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Development of a Digital Professional Competency and Career Intelligence Platform for Library and Information Science in Nigeria

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Method Article

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Development of a Digital Professional Competency and Career Intelligence Platform for Library and Information Science in Nigeria

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Highlights

- Eight-domain, 32-competency LIS competency framework for Nigeria
- Competency-Career Intelligence Model treats the role-relative gap as key
- Rule-based traceable inference: 27 role rules and 96 domain weights
- Prototype passed all 12 functional requirements in end-to-end testing
- No integrated Nigerian LIS competency platform found in 2022-2026 review

Abstract

This study develops and evaluates a digital professional competency and career intelligence platform, the NALISE LIS Professional Hub, for Library and Information Science (LIS) education and practice in Nigeria. Design Science Research combined with secondary requirements analysis was used to move from problem identification and competency framework construction through prototype development to evaluation. The study is bounded to secondary data: no survey, interview or field deployment was conducted and no human participants were recruited. Structured documentary analysis of literature and professional association frameworks published between 2022 and 2026 yielded an eight-domain LIS competency framework of 32 competencies, twelve career pathways, twenty-seven competency-to-role rules and a twelve-by-eight matrix of weighted domain importance. The Competency–Career Intelligence Model, the study's principal conceptual contribution, formalises competency development as a closed loop in which the role-relative difference between required and current competency constitutes the operative quantity, is translated into a development need, matched to continuing professional development (CPD) activity, and returned as an updated competency profile. The model was implemented as a minimum viable product on a PHP 8 and MySQL stack using rule-based, fully auditable inference. Functional conformance testing confirmed all twelve derived

functional requirements, and appraisal against criteria derived from the secondary literature supports the framework's coverage and the artefact's design. The study contributes an integrated, evidence-traceable competency-to-career infrastructure for the Nigerian LIS profession and a transferable design pattern for professional association competence infrastructure elsewhere

Keywords: Library and Information Science; Professional Competency; Career Intelligence; Continuing Professional Development; Digital Platform; Librarianship; NALISE

1. Introduction

The nature of librarianship has changed within a single professional generation. Work once centred on print collection management, cataloguing and desk reference has shifted toward digital libraries, institutional repositories, research data services, discovery systems and data-intensive scholarship. Ashiq, Jabeen and Mahmood (2022) document how the COVID-19 pandemic compelled rapid service transformation, converting physical reference interaction into mediated digital practice, and Chisita and colleagues (2022) record comparable remaking of academic library services in Zimbabwe. What the pandemic accelerated is now structural: Adarkwah and colleagues (2024) trace African academic libraries across pre-pandemic, post-pandemic and generative AI eras and find digital transformation has become an expected condition of professional competence.

Three forces now shape demand for librarian competence. The first is artificial intelligence as both object of study and component of service infrastructure; Cox (2024) examines how academic librarian competencies must be reconfigured for AI, and Johnson, Owens, Menendez and Kim (2024) show generative systems already reshaping library instruction. The second is the growth of research support and scholarly communication as core functions, with librarians supporting open science, data-intensive research and bibliometrics. The third is the normative shift from static qualification to continuous competency development, now embodied in the American Library Association core competences updated in 2022 and adopted in 2023 (American Library Association, 2023) and in the proliferation of AI-specific competency statements since 2024 (Ali and Richardson, 2025).

The competencies increasingly required span digital libraries, information management, AI and emerging technologies, research support, data management, scholarly communication, information literacy, digital preservation, knowledge organisation, and leadership. Makhafola, Van Deventer, Holmner and Van Wyk (2025) map the contested boundaries of digital literacy, competence, fluency and dexterity in academic libraries; Kavak and Gültekin (2026) evidence the relationship between digital competency and AI literacy among academic librarians;

and Harper and Groth (2025) demonstrate that existing librarian skillsets do not meet AI-driven job requirements.

