



User-Centered Web-Based Student Admission System for Junior High School

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ABSTRACT

Manual student admission at SMP Swasta Taman Siswa Sugarang Bayu required applicants and parents to visit the school, while staff recorded and searched paper forms. This study developed a web-based admission information system using a user-centered design procedure to align its functions with applicant and administrator workflows. The procedure covered understanding the context of use, specifying user requirements, producing design solutions, and evaluating the implemented functions. The system was modeled with Unified Modeling Language, implemented with Bootstrap and MySQL, and organized into applicant and administrator modules. Applicants can register accounts, authenticate, complete biodata, enter report-card scores, and print documents; administrators can manage users, menus, information, applicant records, scores, and contacts. Black-box testing across seven navigation and transaction scenarios produced seven successful outcomes (100%), with no broken links observed in the tested workflow. The system therefore provides a functional digital alternative to the former paper-based process. Because the evaluation was limited to functional verification, future work should quantify effectiveness, efficiency, satisfaction, accessibility, and security with representative users and deployment data.

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1. INTRODUCTION

Digital information systems increasingly support educational administration by reducing repeated data entry, widening access to services, and making institutional records easier to retrieve. Digital transformation is valuable, however, only when the resulting service remains accessible and understandable to its intended users [1], [2]. In student admission, a web system can connect information publication, account registration, data submission, verification, and document preparation within one workflow [3], [4].

SMP Swasta Taman Siswa Sugarang Bayu previously relied on a conventional admission procedure. Prospective students and their parents had to visit the school, complete paper forms, and depend on staff for subsequent processing. This arrangement consumed travel and waiting time, created queues, and exposed records to physical damage, loss, and slow retrieval. It also made timely verification and transparent

communication more difficult for the admission committee. The problem was therefore not merely the absence of a website, but the lack of an integrated workflow serving both applicants and school administrators.

User-centered design (UCD) addresses this problem by grounding design decisions in users, tasks, goals, and contexts of use. ISO 9241-210 describes human-centered design as an iterative process that understands context, specifies requirements, produces design solutions, and evaluates those solutions [5]. The approach originates from the principle that interactive systems should adapt to human capabilities and practices rather than force users to accommodate technology [6]. Explicit user focus, active involvement, iterative evaluation, multidisciplinary work, and attention to the whole user experience are recurring UCD principles [7], while a wide range of contextual inquiry, requirements, prototyping, and evaluation methods can operationalize them [8]. Usability is consequently interpreted in relation to specified users, goals, and contexts, rather than as a property inferred from visual appearance alone [9], [10].

Empirical and practice-oriented studies show that UCD is widely adopted because early attention to users can reveal requirements that purely technical development may miss [11]. Recent educational work has used a UCD framework to develop accessible student-facing information tools [12]. In Indonesia, UCD has also been applied to web-based new-student admission interfaces [4], school website design [13], and school library applications [14]. These studies support the relevance of UCD in educational services, but they also show a recurring need to connect interface design with an operational back-office workflow and to report evaluation evidence precisely.

This study responds to that need in the context of a private junior high school with limited prior digital administration. It does not treat interface appearance as the only outcome. Instead, the design translates the existing admission process into two connected modules: an applicant module for registration, biodata, report-card scores, and document printing, and an administrator module for managing users, menus, public information, applicant records, scores, and contacts. Functional verification is reported separately from usability so that successful execution is not misinterpreted as proof of user satisfaction.

Accordingly, the study aims to develop and functionally verify a web-based student admission system using the UCD process at SMP Swasta Taman Siswa Sugarang Bayu. Its contribution is a context-specific workflow model and implemented system that replace fragmented paper handling with a structured digital process. The study also identifies the boundary of the available evidence: seven black-box scenarios establish functional operability of the tested workflow, while quantitative usability, accessibility, security, and field performance remain topics for subsequent evaluation.

2. RESEARCH METHOD

2.1. Research setting and design

The study was conducted at SMP Swasta Taman Siswa Sugarang Bayu, Pematangsiantar, Indonesia, from March to July 2026. It used a system-development research design focused on the existing admission workflow and its transformation into a web-based information system. Evidence about the operational problem and required functions was obtained from the school context through observation of the admission process, discussion with relevant school stakeholders, and analysis of the forms and information handled during admission. No personally identifiable applicant dataset is reported in this article.

The development process combined UCD with conventional software-engineering activities. Requirements were translated into Unified Modeling Language (UML) models, database structures, interface designs, and implemented modules. UML was used to clarify actor responsibilities and interactions before coding [15]–[17]. The system was implemented as a responsive web application with Bootstrap and a MySQL database managed in a local XAMPP environment [18], [19].

