

Development of Forgotten History: A Survival-Horror Game on Bicolano Folk Beliefs and Mythological Beings

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ABSTRACT

Bicol folk belief is recorded in ethnographic fieldwork and regional oral literature, yet recent studies report misunderstandings of intangible cultural heritage among Filipino college students and describe Bikol folkways that are fading from practice. Philippine game-based learning research has addressed school subjects and national culture broadly, while commercial Filipino horror games use folk creatures without instructional aims or structured evaluation. This study develops Forgotten History, a single-player survival-horror game on the Roblox platform in which documented Bicolano folk beliefs operate as game mechanics: each threat can be countered only by the practice of its cited source records. The study employs a descriptive-developmental design and the Game Development Life Cycle. A source-traceable content inventory will be validated by three folklore or Philippine studies experts using the Index of Item-Objective Congruence, first against its sources and again as represented in the game. The build will be calibrated to Roblox's Moderate content maturity label, which standard accounts aged 16 and above can access. Five IT experts and at least 50 senior high school and college students aged 16 to 21 will evaluate the system against four ISO/IEC 25010:2023 characteristics on a five-point Likert scale, analyzed by weighted mean. Expected outputs are a validated content inventory, a playable evaluation build, and quality ratings that establish readiness for a subsequent learning-outcome study.

Keywords: *Serious games, Survival horror, Intangible cultural heritage, Bicol folklore, Roblox, ISO/IEC 25010*

SECTION I — INTRODUCTION (THE PROBLEM AND ITS SETTING)

1.1 Introduction

Belief in the asuwáng and related beings forms part of the intangible cultural heritage of the Bicol Region. Fieldwork in Camarines Sur and Albay documented it as a structured system — classes of beings, accounts of how a person becomes one, and the measures households took against them (Lynch, 1949) — while Bikol oral literature preserves deity and creation narratives of its own (Sajulga & Canayong, 2024). Transmission of this heritage is uneven. Filipino college students show misunderstandings in their knowledge of intangible cultural heritage (Pastera, 2024), and

ethno-literary fieldwork in Albay finds some Bikol folkways still practiced while others are fading or already discarded (Aranas, 2025).

This study asks one question: how can survival-horror game mechanics deliver documented Bicolano folk beliefs to senior high school and college learners? *Forgotten History* answers it with a survival-horror game built on Roblox and set in a fictional rural Bicol barrio. The player carries no weapon: each threat can be countered only by the practice of its cited source records, so recalling the belief is the act of surviving rather than a quiz that follows play.

The study follows a descriptive-developmental design. The developmental component produces the game through the Game Development Life Cycle; the descriptive-quantitative component validates its cultural content through expert review and evaluates its software quality against ISO/IEC 25010:2023.

1.2 Background of the Study

Three conditions make this project both possible and necessary: game-based learning is well evidenced but has not been applied to regional folk belief, Bicol tradition is documented yet unevenly transmitted, and fear in games has a measurable effect with a known ceiling.

Game-based learning is established; regional folk belief is not yet its subject. Meta-analytic and systematic-review evidence supports digital game-based learning when gameplay aligns with learning objectives (Barz et al., 2024; Cai et al., 2025; Dan et al., 2025; Hong et al., 2024), and heritage studies show that cultural content can be carried through exploration, storytelling, and interaction (Anwar et al., 2025; Camuñas-García et al., 2024; Zhang et al., 2025). Philippine applications exist in history (Dela Cruz, 2024), Technology and Livelihood Education (Escueta, 2024), Science, Technology, and Society (Balic & De Gracia, 2024), and national culture (Fuentes et al., 2024), but none addresses the belief system of a single region.

Bicol tradition is documented but unevenly transmitted. Lynch's (1949) fieldwork produced a structured account of the *asuwáng* in Camarines Sur and Albay, and Ramos (1990) placed such beliefs within a national account of the *aswang* complex. Philippine myths were transmitted orally and vary even within one region, and their study has drawn limited attention from educators and students (Sajulga & Canayong, 2024). College students show misunderstandings about intangible cultural heritage (Pastera, 2024), and fieldwork in Ligao City, Albay, classifies some Bikol folkways as fading or already discarded (Aranas, 2025).

Fear is a design instrument with a documented ceiling. A study of 1,015 horror game players found that fear-inducing elements shape psychological response and emotional value, that design elements shape perceived control, and that excessive fear-inducing elements reduce actual play (Savino et al., 2025); players' ability to confront monsters is likewise associated with stronger immersion (Yan, 2024). The design position that follows is moderate, controllable tension in which the player keeps agency, with cultural content fused to the threat rather than presented beside it.

Roblox lowers the cost of building and reaching learners. The platform supplies a free development environment, scripting language, and hosting, and learners reach a published experience through a client they can install on a personal computer or an ordinary smartphone, which removes installation and device barriers at evaluation. It has already carried expert-validated cultural learning content (Toopmongkol et al., 2025). These properties, rather than any claim about audience size, are the basis for the platform choice; the limits it imposes appear in Section 1.4.

No Philippine study located in this review combines survival-horror mechanics, a single documented regional belief system, and learners aged roughly 16 to 21. A commercial Filipino survival-horror title uses folk creatures (Zeenoh Inc., 2016), but it states no learning objectives and reports no structured evaluation.

1.3 Objectives of the Study

General Objective. To develop Forgotten History, a Roblox-based survival-horror game that teaches documented Bicolano folk beliefs and mythological beings to senior high school and college learners, and to evaluate its cultural accuracy and software quality.

Specific Objectives.

1. Construct a content inventory of Bicolano folk beliefs and beings from documented sources, and derive from it an enemy taxonomy that maps each being's recorded characteristics to a distinct threat behavior.
2. Implement documented countermeasures as the player's sole means of defense, one mechanic per cited practice, so that progression requires applying the belief rather than reading it.
3. Develop a single-region barrio environment with exploration, encounter, and progression systems in Roblox Studio using Luau, calibrated to qualify for Roblox's Moderate content maturity label.
4. Validate the cultural accuracy of the content inventory, and of its representation in the game, through expert review by three folklore or Philippine studies specialists using the Index of Item-Objective Congruence.
5. Evaluate the system against four ISO/IEC 25010:2023 characteristics — functional suitability, performance efficiency, interaction capability, and reliability — using a five-point Likert scale administered to student evaluators and IT experts, analyzed by weighted mean.

