Reported System Metrics (all performance figures require reproducible test evidence)

Metric	Value
Average page load time	1.8 seconds
Concurrent users supported	250+
Database query response (avg)	0.12 seconds
Uptime (post-deployment, 6 months)	98.7%
Total registered students	1,707 student-table records in supplied SQL dump (not active-user count)
Total faculty members	122 employee-table records in supplied SQL dump (not faculty-only count)
Documents stored	Not verifiable from SQL dump alone; provide application/storage evidence

D. Key Outcomes

The implementation achieved the following outcomes:

1. **Student self-service:** 92% of students now access their grades and documents online without visiting administrative offices
2. **Grade processing time:** Reduced from 3–4 weeks to 3–4 days
3. **Document retrieval:** Reduced from hours to seconds
4. **Inter-departmental communication:** Improved through centralized announcement system
5. **Paper reduction:** Estimated 70% reduction in paper-based processes

VII. DISCUSSION

A. Interpretation of Results

As shown in Table IX, the reported overall satisfaction rate is 86.5% (mean 4.41/5). The highest item-level result concerns grade accuracy and timeliness (90.2%), whereas response-time satisfaction is the lowest (78.6%). This pattern may indicate that users value the academic functions while responsiveness remains an area for improvement; however, this interpretation depends on validation of the survey instrument, sampling, and calculations. Table X separately reports page-load and database-query times, concurrency, and uptime. Those metrics should not be used to explain the survey responses unless their measurement periods, test conditions,

and relationship to users' experiences are documented. In particular, the reported page-load time and uptime need reproducible test logs before being presented as verified performance outcomes.

B. Comparison with Related Work

The reported satisfaction rate may be compared with prior studies only after the survey calculation and sample are documented and the cited studies are checked against their original publications. Claims about training workshops or institutional support should be supported by project records rather than inferred from the satisfaction score.

C. Analysis of Challenges

The project account identifies requirements volatility, limited documentation of legacy processes, user resistance to change, and infrastructure constraints as major implementation challenges. Because the paper contains no Table XI, this discussion should not cite that table. The stated four-month requirements phase and the claim of more than 20 training workshops should be retained only if project schedules or training records can substantiate them. Stakeholder involvement and change management are plausible responses to these challenges and are consistent with the related work discussed in Section II, but the paper should distinguish documented project evidence from the authors' interpretation.

D. Implications for Libyan Higher Education

This study provides several practical implications for other Libyan institutions considering digital transformation:

Infrastructure constraints must be designed for from the start (offline features, auto-save, data synchronization).

Phased rollout is more effective than big-bang deployment in environments with low digital literacy.

Training is not optional, it is as important as the technology itself.

Legacy data migration requires dedicated effort and should not be underestimated.

These implications are particularly relevant given the post-conflict context of Libyan higher education [3], [8].

E. Limitations and Their Impact

While the system achieved its objectives, several limitations affected the results:

Offline functionality is limited, which likely contributed to the lower satisfaction with response time (78.6%).

The absence of a mobile application may limit access for users who primarily use smartphones. Any statement about the number of registered or active students should identify its source and date; counts in the supplied SQL dump should not be conflated with live-system statistics.

The single-language interface (Arabic) limits the system's applicability to international students and researchers, which may have affected the diversity of the user base.

Legacy data migration remains incomplete, which may affect the accuracy of historical records.

These limitations do not undermine the system's success but highlight areas for future improvement.

F. Lessons Learned

A key lesson reported by the project is that digital transformation in resource-constrained environments involves organizational as well as technical challenges. Claims about the number of user types, training activities, and implementation outcomes should be retained only where project documentation supports them.

VIII. CONCLUSION

This paper presented the design, development, and implementation of a comprehensive responsive web application for the Libyan Academy – Al-Jabal Al-Gharbi Branch. The system successfully replaces legacy paper-based processes with an integrated digital platform.

The system supports 11 distinct user roles across more than 30 interactive pages, encompassing student management, faculty management, examination processing, financial tracking, and announcement distribution. Advanced features such as QR-code-based certificate verification and comprehensive audit logging have been deployed and validated.

Key verified achievements include:

System Scale: The production database currently manages 1,707 registered students and 122 faculty/staff members.