2.2. User-centered design procedure

The UCD procedure followed four connected activities. First, the context-of-use analysis identified applicants or parents and school administrators as the principal users, together with their goals, devices, information needs, and operational constraints. Second, user and organizational requirements were specified as functional tasks and data requirements. Third, the requirements were converted into use-case and activity models, database tables, interface layouts, and an implemented web system. Fourth, the implemented workflow was evaluated against the specified functional requirements. When a design or function did not align with a requirement, the solution was intended to return to the design stage for refinement. This structure is consistent with the iterative logic of human-centered design [5], [7], [8].

The original applicant use-case model from the thesis is reproduced in Figure 1. It shows the functions available to a prospective student after account creation and login, including access to the home area, account data, biodata completion, report-card score entry, document printing, and logout. The diagram is included without replacing its actors, labels, or relationships with a newly interpreted model.

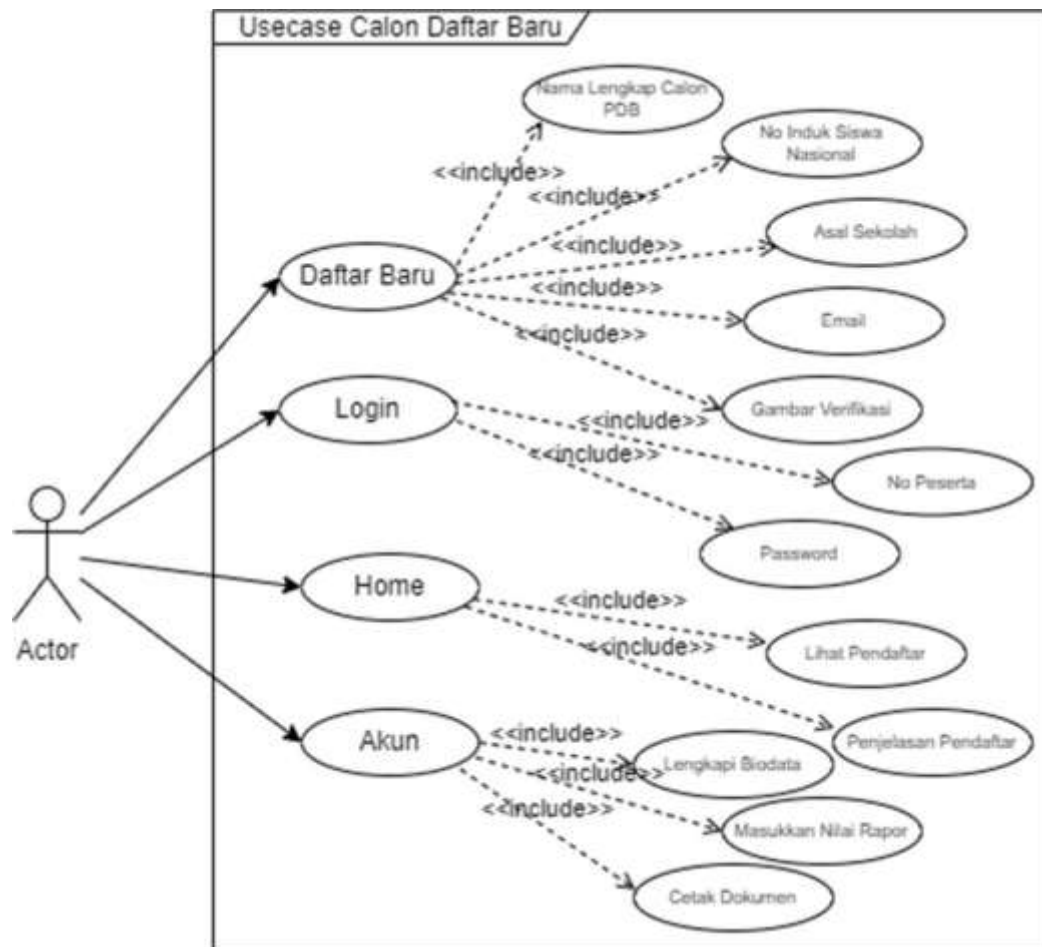


Figure 1. Original use-case diagram for a prospective applicant

Figure 2 reproduces the original administrator use-case model. The administrator authenticates before reaching configuration and admission-management functions, including menus, users, applicant data, public information, contact records, and printed outputs. Together, Figures 1 and 2 document the role separation that was subsequently implemented in the program.