1.4 Scope and Limitation of the Study

Scope. The study covers folk beliefs and mythological beings documented for the Bicol Region, drawing chiefly on fieldwork from Camarines Sur and Albay. Content spans three layers: Bikol deity and creation narratives, the asuwáng belief complex, and other lower-mythology beings recorded for the region; the final membership of each layer is set by the inventory procedure in Section 3.3. The game is a single-player survival-horror game built in Roblox Studio with Luau and set in one fictional barrio, so that no real community is depicted as a site of malevolent beings. It comprises the inventoried beings as enemy types, recorded practices as defensive mechanics, and an in-game reference that presents each belief with its source. Evaluation covers cultural accuracy by expert review and software quality by ISO/IEC 25010:2023 assessment, conducted with senior high school and college students aged 16 to 21 and with IT experts at a private basic and higher education institution in Central Luzon, Philippines.

Limitations.

- Coverage is limited to Bicol. Other regional traditions are excluded, and where a being also appears in other regions, only its documented Bicol form is represented.
- Only beliefs attested in written sources are included. Undocumented variants and oral accounts gathered outside the cited literature are excluded, and each source is treated as a record of belief at the time and place it was documented.
- No learning outcome is measured. There is no pre-test or post-test of knowledge gain and no claim of improved retention; the evaluation assesses the system, not the learner.
- Fear intensity is capped at Roblox's Moderate content maturity label. Experiences labeled Restricted are available only to age-verified users aged 18 and above, which would exclude part of the intended audience (Roblox Corporation, n.d.).

- Excluded from the build: multiplayer, since isolating the player is central to the horror design; voice acting, on cost grounds; Bicol-language localization, since the game teaches Bicol culture to learners outside the region and must remain readable to them; native mobile ports outside the Roblox client; and public or commercial release.
- Evaluators are drawn from a single institution by purposive sampling, so findings are not generalizable to the wider student population.

1.5 Significance of the Study

Senior high school and college learners. Encounter Bicolano belief as a documented regional system — beings, stated causes, and recorded countermeasures — in a genre suited to their age band, with every in-game claim traceable to a source.

Teachers of Philippine culture, literature, and social studies. Gain a supplementary resource whose content has been validated by specialists and carries citations, usable alongside units on regional culture, folk literature, or precolonial belief.

Bicolano cultural stakeholders. Gain a digital representation that keeps regional distinctiveness intact, attributes each belief to its documented source, and depicts no real community as a site of malevolent beings.

Game developers. Gain a worked example of folklore-driven mechanic design, in which documented practice becomes a game system, fear is calibrated rather than maximized, and cultural content must pass a validation gate before it can enter the build.

Future researchers. Gain a content-validated game and a fully specified protocol against which learning outcomes can later be measured; this study defines that evaluation without conducting it.

The proponents. Gain applied experience in game development, primary-source cultural research, and standards-based software evaluation, consistent with the Mobile Development specialization.

Sustainable Development Goals. The study supports SDG 4 (Quality Education) by providing an alternative instructional resource, and Target 11.4 of SDG 11, which calls for strengthened efforts to safeguard cultural heritage, through the validated digital representation and transmission of a regional belief system.

1.6 Definition of Terms

Asuwáng. *Conceptual:* the Bicol term for beings believed able to harm humans by supernatural means, documented as a cluster of related beliefs rather than a single creature (Lynch, 1949; Ramos, 1990). *Operational:* the enemy category of the game, subdivided into the documented classes below.

Asuwáng na lakaw. *Conceptual:* the class of asuwáng recorded as moving on foot (Lynch, 1949). *Operational:* ground-based enemies that pursue the player through the barrio.

Asuwáng na layog. *Conceptual:* the class of asuwáng recorded as able to fly (Lynch, 1949). *Operational:* enemies that approach from above, requiring different countermeasures from ground-based enemies.

Content inventory. *Conceptual:* a structured record of the beliefs and beings a cultural product represents, each linked to its source. *Operational:* the validated data set from which every in-game being, countermeasure, and reference entry is generated; entries not retained through expert review cannot enter the build.

Content maturity label. *Conceptual:* a platform rating that describes the intensity of a game's content and determines which account types can access it. *Operational:* the label Roblox assigns after its content maturity questionnaire is completed; this study targets the Moderate label (Roblox Corporation, n.d.).

Countermeasure. *Conceptual:* a practice documented in the sources as a means of repelling, detecting, or surviving a particular being. *Operational:* an in-game item or action that prevents or interrupts harm from one enemy type, mapped one-to-one to a cited source.

Cultural accuracy. *Conceptual:* correspondence between a representation and the documented tradition it depicts. *Operational:* the Index of Item-Objective Congruence assigned by expert reviewers to each inventory entry and to its in-game representation.

Game Development Life Cycle (GDLC). *Conceptual:* a game-specific development model of six stages — initiation, pre-production, production, testing, beta, and release (Mu'Ammar et al., 2025). *Operational:* the development methodology of this study, described in Section 3.2.

Index of Item-Objective Congruence (IOC). *Conceptual:* a content-validity index computed from expert ratings of +1 (congruent), 0 (uncertain), or -1 (incongruent) for each item against its stated objective (Toopmongkol et al., 2025). *Operational:* the cultural-accuracy measure of this study, computed as $\Sigma R / N$ across three experts, with items retained at $IOC \geq 0.67$.

Intangible cultural heritage. *Conceptual:* practices, expressions, and knowledge that communities recognize as their heritage, classified by UNESCO into five domains that include oral traditions and knowledge concerning nature and the universe (Wang & Men, 2025). *Operational:* the category under which Bicolano folk belief is treated in this study.

Interaction capability. *Conceptual:* the ISO/IEC 25010:2023 characteristic that replaced usability, describing how effectively users can interact with a product (International Organization for Standardization & International Electrotechnical Commission [ISO/IEC], 2023). *Operational:* the questionnaire items on appropriateness, recognizability, learnability, operability, user error protection, user engagement, and self-descriptiveness.

ISO/IEC 25010:2023. *Conceptual:* the international product quality model defining nine characteristics — functional suitability, performance efficiency, compatibility, interaction capability, reliability, security, maintainability, flexibility, and safety (ISO/IEC, 2023). *Operational:* the evaluation framework of this study, applied across four characteristics on a five-point Likert scale.

Moderate fear intensity. *Conceptual:* fear-inducing content held below the level at which engagement declines (Savino et al., 2025). *Operational:* content that qualifies for Roblox's Moderate label, which permits moderate fear-based content and is accessible to standard accounts aged 16 and above (Roblox Corporation, n.d.).

Omen cue. *Conceptual:* a sign that a belief associates with the approach of a being. *Operational:* a non-damaging audio or environmental cue that precedes an encounter, used only where a source records a sign associated with that being.

