

Design of a Web-Based Interactive Digital Book (E-Book) Application (Case Study: Politeknik Bisnis Digital Indonesia)

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KEYWORDS	ABSTRACT
E-book; Digital Learning; Indonesian Digital Business Polytechnic	This research aims to design and develop a web-based e-book application at the Politeknik Bisnis Digital Indonesia. With the rapid development of digital technology, educational institutions need to provide efficient and flexible solutions for accessing learning materials. This e-book system is designed to make it easier for students and lecturers to access digital books anytime and anywhere, without relying on physical availability in the library. The method used in this study is software engineering with the Waterfall approach, including needs analysis, system design, implementation, testing, and maintenance. The results of the study show that this e-book system not only reduces the cost of purchasing and printing physical books but also improves library operational efficiency and learning quality. With features such as user management, e-book management, and digital book readers, the system is expected to support online and hybrid learning on campus. This research makes a significant contribution to improving digital literacy among students and lecturers and preparing campuses to face the era of digital education.

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Introduction

The rapid growth of digital technology encourages educational institutions to create new ways to make learning more effective, efficient, and flexible to adapt to global changes (Kopp et al., 2019; Bond et al., 2021). In this era of digital transformation, universities are expected not only to provide quality learning materials but also to ensure strong digital support that enables students to easily access learning resources (Zawacki-Richter et al., 2019; Sangrà et al., 2019; Redecker, 2020).

The Indonesian Business Digital Polytechnic is a vocational school focused on teaching digital technology and business skills, playing a key role in integrating technology into every part of the learning process (Zhao et al., 2021; Pan, 2024). One important need that suits today's demands is the implementation of an e-book/digital-textbook system, which research shows can improve flexible access to learning resources and usability for students (Amirtharaj et al., 2023). Moreover, adopting open educational resources (OER) within such systems can reduce students' course-material costs while maintaining learning performance (Cho & Permzadian, 2024). In

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Indonesia's context, national studies also underscore the push for technology-supported learning to enhance effectiveness and equity across higher and vocational education (UNESCO, 2023).

With this e-book system, students and lecturers can access various book collections online anytime and anywhere without relying on physical availability in the library (Khan et al., 2021; Natarajan et al., 2020). Additionally, digitizing books enhances efficiency in storing, delivering, and updating academic materials (Foster et al., 2022). This system is expected to integrate with the existing academic platform to improve accessibility and information management (Ally & Prieto-Blázquez, 2014) and support the growing hybrid and online learning methods in higher education (Rapanta et al., 2020).

The Indonesian Business Digital Polytechnic can strengthen its learning ecosystem, expand digital literacy outreach, and create a modern, sustainable technology-based campus (Ningsih et al., 2025). This project aligns with the campus's vision of producing graduates who are adaptive, innovative, and ready to face the challenges of the digital-based workforce.

This research holds high urgency due to the need for flexible and efficient learning in the post-pandemic era. Digital *e-book* systems overcome the limitations of physical books, such as high printing costs, limited availability, and distribution inefficiencies. Prior studies have highlighted the benefits of *e-book* systems in education (Anderson, 2008; Bates, 2015), yet research gaps remain—especially regarding systems tailored to vocational institutions and their integration with existing academic systems. This research presents novelty by developing an *e-book* system customized to the polytechnic curriculum, equipped with role-based access controls, and designed for future integration with campus systems.

The purpose and benefit of this research are to develop a web-based *e-book* system that facilitates students' and lecturers' access to digital learning resources within the campus environment. The research aims to build an efficient, flexible, and cost-effective platform for textbook storage and distribution, while improving digital literacy skills. Furthermore, it promotes structured and integrated digitization of campus academic assets. Academically, the system is expected to increase accessibility to learning resources anytime and anywhere, simplify the updating of digital teaching materials, and support the development of students' digital literacy as part of 21st-century competencies. Consequently, the system will support online and hybrid learning on campus.