2 Problem Statement

The problem is not that Nigerian librarians lack competencies. Aliyu Ango (2024) found meaningful digital skills alongside persistent access constraints among 301 university librarians in north-central Nigeria, and Odusanya and Adeyeye (2024) documented strong ICT skills among Ibadan research-institute librarians. Ogunjimi, Oladokun, Okeke and Adefila (2026) show Nigerian LIS curricula being renegotiated in response to changing roles. The deficiency is one of infrastructure, not effort. Five gaps motivate the study.LIS competencies are distributed across curricula, association frameworks, job descriptions and training programmes without representation in one machine-readable system. Hu, Ocepek, Downie and Barker (2022) derived a consolidated competency picture by manual analysis; Awan, Soroya and Azhar (2026) built a four-element framework from systematic review. Both remain static documents rather than operational structures.

Studies have also indicated that qualifications, skills, experience, certifications, CPD and specialisations are scattered across curricula vitae, paper certificates and institutional records that no third party can verify. Mazzocca and colleagues (2025) survey the verifiable credential infrastructure that could make such claims portable, while Varadarajan, Koh and Daniel (2023) identify persistent obstacles to credential portability and recognition. Furthermore, there is limited infrastructure through which an LIS student or professional can systematically compare current competency against required competency for a specific role; generic skills-gap literature offers no LIS-specific instrument (Rikala, Braun, Järvinen, Stahre and Hämäläinen, 2024).

Continuing Professional Development, internships, employment routes and pathways are equally distributed across independent sources. Nakaziba and Ngulube (2025) found CPD across African academic libraries abundant but uncoordinated, while Sulyman, Usman and Badmus (2023) identified employability investment as urgent without an operational mechanism. Without aggregated competency-level data, an association cannot identify emerging skill demand, quantify population-wide gaps or target curriculum and CPD intervention. And that is the gap this study intended to bridge.

3 Aim, Objectives and Research Questions

The aim is to develop a digital professional competency and career intelligence platform for LIS education and practice in Nigeria, treating the platform and its supporting framework as inseparable outputs of one research problem (Delport, Von Solms and Gerber, 2024). The objectives are to identify the professional competencies required for emerging Nigerian LIS practice; to develop a competency and career intelligence framework mapping competencies to roles, pathways and CPD; to design and develop a functional prototype of the NALISE LIS Professional Hub; and to evaluate the prototype's functionality, usability and

perceived usefulness. Corresponding research questions ask what competencies are required; how competencies may be mapped to roles, pathways and CPD; what features should constitute such a platform; and what the prototype's functionality, usability and usefulness are. This yields a clean identify → framework → develop → evaluate sequence.

4 Significance and Scope

For students and early-career professionals the study converts an abstract career question into a sequenced development plan. For practising librarians and educators it supplies a defensible instrument for evidencing professional standing, addressing the employability deficit Sulyman, Usman and Badmus (2023) identify. For NALISE it establishes a mechanism for the aggregated competency intelligence the association currently lacks, supporting the capacity-building role described by Ebong, Ogwo and Nwachukwu (2022). The study is bounded: it addresses the Nigerian LIS context, produces a minimum viable product rather than a national deployment, deliberately employs rule-based rather than learned inference to preserve academic explainability and MVP feasibility (Gunwant, Pande and Bisht, 2022), and reports modest, exploratory evaluation as such.

2. Literature Review

2.1 Changing Nature of Librarianship

Transformation from custodial to digitally mediated, research-integrated practice is well established. Ashiq, Jabeen and Mahmood (2022) find that pandemic-driven transformation produced lasting changes in expectations and service design, and Chisita and colleagues (2022) show service remaking shifting librarians toward mediated digital support. Adarkwah and colleagues (2024) extend this to generative AI, framing African transformation as a three-stage journey introducing not only new capability but new evaluative and ethical demands. White, Ahenkorah-Marfo and Bortye (2023) argue post-pandemic digital librarianship requires deliberate strategy rather than reactive adoption.

2.2 Next-Generation Information Professionals

Zeynali-Tazehkandi, Nowkarizi and Budd (2025) identify essential soft skills for LIS students, complementing the technical inventory of Dube, Rammutloa and Matatiele (2024), whose review of 27 empirical studies identifies the IT competencies academic librarians are required to hold. Munshi, Biswas and Barsha (2023) show measured digital literacy self-efficacy predicts materially different practice from assumed competence, validating self-report instruments of the type used here. Hamad, Al-Fadel and Shehata (2023) show digital competency predicts capacity to deliver smart information services. Awan, Soroya and Azhar (2026) integrate these into a four-element framework spanning policies, stakeholders, competencies and methods. Competency is thus multidimensional, context-sensitive and measurable - but not machine-operable.