Roblox. *Conceptual:* an online platform on which users build and publish games with Roblox Studio and the Lua scripting language. *Operational:* the development and deployment environment of this study and the source of the content maturity constraints in Section 1.4.

Survival-horror. *Conceptual:* a game genre in which the player faces threats under constrained resources, favoring avoidance and evasion over combat. *Operational:* the design model of this game, in which the player has no conventional weapon.

SECTION II — LITERATURE REVIEW

2.1 Introduction to the Review

This chapter reviews the literature in four tiers, moving from global to focal: global research on digital game-based learning, heritage games, and fear in games; national studies of game-based learning and heritage awareness in the Philippines; local studies of Bicol oral tradition; and focal documentation of Bicol folk belief. Research literature is limited to studies published in 2024 and 2025. Ethnographic sources that document the belief system itself are older by necessity; Section 2.2.4 treats them as primary documentation of content, not as evidence about current practice.

2.2 Review of Related Literature and Studies

2.2.1 Global Studies

Digital game-based learning. Meta-analytic and systematic-review evidence supports digital game-based learning when its mechanics align with learning objectives. Barz et al. (2024) synthesized school-based interventions across cognitive, metacognitive, and affective-motivational outcomes; Cai et al. (2025) examined effects on problem-solving; Dan et al. (2025) reviewed the field from the standpoint of K–12 educators; and Hong et al. (2024) mapped how game elements are tailored to learners. The operative principle for this study is alignment: the action the player repeats should be the knowledge the game intends to teach.

Games as carriers of cultural heritage. Camuñas-García et al. (2024) analyzed heritage-based video games, Anwar et al. (2025) reviewed metaverse and extended-reality heritage applications, and Zhang et al. (2025) proposed a museum heritage game model grounded in embodied cognition. Que et al. (2025) reviewed how entertainment videogames represent cultural heritage, extending the field beyond purpose-built serious games. Mao and Cho (2024) observed that established serious-game evaluation approaches come largely from education and medicine and remain unverified for cultural heritage games, which is why this study separates cultural-accuracy validation from software-quality evaluation.

Engagement with intangible cultural heritage games. Bai et al. (2025) found that enjoyment, cultural identity, and aesthetic quality shaped user perceptions of intangible cultural heritage (ICH) games. Jiang et al. (2025), with 430 participants, found that four qualities raised perceived usefulness and enjoyment: how genuine the cultural elements seemed, how much information the game carried, how it looked, and how far it let players act. Wang and Men (2025), surveying 338 players, found that system and information quality predicted whether players judged a game useful, and cautioned against altering heritage elements more than the material warrants. Two commitments follow: authenticity must be verified rather than assumed, and system quality is a legitimate evaluation target.

Fear in games. Savino et al. (2025) analyzed 1,015 horror game players and found that fear-inducing elements shaped psychological response and emotional value, design elements shaped perceived control, and excessive fear-inducing elements reduced actual play; they recommended balancing fear with pacing and perceived control.

Yan (2024) associated players' ability to confront monsters with stronger immersion, and Mateu (2024) reviewed folk horror across the audiovisual arts, including video games, as a subgenre with defined narrative and aesthetic features.

Roblox and development precedents. Toopmongkol et al. (2025) built a learning environment in Roblox Studio around culturally grounded content and validated it with three experts using the Index of Item-Objective Congruence (IOC). Mu'Ammar et al. (2025) applied a six-stage Game Development Life Cycle (GDLC) to a regional-culture game, verified 14 black-box scenarios during alpha testing, and evaluated the beta build with 50 respondents aged 18 to 24. Chevin and Permadi (2024) applied GDLC to a folklore adventure game evaluated through black-box and user acceptance testing. These studies supply the development and validation precedents adopted in Chapter III.

2.2.2 National Studies

Game-based learning in Philippine education. Dela Cruz (2024) developed gamified resources for Junior High School history, Balic and De Gracia (2024) for Science, Technology, and Society in college, and Escueta (2024) examined game-based learning in Technology and Livelihood Education. Fuentes et al. (2024) developed Hanapin at Kilalanin, an offline Android puzzle game on Philippine culture evaluated by survey. All address subject content or national culture broadly; none centers on one region's belief system or uses horror mechanics.

Heritage awareness among Filipino learners. Pastera (2024) analyzed essays written by 75 college students, found mistaken ideas about intangible cultural heritage among the themes that emerged, and recommended teaching approaches that bring college students into contact with Philippine ICH. Sajulga and Canayong (2024) observed that Filipino mythology has drawn limited attention from educators and students and that orally transmitted myths vary even within a single region, which grounds this study's decision to represent one region's documented forms rather than a national composite.

2.2.3 Local Studies

Bicol oral tradition. Aranas (2025) documented eight folksongs from Ligao City, Albay, through interviews with key informants aged 50 and above, then sorted the folkways they reflect into those the community still keeps, those close to disappearing, and those no longer practiced, tracing the erosion of Bicolano collective memory to technology and dominant languages under globalization. Sajulga and Canayong's (2024) analysis includes a Bikol creation story in which Daga, Aldao, Bulan, and Bitoon, children of the deities Paros and Dagat, are described through the earth's minerals — evidence of a deity-level narrative layer distinct from Bikol lower mythology.

2.2.4 Focal Sources

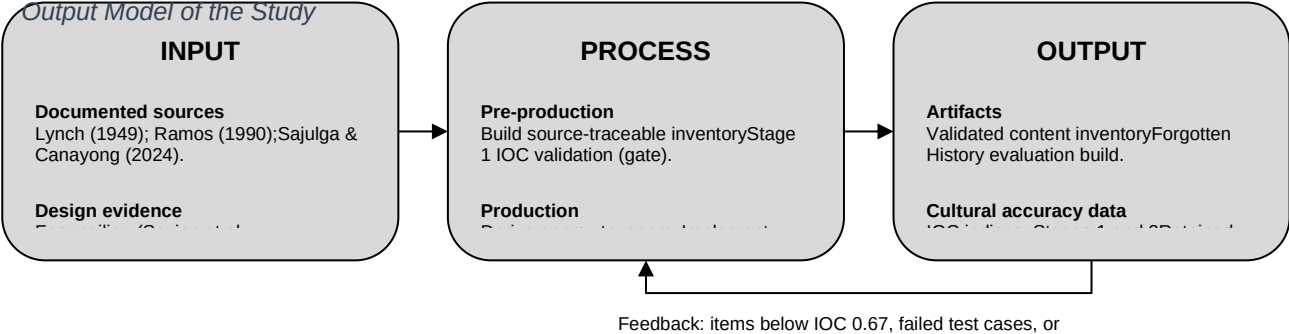
Primary documentation of Bicol belief. Lynch (1949) documented the asuwáng belief in Camarines Sur and Albay through fieldwork, covering their kinds, characteristics, and the measures taken against them, and distinguished flying (layog) and walking (lakaw) classes. Ramos (1990) placed such beliefs within a national account of the aswang complex. Their age reflects the history of fieldwork on the subject, not a lapse in currency: they are the record against which the content inventory is checked, and the expert validation in Section 3.6 tests the inventory's fidelity to them.