The practical benefits of this study include significantly reducing the costs associated with purchasing and printing physical books, saving physical storage space, and lowering the operational burden on libraries. The system will also expedite book distribution and borrowing by conducting these processes online, enhancing work efficiency for librarians and academic administrative staff. Technologically, this research applies a modern digital information system accessible from various devices. The system is also expected to be a first step in connecting *e-books* with the Campus Academic Information System (SIKAD), provide secure user access control, and prepare campuses for digital transitions in education, making them more flexible and intelligent.

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The main targets of this study are the direct users who will experience the system's benefits. Students, as primary users, will easily access teaching materials and academic literature, thereby improving digital literacy and supporting independent learning. Lecturers will use the *e-book* system to distribute digital book references and manage teaching materials, facilitating online or hybrid learning methods. College management will benefit from more efficient academic resource management and cost savings while promoting digital transformation to enhance academic services. Librarians and academic staff will assist in managing digital book collections and user access rights, reducing their operational workload and improving library service quality. Application developers are responsible for designing, developing, and maintaining the system to meet user needs and offering functional, secure technological solutions.

The data for this research report was collected at the Indonesian Digital Business Polytechnic Campus, Jl. Raya Cileungsi-Jonggol No.24 KM.3, Cileungsi Kidul, Cileungsi District, Bogor Regency, West Java, postal code 16820, during April–July 2025.

RESEARCH METHOD

This research uses a development research method Software Engineering Method with the Waterfall approach. The Waterfall method was chosen because it has clear and structured stages, making it easier to plan, control, and ensure the final result according to the needs that have been determined from the beginning.

Waterfall Stages:

- a. Needs Analysis – Collecting user needs from the campus.
- b. System Design – Create interface design (UI/UX) and set up database structure.
- c. Implementation – Perform the process of writing code and developing features.
- d. Testing – Testing the functionality and performance of the system.
- e. Maintenance – Bug fixes and improvements after use.

Application Testing Media

- a. Browser: Google Chrome, Mozilla Firefox
- b. Devices: Laptop/Desktop (Windows/Mac), and Smartphone (Android/iOS)
- c. Testing tools:
 - 1) Postman (for API testing)
 - 2) Browser Developer Tools (debugging)
 - 3) Lighthouse (for performance and accessibility tests)
- d. User Testing:

User Acceptance Test (UAT) with lecturers, Head of IT (as system Admin) and campus students.

Programming language

- a. Frontend (User view): HTML5, CSS3, JavaScript
- b. Backend (Logika & Database):
 - 1) PHP (with Codeigniter 4 Framework)

- 2) Database: MySQL or PostgreSQL

RESULTS AND DISCUSSION

A Brief History

The Indonesian Digital Business Polytechnic was established thanks to the great spirit and vision of the Bogor Business Development and Empowerment Foundation to produce superior human resources and are ready to compete in the era of digital transformation. Officially established in 2023, this polytechnic obtained an establishment permit based on the Decree of the Minister of Education, Culture, Research, and Technology of the Republic of Indonesia Number 267/D/OT/2023. As a Private University located in Bogor Regency, West Java Province, this polytechnic is under the auspices of the Directorate General of Vocational Education and is designed to become an adaptive, innovative, and able to meet the needs of the digital-based business and industrial world.

Since its inception, the Indonesian Digital Business Polytechnic has been committed to providing education that emphasizes not only theoretical mastery, but also practical skills and professional attitudes. With the support of a curriculum that is prepared in line with technological developments and industrial needs, as well as experienced teaching staff, this polytechnic is determined to make a long-term contribution to the nation and state. Through strengthening the role of vocational education, this polytechnic seeks to produce graduates who are innovative, globally competitive, and able to have a positive impact on the progress of society in the digital era.