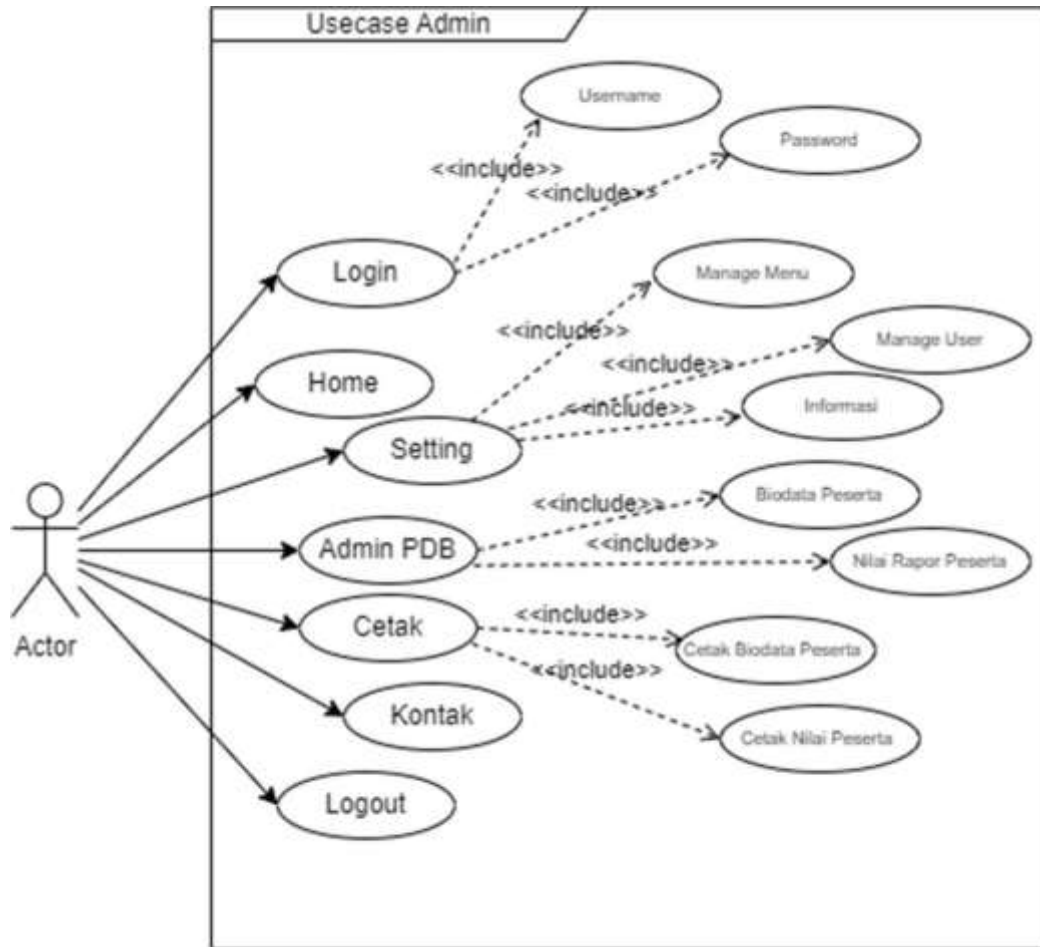


Figure 2. Original use-case diagram for the administrator

2.3. Actors and functional requirements

Two roles were modeled. The applicant role represents prospective students and, where relevant, parents or guardians assisting them. The administrator role represents authorized school personnel who manage admission information and records. Table 1 summarizes the functions derived from the documented workflow.

Table 1. Functional requirements by user role

Role	Required function	Expected outcome
Applicant	Create account and log in	Authenticated access to the applicant area
Applicant	Complete biodata	Applicant identity and supporting details are stored
Applicant	Enter report-card scores	Academic data are recorded for administrative review
Applicant	View status and print documents	Applicant can retain a printable admission record
Administrator	Manage users and menus	Authorized access and visible functions can be maintained
Administrator	Manage information, biodata, scores, and contacts	Admission records and public communication can be administered
Administrator	Print applicant biodata and scores	Administrative documentation can be produced

2.4. Implementation and functional testing

The development environment used Windows 11, Visual Studio Code, XAMPP/MySQL 3.2.2, and an Asus ExpertBook with 32 GB RAM and solid-state storage. Functional testing used a black-box strategy, in which externally observable inputs, navigation actions, and outputs were examined without relying on internal code structure [20]-[22]. Seven scenarios covered access to the local domain, navigation to registration, applicant lists

and login, completion of biodata, entry of report-card scores, and document printing. A scenario was marked successful when the displayed page or operation matched the expected result.