Prior Filipino horror game. Nightfall: Escape (Zeenoh Inc., 2016) is a commercial Filipino survival-horror game built around Philippine folk creatures. It demonstrates that the genre suits this material, but as an entertainment product, it states no learning objectives and reports no structured evaluation.

2.3 Conceptual Framework

The study adopts an Input–Process–Output (IPO) model. Inputs are the documented sources, the design evidence from Section 2.2, and the platform and evaluation constraints. The process follows the GDLC stages, with validation and testing embedded in them. Outputs are the validated game and the data that establish its readiness.

Figure 1. *Input–Process–Output Model of the Study*



2.4 Synthesis

Four findings emerge from the review.

1. Game-based learning works best when its mechanics carry the intended knowledge (Barz et al., 2024; Hong et al., 2024). This argues for belief-application as the core mechanic.
2. Engagement with heritage games depends on perceived cultural authenticity and on system quality (Jiang et al., 2025; Wang & Men, 2025). This argues for separate cultural and software evaluations.
3. Fear engages players only up to a point (Savino et al., 2025). This argues for a calibrated ceiling, operationalized here as Roblox's Moderate label.
4. Bicol belief is documented in primary sources and regional literature but is unevenly transmitted (Aranas, 2025; Lynch, 1949; Pastera, 2024). This establishes both the content base and the need.

Across the literature reviewed, no study combines survival-horror mechanics, a single documented regional belief system, learners aged roughly 16 to 21, and a validation design that checks cultural content against its sources. Philippine educational games address subjects or national culture broadly (Dela Cruz, 2024; Fuentes et al., 2024); the Filipino horror title identified is an entertainment product (Zeenoh Inc., 2016); and research on ICH games so far comes chiefly from outside the Philippines (Bai et al., 2025; Jiang et al., 2025; Wang & Men, 2025).

Forgotten History addresses this gap by making documented Bicolano belief the survival mechanic of a survival-horror game, validating that content against its sources before and after implementation, and evaluating the resulting software against ISO/IEC 25010:2023.

SECTION III — METHODOLOGY

3.1 Research Design

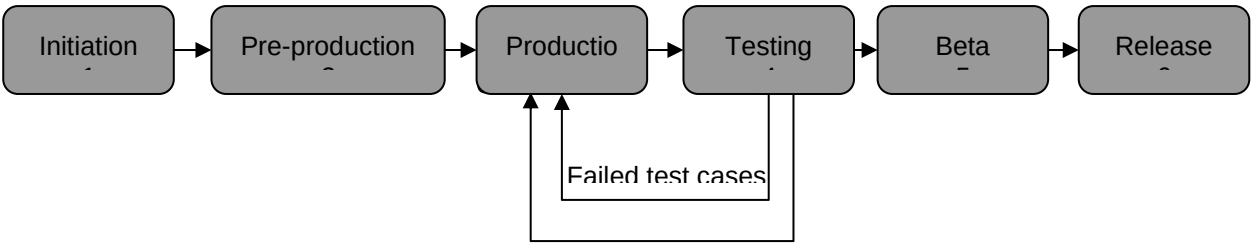
This study employs a descriptive-developmental research design with a quantitative approach. The developmental component governs the construction of Forgotten History through the GDLC. The descriptive-quantitative component evaluates the resulting game on two independent dimensions: cultural accuracy, measured through expert ratings with the IOC, and software quality, measured through ISO/IEC 25010:2023-based ratings analyzed

by weighted mean. The design does not test learning outcomes; it produces and evaluates the game on which such a test can later be run.

3.2 System Development Methodology

The project follows the GDLC, a six-stage model - initiation, pre-production, production, testing, beta, and release - applied in recent cultural-game development (Chevin & Permadi, 2024; Mu'Ammar et al., 2025). Production proceeds in short iterative builds so that failed tests and expert revisions can re-enter development without restarting the cycle. Table 1 maps each stage to this study.

Figure 2. GDLC Flow



Items below IOC threshold or quality mean below 3.41

Table 1. GDLC Stages Applied to the Study

Stage	Activities in this study	Output
Initiation	Define the concept, target learners (16 to 21), platform, and fear ceiling	Concept document
Pre-production	Build the content inventory from sources; Stage 1 IOC validation; derive the enemy taxonomy; write the game design document	Validated inventory; game design document
Production	Implement the environment, enemy behaviors, countermeasure mechanics, reference system, and save system in Roblox Studio	Alpha build
Testing (alpha)	Black-box testing; performance measurement; content maturity questionnaire	Test report; Moderate label
Beta	Stage 2 IOC validation; pilot and administration of the ISO/IEC 25010:2023 questionnaire	IOC indices; quality ratings
Release	Deploy the revised build as a private evaluation release; no public release	Evaluation build

Project team. The six researchers divide responsibilities by GDLC function, and every member takes part in alpha testing: a project lead handles the schedule, ethics clearance, and coordination with the expert panels; a cultural content researcher handles source extraction, the content inventory, and liaison with the cultural experts during IOC validation; a lead programmer handles server-side systems, namely enemy behavior, countermeasure resolution, and persistence; a gameplay and interface programmer handles client-side systems, namely input, camera, interface, and the reference screen; an environment and asset designer handles the barrio environment, models, lighting, and audio; and a quality and evaluation lead handles test cases, performance measurement, questionnaire administration, and data analysis.

Participants and sampling. Purposive sampling is used for all three groups in Table 2. The three-expert panel follows the IOC precedent of Toopmongkol et al. (2025), and the student sample of at least 50 mirrors the beta evaluation of Mu'Ammar et al. (2025), whose respondents fell in a comparable age band. Quotas of 25 senior high school and 25 college students ensure that both halves of the target age range are represented. All participants are drawn from a private basic and higher education institution in Central Luzon, Philippines.