2.3 LIS Professional Competencies

Two approaches coexist. The normative derives competencies from association policy, producing authoritative but slowly changing lists: the ALA core competences (American Library Association, 2023) and the cataloging and metadata competencies of Evans and colleagues (2023), with Sanders and Snow (2025) noting practitioners' alignment with such standards is unevenly realised. The empirical derives competencies from practitioner evidence: Hu, Ocepek, Downie and Barker (2022) foregrounded practitioner voice in derivation, and Ogunjimi and colleagues (2026) applied curriculum and student analysis to detect role change in Nigeria specifically. Santos-Hermosa and Atenas (2022) extend competency definition into open knowledge practice. Neither approach yields a data structure.

2.4 Emerging Digital and AI Competencies

AI competency now supports instrument development. Wang, Rau and Yuan (2023) validated an AI literacy scale for user competence; Koch, Carolus, Wienrich and Latoschik (2024) produced a Meta AI literacy scale; Ning and colleagues (2025) developed a teacher-focused instrument; and Lintner (2024) reviewed AI literacy scales, finding convergent measurement structure. Within LIS, Ali and Richardson (2025) scoping-reviewed AI literacy guidelines; Chigwada (2024) proposed an AI digital literacy course framework; Zhang, Wang, Ye and Khamo (2025) proposed critical AI literacy for academic librarians; Alam, Subaveerapandiyan, Mvula and Tiwary (2024) surveyed AI literacy among Zambian librarians; and Mirza and Arif (2026) systematically reviewed AI literacy integration in instruction. Bridges, Lopezosa, Centelles Velilla and Ferran-Ferrer (2025) found critical AI literacy weak across LIS curricula, while Harper and Groth (2025) demonstrated skillset mismatch against AI labour demand. Nigerian evidence is emerging: Oyetola, Oladokun and Dogara (2024) reported Nigerian LIS educators' perceptions of AI adoption, and Adeyemi and colleagues (2025) documented big data applications in Nigerian academic libraries. The instruments exist; their application as continuous career-linked self-assessment for Nigerian practitioners does not.

2.5 LIS Career Development and Continuing Professional Development

Career development research in LIS is largely qualitative, addressing mobility, gender and leadership rather than instrumented pathways. Ashiq and Warraich (2023) analyse strategies for female professionals to attain leadership; Ambrose, Ailakhu and Hassan (2025) document Nigerian librarianship trends. CPD is well established as necessary and poorly coordinated as a system. Nakaziba and Ngulube (2025) found variation in CPD approach without alignment to competency measurement, and Moonasar (2024) frames CPD against changing academic library work. Nigerian evidence confirms demand and fragmentation: Anene and Idiedo (2023) examined participation in online CPD workshops in Nigeria; Ebong, Ogwo and Nwachukwu (2022) evaluated CPD as empowerment for LIS educators; Wusa, Muttee and Mutwiri (2022) reviewed continuous staff development as a route to online competency acquisition; and Sulyman, Usman

and Badmus (2023) identified the Nigerian Library Association, the Librarians Registration Council of Nigeria, the National Library of Nigeria and NALISE as the recognised agents for such investment. The missing link is a mechanism connecting a measured competency gap to a recorded, credentialed CPD response.

2.6 Professional Profiles, Skills Portfolios and Gap Analysis

The professional passport has technical precedent. Breen, Waters and O'Shea (2022) demonstrated library-led digital literacy programmes that build portfolio capability; Varadarajan, Koh and Daniel (2023) documented micro-credential obstacles; and Mazzocca and colleagues (2025) surveyed the decentralized identifier and verifiable credential substrate on which trustworthy portable profiles can rest. Sharma and Singh (2024) established UTAUT-based measurement of AI adoption intention, supporting acceptance-oriented evaluation, while Alduaij, Alterkait and Alainati (2024) applied the DeLone and McLean model to information system success evaluation, informing the multi-dimension instrument used here. Generic skills-gap research provides the analytic method: Rikala, Braun, Järvinen, Stahre and Hämäläinen (2024) found gap definition depends critically on the reference standard chosen, which is why the model below carries role-specific required levels rather than absolute scores.