3. RESULTS AND DISCUSSION

3.1. Requirement translation and system structure

Context analysis showed that the manual process created two connected burdens. Applicants experienced physical visits, waiting, and dependence on paper forms, whereas staff experienced repeated recording, slower searches, and exposure to damaged or missing documents. The resulting design therefore centralized the admission workflow while maintaining different interfaces and permissions for applicants and administrators. The database named db_ppdb supported administrative accounts, applicant accounts, biodata, subject scores, information, menus, and contact messages.

The database design in the thesis specifies the field name, data type, size, and purpose of each stored attribute. Figure 3 reproduces the original structures of the ppdb_admin and ppdb_adm_siswa tables. These tables provide authenticated administrator records and the core applicant account and admission-status data; related tables store biodata, subject scores, menus, information, and contact messages.

Tabel ppdb_admin digunakan sebagai salah satu untuk mencatat beberapa pengguna yang dapat masuk ke dalam sistem, yaitu :

Tabel 3.2 ppdb_admin

No	Field	Type	Size	Keterangan
1	admin_id	Int	11	admin_id
2	username	Varchar	40	username
3	password	Varchar	255	password
4	name	int	11	name
5	alamat	Varchar	100	alamat
6	last_login	datetime	-	last_login
7	islogin	int	11	islogin
8	isenable	Int	11	isenable

2. Tabel ppdb_adm_siswa

Pada ppdb_adm_siswa digunakan sebagai salah satu untuk mencatat sebagai data peserta yang dapat masuk ke dalam sistem, yaitu :

Tabel 3.3 ppdb_adm_siswa

No	Field	Type	Size	Keterangan
1	adm_id	Int	11	adm_id
2	no_peserta	bigint	11	no_peserta
3	nama	Varchar	50	nama
4	nisn	bigint	10	nisn
5	asal_skl	Varchar	50	asal_skl
6	email	varchar	50	email
7	password	varchar	255	password
8	pass_view	varchar	50	pass_view
9	tgl_daftar	date	-	tgl_daftar
10	status	int	11	status
11	sts_verifikasi	int	11	sts_verifikasi
12	sts_seleksi	int	11	sts_seleksi

Figure 3. Original database table structures for administrator and applicant records

The applicant journey begins at the public home page, continues through account creation and authentication, and then directs the user to biodata, report-card score entry, and document output. The administrator journey starts with authentication and provides management views for users, menus, public information, applicants, biodata, scores, and messages. This role separation reduces the need for applicants to understand internal administration while giving staff a consolidated view of submitted records.

3.2. Implemented user interfaces

Figure 4 presents original program outputs for the applicant-facing workflow. The public page communicates admission information and entry points, while the authenticated applicant account groups the required next actions: completing biodata, entering report-card scores, and printing documents. These screens preserve the terminology used in the school admission process and make the applicant's progress visible in one area.



Figure 4. Original applicant-facing program outputs

Figure 5 presents original administrator outputs. The administrator home page provides a consolidated entry to admission data, and the menu-management page supports configuration of the functions exposed by the system. Other implemented administration pages manage users, applicants, biodata, scores, public information, contact messages, and printable records. Bootstrap was used to maintain a consistent responsive structure across these outputs.