Table 2. *Participant Groups*

Group	n	Selection criteria	Role
Cultural content experts	3	Faculty or researchers in Philippine studies, folklore, anthropology, or Bikol literature; at least one with Bikol-language proficiency	IOC validation, Stages 1 and 2
IT experts	5	IT or computer science faculty, or professional game or software developers, each with at least three years of relevant experience	ISO/IEC 25010:2023 evaluation; instrument review
Student evaluators	at least 50 (25 senior high school, 25 college)	Enrolled students aged 16 to 21 who accept the content advisory; students who decline horror content are excluded without penalty	ISO/IEC 25010:2023 evaluation

Instruments. Three instruments are used. The *content validation form* lists each inventory entry (Stage 1) or in-game representation (Stage 2) with its cited source, for experts to rate +1, 0, or −1 with optional comments. The *ISO/IEC 25010:2023 evaluation questionnaire* is an adapted five-point Likert instrument covering four characteristics (Section 3.6), reviewed by the IT expert panel and pilot-tested before use. The *black-box test checklist* holds one or more test cases per functional requirement in Section 3.3, each recorded as passed or failed.

Data collection procedure.

1. Secure ethics clearance from the institution's research ethics committee.
2. Recruit the expert panels and obtain their informed consent.
3. Build the content inventory and conduct Stage 1 IOC validation; revise and re-rate items below threshold.

4. Develop the alpha build; run black-box tests and performance measurement; complete Roblox's content maturity questionnaire.
5. Conduct Stage 2 IOC validation on the in-game representation of each retained entry.
6. Pilot the questionnaire with at least 20 students outside the sample and compute Cronbach's alpha.
7. Conduct supervised evaluation sessions: content advisory and consent or assent, a gameplay session of about 30 minutes, the questionnaire, and a debriefing.
8. Tabulate and analyze the data as specified in Section 3.6.

Ethical considerations. The study follows the National Ethical Guidelines for Research Involving Human Participants (Philippine Health Research Ethics Board [PHREB], 2022), which apply to non-health research involving human participants, and the Data Privacy Act of 2012 (Republic of the Philippines, 2012).

- *Consent and assent.* Participants aged 18 and above give written informed consent. Participants aged 16 and 17 give written assent, with written consent from a parent or guardian.
- *Content advisory.* Before consenting, every participant receives a plain-language description of the horror content and may decline without penalty.
- *Right to withdraw.* Participants may stop at any time, including mid-session; the pause and exit functions (FR9) remain available throughout play.
- *Privacy.* No names appear on instruments; responses carry codes, are stored on encrypted drives accessible only to the researchers, are reported only in aggregate, and are deleted after the study. Sessions use researcher-owned evaluation accounts on laboratory devices, so no participant creates or discloses a personal Roblox account.
- *Debriefing.* After play, participants are reminded that the game depicts documented beliefs held by real communities and that its depictions are interpretations reviewed by specialists.
- *Respectful representation.* The setting is a fictional barrio so that no real community is depicted as a site of malevolent beings, and cultural experts review all content before evaluation, consistent with calls to honor heritage traditions and avoid excessive alteration of heritage elements (Wang & Men, 2025).

3.3 Requirement Specification and Analysis

Content requirements. Content requirements derive from an inventory built in four steps:

1. Extract every candidate belief, being, and associated practice from the sources, recording the citation and page for each.
2. Keep only content attributed to the Bicol Region; where a being appears in several regions, record only its Bicol form.
3. Structure each retained item as an inventory entry: name, class, recorded characteristics, associated practices, and source.
4. Submit the entries to Stage 1 IOC validation; only retained entries become requirements for production.

Functional requirements. Table 3 lists the functional requirements, each of which receives at least one black-box test case.

Table 3. *Functional Requirements*

ID	Requirement
FR1	Display a content advisory before first play and require acknowledgment.

FR2	Allow the player to explore the barrio environment.
FR3	Spawn enemies whose behavior follows their class in the enemy taxonomy.
FR4	Present an omen cue before an encounter wherever the source records a sign for that being.
FR5	Allow the player to acquire countermeasure items or actions within the environment.
FR6	Resolve countermeasures one-to-one: a countermeasure repels only the enemy type its source associates with it.
FR7	Unlock a reference entry, with its citation, when the player first encounters a being.
FR8	Save and restore progress, unlocked entries, and settings.
FR9	Allow the player to pause or exit at any time.
FR10	Provide comfort settings: audio volume, subtitles for audio cues, and camera sensitivity.

Non-functional requirements. Four requirements map to the ISO/IEC 25010:2023 characteristics evaluated in Section 3.6. For functional suitability, every retained inventory entry is represented in the build and every countermeasure behaves as its entry specifies. For performance efficiency, the game sustains at least 30 frames per second on both minimum test devices during encounters. For interaction capability, a first-time player can complete the opening area without researcher assistance, and every audio cue has a subtitle. For reliability, progress survives disconnection and rejoining with no loss of unlocked entries. Beyond these, the build must qualify for Roblox's Moderate content maturity label (Roblox Corporation, n.d.).

Data flow. The Level 0 data flow diagram treats the game as a single process exchanging data with three external entities (Figure 3). The player supplies movement, item use, and menu selections, and receives game state, omen cues, reference entries, and feedback. The researcher, acting as content administrator, supplies validated inventory entries and receives a content build report. Roblox platform services supply stored progress on load and receive progress records to store. The Level 1 diagram decomposes the system into five processes and three data stores (Figure 4), specified in Table 4. Processes 1.0 through 4.0 run at play time; process 5.0 runs once before evaluation, when validated inventory entries are loaded into the content store.

Figure 3. Context Diagram (Level 0 Data Flow Diagram)