Logo



Figure 1. Logo of the Indonesian Digital Business Polytechnic

Source: Official document of the Indonesian Digital Business Polytechnic, 2023

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Organizational Structure



Figure 2. Organizational Structure

Source: Indonesian Digital Business Polytechnic Organization Guidebook, 2024

Vision & Mission

a. Vision:

To become a Superior Polytechnic at the International Level by 2043, especially in the Fields of Digital Technology and Business Based on Creative Economy and Entrepreneurship.

b. Mission:

- 1) Organizing vocational higher education in the field of digital technology and business that supports the development of creative character and personality of graduates, is committed to developing science and applying it, and has an entrepreneurial spirit to improve the economy and community welfare.
- 2) Carry out research and community service by building industrial networks in both the government and private sectors and other related institutions, which are based on research in the field of technology and business.
- 3) Carry out cooperation with trusted businesses, industries, and government agencies to help implement education, research, and community service programs.
- 4) Preparing honest, open, responsible, and trustworthy management of higher education, so that institutions can be independent by prioritizing quality and able to compete globally.

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Courses

a. D4 Digital Business - S.Tr.Bis

1) Scientific Vision:

Carry out education and skill development for Digital Marketers, Digital Business Analysts, Business Consultants, and Entrepreneurs who are innovative, creative, collaborative, have global competence, and are ethical in business.

2) Mission:

1. Organizing quality education in the field of digital business with a focus on forming the personality and character of creative graduates, committed to the development of knowledge and its application, and having an entrepreneurial spirit to improve the quality of the economy and community welfare.
2. Implementing scientific products and services in the field of digital business that support the industrial sector and small medium enterprises through community service activities.
3. Building cooperation with the business world, industry, educational institutions, and government institutions that are productive and sustainable in the field of digital business.
4. Organizing credible, transparent, accountable, and responsible governance of the Digital Business study program in an effort to achieve independence by building institutional management that focuses on quality and competitiveness at the international level.

b. D4 Business Logistics – S.Tr.Log

1) Scientific Vision:

Produce prospective managers and supervisors in the field of logistics and management who excel in logistics management, warehousing, transportation, distribution, and inventory management.

2) Mission:

1. Organizing quality education in the field of logistics management and administration that is oriented to the formation of the character and personality of graduates who are creative and have a commitment to the development of science and its application, as well as have an entrepreneurial spirit to improve the economy and community welfare.
2. Implementing scientific products and services in the field of logistics management and administration that support the industrial sector and small medium enterprises through community service activities.
3. Building cooperation in the business and industrial world, educational institutions, and government institutions that are quality and sustainable, in the field of logistics management and administration.
4. Organizing credible, transparent, accountable, and responsible business logistics study program governance in an effort to achieve independence by building institutional management that focuses on quality and competitiveness at the international level.

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c. D4 Software Engineering Technology - S.Tr.Kom

1. Scientific Vision:

To form prospective programmers who are experts in the field of software engineering technology, with a focus on planning, development, and implementation of systems, especially in the fields of software development, web development, and systems analysis.

2. Mission:

- 1) Organizing quality education in the field of software engineering technology that is oriented to the formation of the character and personality of graduates who are creative and have a commitment to the development of science and its application, as well as have an entrepreneurial spirit to improve economic conditions and community welfare.
- 2) Implementing scientific products and services in the field of software engineering technology that supports the industrial sector and small medium enterprises through community service activities.
- 3) Establishing cooperation with the business world and the industrial world, educational institutions, and government institutions that are productive and sustainable, in the field of software engineering technology.
- 4) Organizing the management of the Software Engineering Technology study program that is trustworthy, honest, responsible, and transparent, with the aim of achieving independence by improving the management capabilities of the institution, with a focus on quality and competitiveness at the international level.

d. Contact

Telephone Number : 02180473871

Whatsapp Number : 0857 7224 4697

Email : info@polbis.ac.id

Project Costs and Financing Sources

Table 1. Project Financing Costs and Sources

No	Information	Sum
1	Domains and Hosting	Rp. 390.000
2	Quota	Rp. 300.000
3	Transport	Rp. 450.000
4.	Documentation	Rp. 500.000
5.	Implementation	Rp. 400.000
6.	Socialization	Rp. 300.000
7.	Haki Publishing	Rp.
8.	Journal Publication	Rp.
Total Cost		IDR 10,000,000
Source of Cost		From the students who created this report

Source: Research team analysis based on project budget (April-July 2025)

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Specifications

A. Functional Specifications

The main functions that the application must have:

- 1) User Management
 - a. Registration and login (Students, Lecturers, Admin)
 - b. Role-based access rights management
- 2) E-Book Management
 - a. Upload files (PDF) that can only be done by lecturers and admins
 - b. Metadata inputs: title, author, year, category
 - c. Editing or deletion of e-books
- 5) Book Search and Catalog
 - a. Search feature by keyword
 - b. Filter by category, year, and author
- 3) Digital Book Reader (Reader)
 - a. View the contents of a book in your browser
 - b. Page navigation and text enlargement

B. Non-Functionality Specifications

It is a system requirement in terms of quality and performance:

- 1) Availability: The system can be accessed at any time online 24 hours a day.
- 2) Security: The system comes with secure logins, input validation, and limited access control.
- 3) Responsiveness: Accessible on multiple devices (PCs, tablets, smartphones).
- 4) User Friendly: An easy-to-use interface (clean and intuitive UI/UX).
- 5) Scalability: The system is designed to be further developed (e.g. integration with LMS or SIAKAD).

C. User Interface (UI) Display Plan

- 1) Login/Register Page
- 2) User Dashboard (Students, Lecturers, Admins)
- 3) Book/Catalog List Page
- 4) Reader View
- 5) Book Upload Form (for Lecturers/Admins)
- 6) Statistics & Reports Page (Admin only)
- 7) Completion Timeline

The completion period of this project is estimated to be around 16 weeks, with stages including: Initial Planning, System Needs Analysis, Database Design, UI/UX Design, System

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Design, Testing, UAT (User Acceptance Test), System Socialization to Partners, BAST (Handover), and Project Report Preparation.

Table 2. Completion Timeline

No	Phases/Activities	March			April			May			June			July		
		2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1.	Advance Planning															
2.	System Needs Analysis															
3.	Database Design															
4.	UI/UX design															
5.	System Planning															
6.	Testing															
7.	UAT (User Acceptance Test)															
8.	Socialization of the System to Partners															
9.	BAST (Handover)															
10.	Project Report Preparation															

Source: Developer team work plan (Gantt Chart E-Book Project, March-July 2025)

Output

The direct results resulting from the e-book system development process are as follows:

- a. E-Book System Application: A web-based platform that can be accessed directly by students, lecturers, and librarians.
- b. Core Features of the System
 - 1) Login & user management (student/lecturer/admin)
 - 2) Upload & e-book management (PDF)
 - 3) Digital catalog and book search
 - 4) Online reader feature
 - 5) Access history & usage reporting system
- c. Technical Documentation & User Guide
 - 1) System user manual for admins, lecturers, and students
 - 2) System documentation for further management & development

Outcome

The medium-term impact and sustainable benefits once the system is up and running are as follows:

- a. Making Digital Literacy Access Easier and Broader: Students and lecturers can access teaching materials anytime and from anywhere.
- b. Academic and Library Operational Efficiency: Reduce expenses to print, distribute physical books, and handle administrative tasks manually
- c. Improving the Quality of Digital Learning: Assisting hybrid learning methods and encouraging student learning independence.
- d. Transformation Towards a Digital Campus: Strengthening the identity of the Indonesian Business Digital Polytechnic as an educational institution based on modern technology.

Conclusion

This research successfully developed an effective web-based *e-book* system for the Indonesian Digital Business Polytechnic, significantly enhancing accessibility to learning resources for students and lecturers while streamlining the digitization process. The system's practical benefits, including cost reduction and improved library operational efficiency, demonstrate its potential as a sustainable solution to educational challenges in the digital era. To further advance this initiative, future research should focus on immediate integration with the Campus Academic Information System (SIKAD) and learning management systems (LMS) to establish a unified digital ecosystem with single sign-on capabilities. Expanding digital content to include interactive modules and multimedia, migrating the system to a cloud platform for scalability, and applying data analytics to monitor usage will enhance technological robustness. Additionally, ongoing impact evaluations on learning outcomes and comprehensive training for staff are vital, along with ensuring sustainability through dedicated teams and budget allocation. These strategic steps will enable the *e-book* system to serve as a foundation for digital transformation at the polytechnic and as a scalable model for other vocational institutions in Indonesia.

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