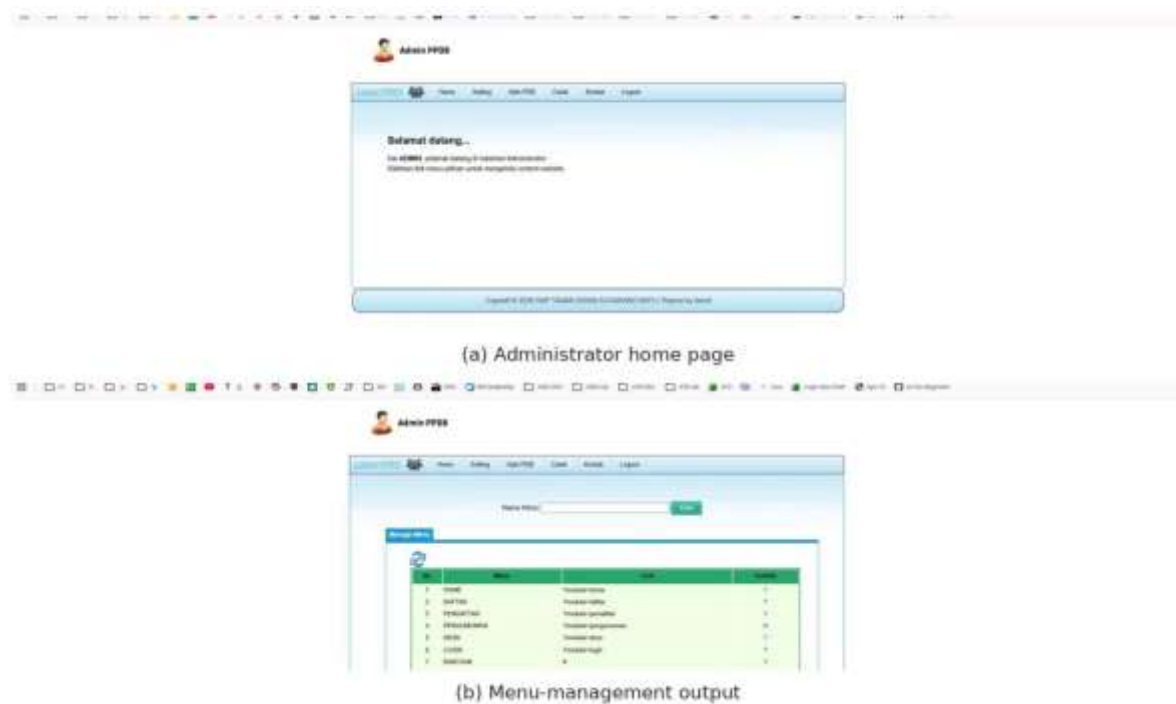


Figure 5. Original administrator program outputs

3.3. Functional test results

Table 2 reports the seven black-box scenarios documented in the thesis. Every tested scenario produced the expected page or operation. The functional success rate was therefore calculated as $7/7 \times 100\% = 100\%$ for the tested scenarios.

Table 2. Black-box functional test results

No.	Test scenario	Expected result	Observed result	Status
1	Access local domain	System home page is displayed	Displayed as expected	Passed
2	Select Registration	Registration page opens	Displayed as expected	Passed
3	Select Applicants	Applicant list page opens	Displayed as expected	Passed
4	Select Login	Login page opens	Displayed as expected	Passed
5	Open Complete Biodata	Biodata form opens	Displayed as expected	Passed
6	Open Report-Card Scores	Score-entry form opens	Displayed as expected	Passed
7	Open Print Documents	Printable document page opens	Displayed as expected	Passed

3.4. Discussion

The results demonstrate that the UCD-guided requirements could be converted into an operational admission workflow. The most important design outcome is not a single screen but the continuity between public information, applicant data entry, and administrative processing. This supports earlier findings that UCD can clarify user tasks in web-based student admission [3], [4] and other school information services [13], [14]. It also reflects the broader UCD principle that design should cover the complete user experience rather than isolated interface components [7].

All seven functional scenarios passed, indicating that the tested navigation paths and pages were available and correctly connected. Black-box testing is appropriate for verifying externally observable behavior [20]-[22], but the result must be interpreted narrowly. A 100% pass rate for seven scenarios does not establish that all possible inputs, validation rules, database failures, authorization boundaries, browser combinations, or security threats have been tested. It also does not show how quickly or comfortably users can complete admission tasks.

This distinction is important because usability requires evidence about effectiveness, efficiency, and satisfaction in a defined context of use [9]. Accessibility likewise requires systematic checks against perceivable, operable, understandable, and robust interaction criteria [23]. The present design uses responsive layouts and

task-oriented labels, but neither responsiveness nor successful navigation alone proves compliance. A subsequent evaluation should therefore recruit representative applicants, parents, and staff; measure task completion, errors, completion time, and satisfaction; and include accessibility inspection and device-based testing.

Several established instruments can strengthen that next stage. Nielsen's usability attributes can guide problem classification [24], while the System Usability Scale can provide a compact standardized satisfaction measure [25]. Quantitative scores should be combined with observation and interview evidence so that detected problems can be traced to specific tasks and interface decisions. Security testing should also examine authentication, authorization, input validation, session handling, and protection of applicant data before public deployment. These additions would extend the present functional proof into a defensible assessment of real-world quality.

4. CONCLUSION

A web-based student admission system was developed for SMP Swasta Taman Siswa Sugarang Bayu using a four-stage user-centered design procedure. The implemented system connects applicant registration, authentication, biodata, report-card scores, and printable documents with administrator functions for users, menus, information, records, scores, and contacts. All seven documented black-box scenarios passed, showing that the tested workflow operated as expected and contained no broken links in those paths. The system therefore provides a functional digital alternative to the former paper-based admission process. The evidence does not yet establish usability, accessibility, security, or field effectiveness; future work should evaluate representative users with task metrics and standardized usability measures, expand functional and security test coverage, and assess performance after deployment.

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