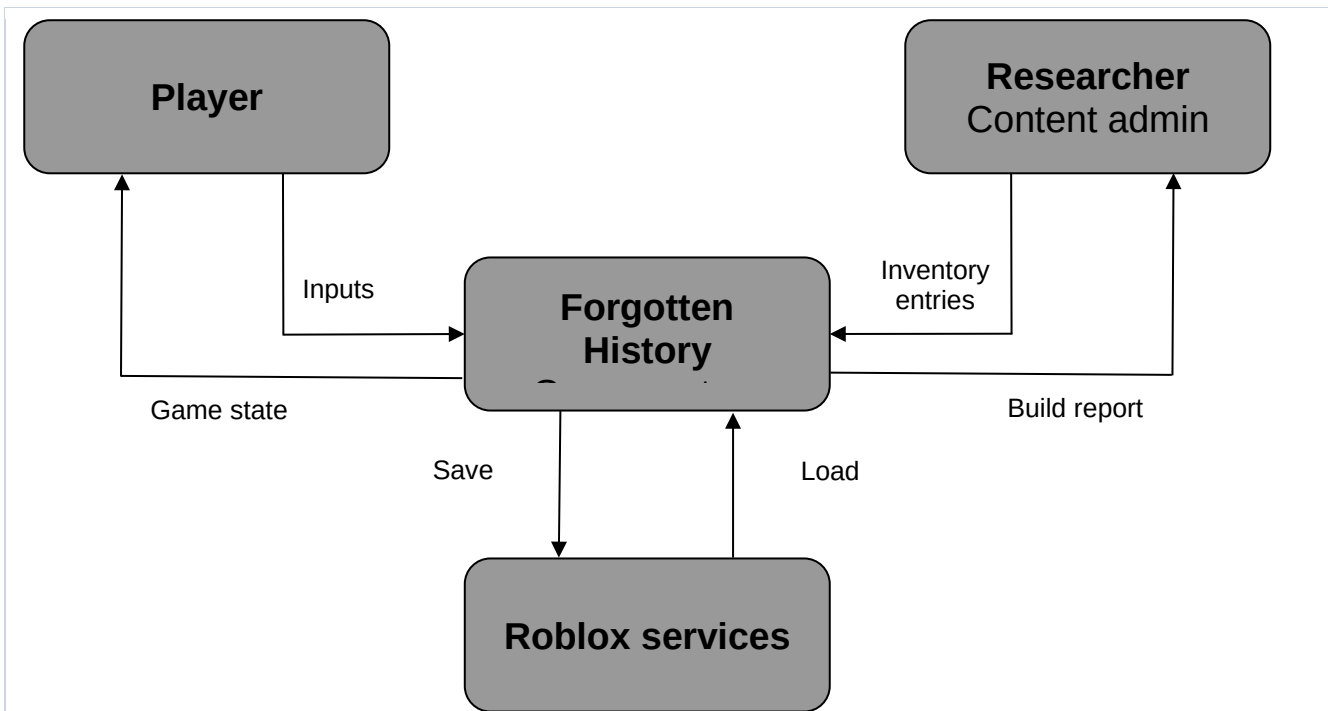


Figure 4. Level 1 Data Flow Diagram

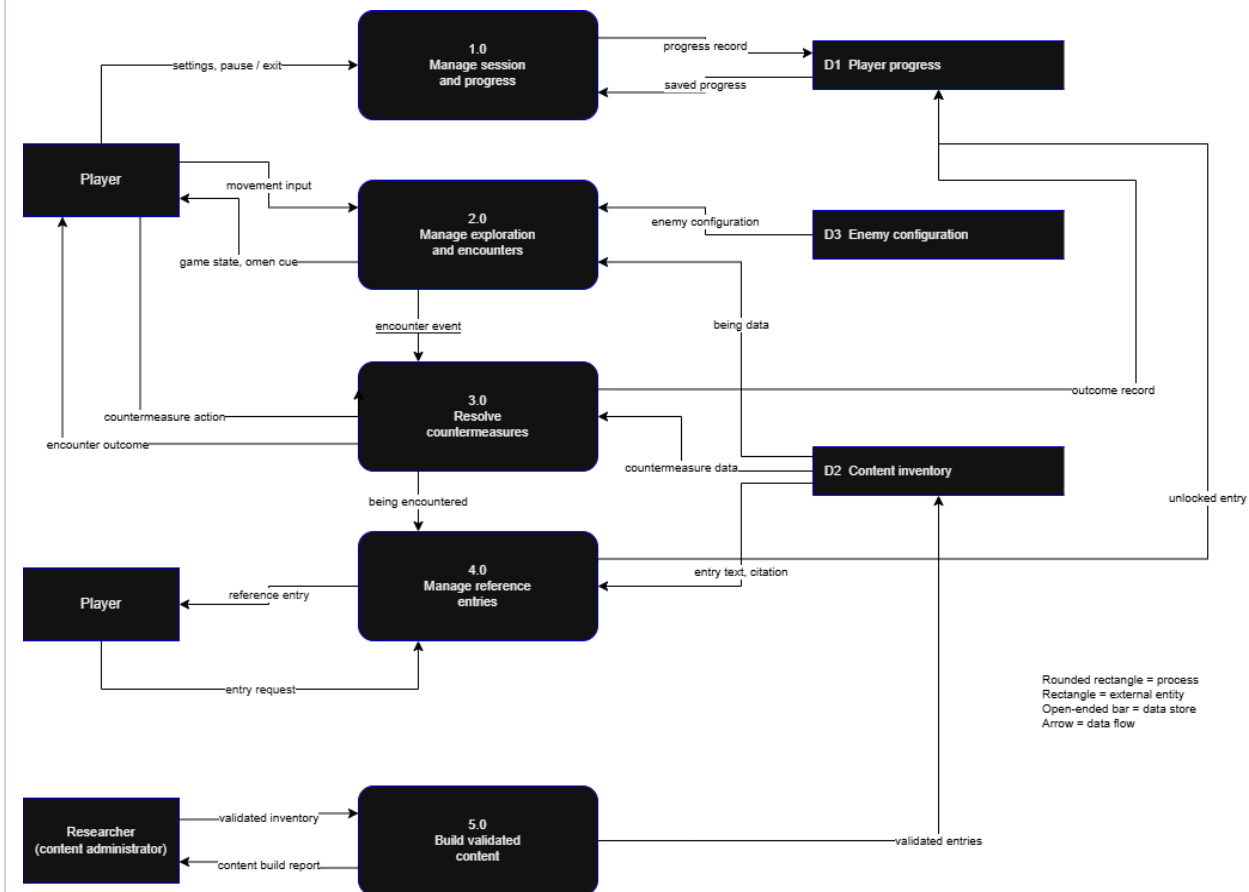


Table 4. *Level 1 Processes and Data Stores*

Process	Reads	Writes
P1 Session and progress management	D1 Player progress	D1 Player progress
P2 Exploration and encounter management	D2 Content inventory; D3 Enemy configuration	Encounter events to P3
P3 Countermeasure resolution	D2 Content inventory	Encounter outcomes to P1
P4 Reference management	D2 Content inventory; D1 Player progress	Unlocked entries to D1

D1 Player progress is written one record per player through Roblox's DataStore service, which the Level 0 diagram treats as an external platform service and the Level 1 diagram represents as the data store itself. D2 Content inventory and D3 Enemy configurations are static and read-only at runtime; D2 is populated once by process 5.0 before any evaluation session, so that only entries retained through Stage 1 validation reach the build.