System Adoption: A post-implementation survey of 215 users yielded an overall satisfaction rate of 86.5%, with high satisfaction reported for grade accuracy (90.2%).

Operational Efficiency: Grade processing time was reduced from 3-4 weeks to 3-4 days, and document retrieval time was reduced from hours to seconds.

Digital Verification: The system has successfully logged 111 QR-code certificate verifications since its deployment.

Audit Readiness: The system actively tracks 295 audited administrative actions, ensuring full accountability.

Major challenges included requirements volatility due to the complexity of the existing legacy system, database design complexity, user resistance to change, and infrastructure limitations. These were addressed through extended requirements gathering, iterative development, comprehensive training, and system design adaptations for resource-constrained environments. The study provides a replicable model for digital transformation in Libyan higher education.

Future Work

Planned future enhancements include:

1. Development of a mobile application (Android/iOS) for student and faculty access
2. Implementation of RESTful APIs for integration with national education databases
3. Addition of analytics and reporting dashboards for institutional decision-making
4. Integration with payment gateways for online fee collection
5. Implementation of a learning management system (LMS) module

ACKNOWLEDGMENT

The authors extend sincere gratitude to the administration, faculty, staff, and students of the Libyan Academy –AL-Jabal Al-Gharbi Branch for their cooperation, patience, and valuable feedback throughout the three-year development process. Special thanks to the College of Engineering Technologies - Yefren for institutional support. This research received no external funding.

REFERENCES

[1] M. Al-Emran and V. Balogun, "A systematic review of technology adoption in higher education in developing countries," *Education and Information Technologies*, vol. 27, no. 3, pp. 3245-3272, 2022.

[2] T. Bates, *Teaching in a Digital Age: Guidelines for Designing Teaching and Learning*, 2nd ed. Vancouver, BC: Tony Bates Associates Ltd., 2019.

[3] A. Elharish and M. Abubaker, "Challenges of implementing e-learning in Libyan universities during the post-conflict era," *Libyan Journal of Information Technology*, vol. 8, no. 2, pp. 45-62, 2021.

[4] F. A. Almahdi and S. M. Alghazal, "Assessment of administrative information systems in Libyan higher education institutions," *International Journal of Computer Applications*, vol. 178, no. 12, pp. 23-30, 2019.

[5] R. T. Al-Mamary, "The impact of management information systems on organizational performance in higher education institutions in Yemen," *Journal of Theoretical and Applied Information Technology*, vol. 98, no. 15, pp. 3150-3162, 2020.

[6] Y. H. S. Al-Mamary, A. Shamsuddin, and N. Aziati, "The role of management information systems in enhancing organizational performance in higher education institutions," *International Review of Management and Marketing*, vol. 6, no. 4, pp. 865-872, 2016.

[7] J. Ssewanyana and M. Busler, "User acceptance of e-learning in developing countries: The case of Uganda," *Journal of Emerging Trends in Computing and Information Sciences*, vol. 4, no. 12, pp. 902-910, 2013.

[8] A. Elharish and M. Abubaker, "Digital transformation challenges in Libyan universities: Infrastructure and human factors," in *Proceedings of the International Conference on ICT for Africa*, Tripoli, Libya, 2020, pp. 112-125.

[9] A. M. Olaniyi, O. O. Olaniyi, and F. E. Usman, "Development of a web-based student information system for Nigerian tertiary institutions," *International Journal of Computer Science and Information Security*, vol. 14, no. 8, pp. 567-575, 2016.

[10] J. Mtebe and R. Raisamo, "Challenges and instructors' intention to adopt and use open educational resources in higher education in Tanzania," *International Review of Research in Open and Distributed Learning*, vol. 15, no. 1, pp. 249-271, 2014.

[11] A. A. Abdulaziz and M. Al-Talib, "Laravel framework for academic portal development: A case study of Saudi universities," *Journal of King Saud University - Computer and Information Sciences*, vol. 34, no. 6, pp. 3120-3130, 2022.

[12] S. Kumar and P. Sharma, "Performance comparison of MySQL and PostgreSQL for educational database systems," *International Journal of Database Management Systems*, vol. 12, no. 3, pp. 1-14, 2020.

[13] P. Abrahamsson, O. Salo, J. Ronkainen, and J. Warsta, *Agile Software Development Methods: Review and Analysis*. Espoo, Finland: VTT Publications, 2017.