2.7 Digital Platforms for Professional Development and Literature Gap

Evidence for integrated professional-association competence infrastructure is thin internationally. Santos-Hermosa and Atenas (2022) provide capacity-building recommendations, not an implemented platform; Harper and Groth (2025) diagnose the capability gap without an instrument to close it. Nearest analogues lie outside LIS: micro-credential and verifiable credential infrastructures (Varadarajan, Koh and Daniel, 2023; Mazzocca et al., 2025) and career guidance expert systems (Gunwant, Pande and Bisht, 2022). Available LIS systems address adjacent problems discretely — repositories manage publication output, learning platforms manage course completion, management systems catalogue holdings, membership registers record affiliation — and none provides the closed loop from required competency through measured gap to credentialed development. Systematic searching of 2022–2026 literature identified no integrated platform for the Nigerian LIS profession combining competency profiling, competency-gap analysis, career pathway matching and CPD intelligence. A targeted search for a functioning Nigerian CPD or competency platform returned only professional bodies and one-off workshops; no peer-reviewed 2022+ study of a deployed Nigerian platform was found. This is reported as absence of evidence, not proof of non-existence, and is consistent with the fragmentation documented across Nigerian LIS literature.

3. Conceptual and Research Framework

3.1 The Competency–Career Intelligence Model

The study's central contribution is the Competency–Career Intelligence Model (CCIM), a closed-loop model of professional competence development. It asserts that competency is not an attribute a practitioner possesses but a relationship between a required standard and a demonstrated current level, and that the operative quantity for development is therefore the difference between the two:

$$\textbf{Gap(i) = Required(i) − Current(i)}$$

where Required(i) is the level at which competency i is required for a target role and Current(i) is the practitioner self-rating on a five-point scale. Five transformations follow: required plus current competency yields a competency gap, which becomes a development need, which is matched to CPD, training or experience, yielding updated competency, then career readiness, then career progression. Two decisions distinguish this from a generic skills inventory. First, Required is role-relative rather than absolute, because the same competency is critical for one pathway and peripheral for another. Second, the model is iterative: completion returns an updated Current(i), regenerating the gap and permitting the loop to continue. This is the formal justification for storing longitudinal assessment history rather than a single score. A necessary consequence, easily overlooked and expensive to retrofit, is that changes to required levels must preserve the interpretability of past assessments; the implementation therefore persists gap values at assessment time rather than recomputing them.

Table 1. Competency gap bands and development action.

Gap value	Band	Development action
0	No development need	None required
1	Low development need	Monitor; no immediate action
2	Moderate development need	Targeted short CPD recommended
3	High development need	Priority development area
4 or more	Critical development need	Immediate structured development plan