Entity-relationship model. The logical data model has six entities (Table 5). Because Roblox's DataStore service stores key–value records rather than relational tables, the model is logical: static entities are implemented as read-only data tables inside the game, and player progress as one key–value record per player.

Figure 5. Entity-Relationship Diagram

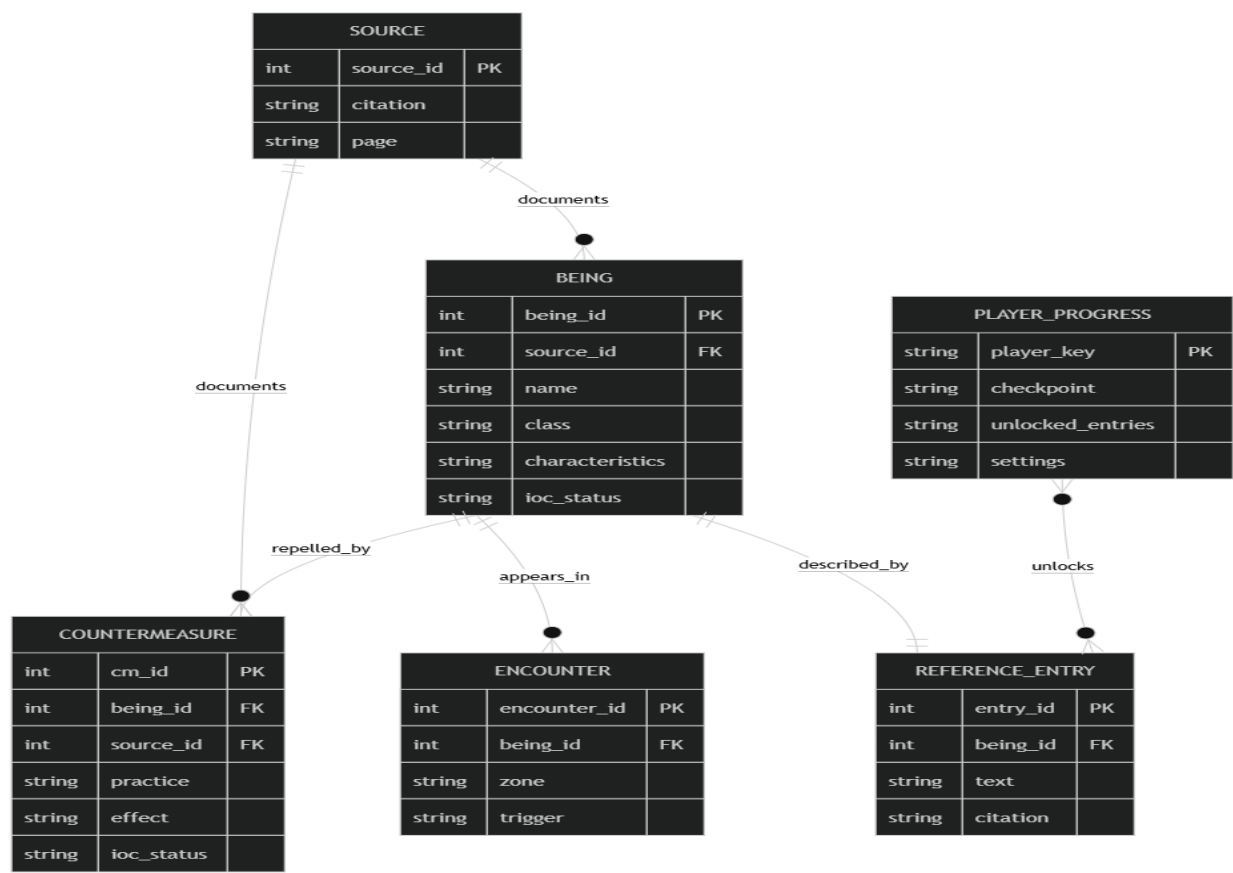


Table 5. Logical Entities

Entity	Key attributes	Relationships
SOURCE	source_id, citation, page	Supports many beings and countermeasures
BEING	being_id, name, class, characteristics, ioc_status, source_id	Has many countermeasures and encounters; has one reference entry
COUNTERMEASURE	cm_id, being_id, practice, effect, ioc_status, source_id	Belongs to one being
ENCOUNTER	encounter_id, being_id, zone, trigger	Belongs to one being
REFERENCE_ENTRY	entry_id, being_id, text, citation	Belongs to one being
PLAYER_PROGRESS	player_key, checkpoint, unlocked_entries, settings	Unlocks many reference entries

3.4 System Design Specification

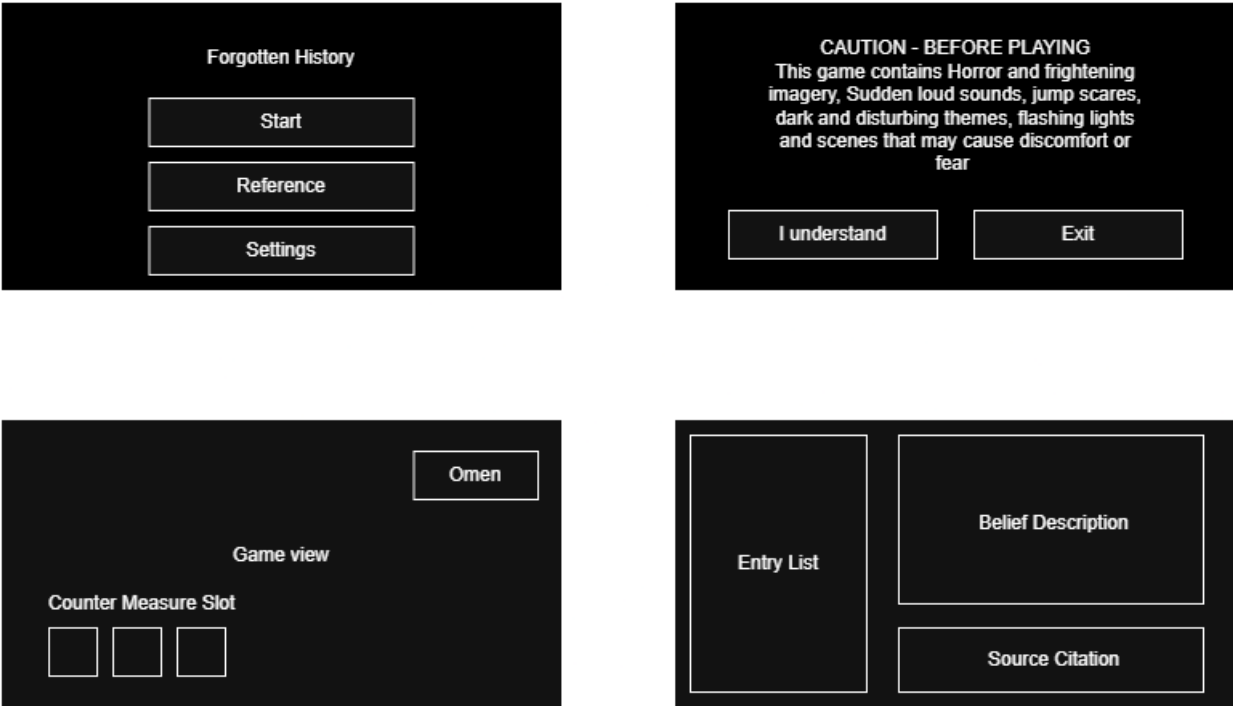
Logical specification. The game comprises six modules (Table 6).

Table 6. *System Modules*

Module	Responsibility
Session Manager	Loads and saves progress; applies settings; handles pause and exit
Encounter Director	Places encounters by zone and paces threat, alternating tension with calm intervals
Enemy Behavior	Runs each enemy through its states: idle, alert, pursuit, repelled, retreat
Countermeasure System	Tracks acquired countermeasures and resolves their effects one-to-one
Reference System	Unlocks and displays entries with citations
Interface	Main menu, content advisory, heads-up display, reference screen, pause menu, settings

Enemy behavior follows a finite state machine. An enemy idles until a trigger moves it to alert, during which its omen cue plays; it then pursues the player. The correct countermeasure moves it to repel and then retreat; any other action has no effect. The Encounter Director enforces calm intervals between encounters so that tension rises and falls rather than accumulating, following the pacing recommendation of Savino et al. (2025). The heads-up display shows countermeasures and an unobtrusive omen indicator; the reference screen lists unlocked beings with their citations.

Figure 6. *UX/UI wireframe*



Physical specification. The game is built in Roblox Studio using the Luau scripting language, with progress persisted through the Roblox DataStore service and the experience hosted on Roblox servers. Players reach it through the Roblox client on Windows PC and Android. Performance is measured on two minimum test devices, one Windows laptop and one mid-range Android smartphone, both meeting Roblox's published minimum requirements. Development uses Roblox Studio collaborative editing with place version history, and during evaluation the experience remains private to researcher-owned evaluation accounts.

3.5 Implementation

Code organization. The game follows Roblox's client–server model. Server scripts own enemy behavior, countermeasure resolution, and persistence, so that outcomes cannot be altered from the client; client scripts handle input, camera, audio, and interface. Clients request actions through remote events, and the server validates each request before applying it. Shared module scripts hold the content data tables and common utilities.

Content pipeline with a validation gate. Each retained inventory entry is converted into a data record that carries its citation and IOC status. At load time the build includes only records whose status is retained, so content that failed or skipped validation cannot appear in the game. An entry revised after Stage 2 must be re-rated before its record is restored.

Persistence. Progress is written to the DataStore at checkpoints and on exit, with retries on failure so that a transient service error does not lose progress.

Content maturity and access. Before any participant plays, the researchers complete Roblox's content maturity questionnaire, confirm the Moderate label, and keep the experience private to researcher-owned evaluation accounts. Roblox restricts the playability of experiences that lack complete content maturity information (Roblox Corporation, n.d.), so this step is a precondition for evaluation.

Data migration. No legacy data exists; the only data loaded into the system is the validated content inventory.

3.6 Testing and Evaluation

Alpha testing. The researchers execute the black-box test cases derived from FR1 to FR10 and record each as passed or failed, following the procedure of Mu'Ammar et al. (2025); all cases must pass before beta. Frame rate is measured on both minimum test devices during scripted encounter sequences using Roblox's built-in developer tools.

Content validation. The three cultural experts rate each item +1 (congruent with its source), 0 (uncertain), or −1 (incongruent) at two stages. Stage 1 rates inventory entries against their sources; Stage 2 rates each entry's in-game representation against the validated entry. The index for each item is:

$$\text{IOC} = \Sigma R / N$$

where ΣR is the sum of the experts' ratings and N is the number of experts. Items with $IOC \geq 0.67$ are retained. With three raters the index moves in steps of one-third, so this criterion retains exactly the items that at least two experts rate congruent and none rates incongruent. Items below it are revised and re-rated, or excluded from the build.

Software-quality evaluation. The questionnaire covers four ISO/IEC 25010:2023 characteristics (Table 7). Compatibility, security, maintainability, flexibility, and safety are excluded because they require code inspection or deployment conditions that play sessions cannot observe. Before administration, the IT expert panel reviews each item for congruence with its subcharacteristic, and the instrument is pilot-tested with at least 20 students outside the sample; internal consistency is accepted at Cronbach's $\alpha \geq 0.70$, the criterion applied by Wang and Men (2025).

Table 7. *ISO/IEC 25010:2023 Characteristics and Subcharacteristics Evaluated*

Characteristic	Subcharacteristics assessed
Functional suitability	Functional completeness, functional correctness, functional appropriateness
Performance efficiency	Time behaviour, resource utilization
Interaction capability	Appropriateness recognizability, learnability, operability, user error protection, user engagement, self-descriptiveness
Reliability	Faultlessness, availability, fault tolerance, recoverability

Statistical treatment. Responses are summarized by weighted mean:

$$\bar{x}_w = \Sigma(f \cdot w) / n$$

where f is the frequency of each response, w its scale value, and n the number of respondents. Means are computed per item, per subcharacteristic, and per characteristic, separately for students and IT experts, and interpreted with Table 8, whose intervals of 0.80 divide the range from 1 to 5 into five equal classes. The black-box pass rate is the number of passed cases divided by the total, expressed as a percentage.

Table 8. *Interpretation Scale*

Mean range	Response	Interpretation
4.21–5.00	Strongly agree	Highly acceptable
3.41–4.20	Agree	Acceptable
2.61–3.40	Neutral	Moderately acceptable
1.81–2.60	Disagree	Slightly acceptable
1.00–1.80	Strongly disagree	Not acceptable

Acceptance criteria. The build is considered ready when all black-box cases pass, every retained content item has IOC ≥ 0.67 at both stages, the frame-rate requirement holds on both test devices, and each ISO/IEC 25010:2023 characteristic reaches a mean of at least 3.41 from both evaluator groups. A characteristic falling below this level is revised, and the result is reported together with the revision made.

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