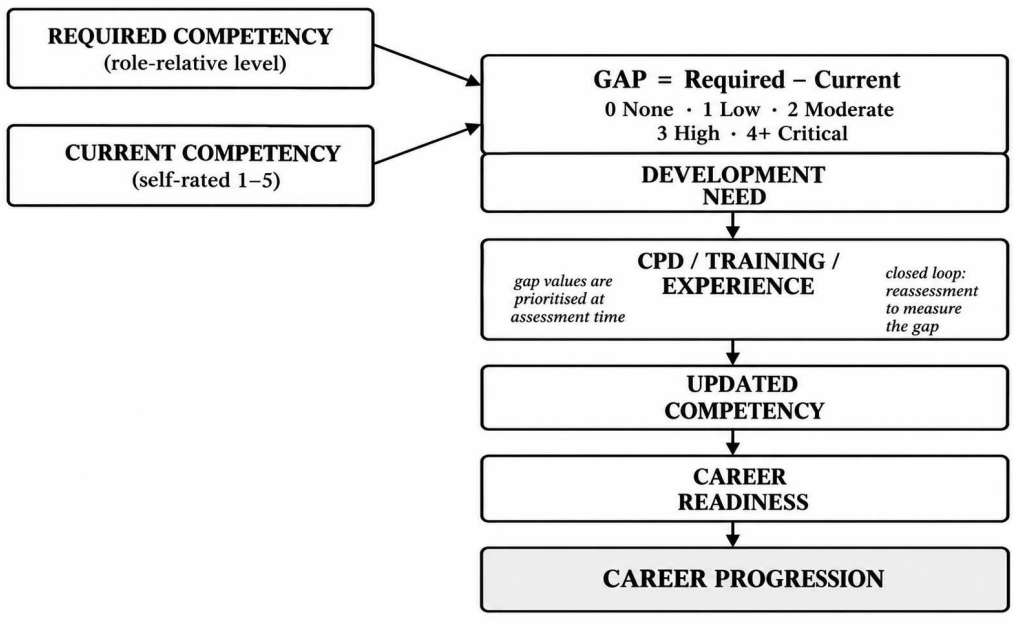


Fig. 1. Competency gap analysis model: the differencing operation and the closed development loop.

3.2 The Conceptual Framework

Fig. 2 situates the CCIM within the wider argument. An emerging LIS environment generates required competencies; these are organised into a competency framework; the framework branches into career roles and CPD requirements; these are formalised as digital intelligence and realised in the NALISE LIS Professional Hub. The hub produces three artefacts such as professional profile, competency assessment, and career/CPD pathway, converging on skills-gap analysis, driving professional development, career progression and, in aggregate, a stronger next generation of LIS professionals.

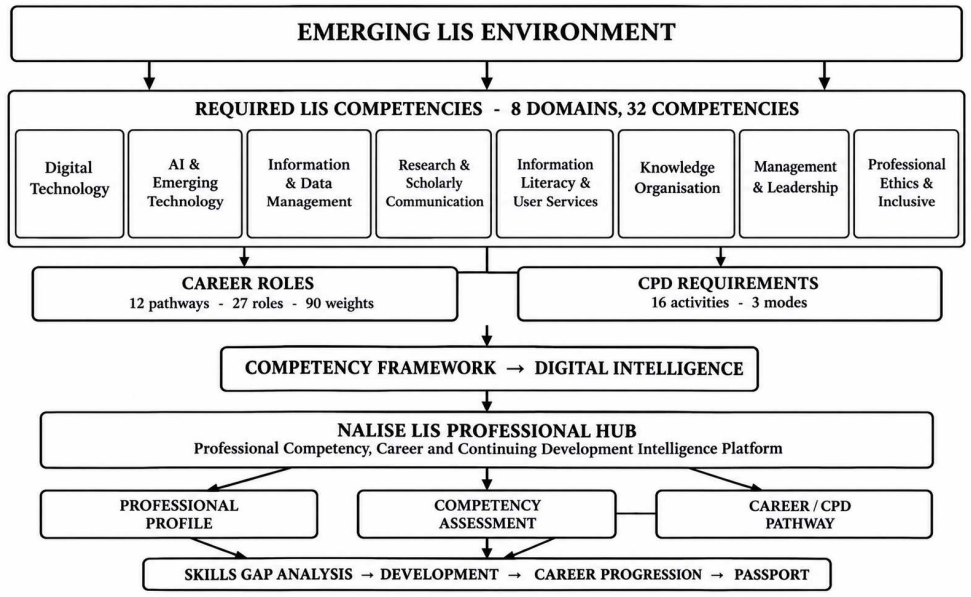


Fig. 2. LIS Professional Competency–Career Intelligence Framework.

3.3 Requirements the Framework Must Satisfy

The framework is constrained by six requirements, each becoming a design obligation in Section 5. R1 Integrative: competencies, roles, required levels and CPD must reside in one queryable relational structure. R2 Role-relative: required levels attach to competency–role pairs so gap computation is defined against a target role. R3 Longitudinal: multiple assessments per user must be retained so competency change is measurable. R4 Traceable: every recommendation must be explainable by reference to the specific rule, weight or gap producing it. R5 Verifiable: a user-facing credential must be independently checkable. R6 Aggregable: individual records must support population-level aggregation without exposing personal data. Requirement R4 is why the intelligence layer is rule-based: explainability is worth more than predictive accuracy at MVP maturity. R5 anticipates the verifiable credential infrastructure of Mazzocca and colleagues (2025) while remaining implementable without external trust infrastructure.

4. Methodology

4.1 Research Design

The study adopted Design Science Research combined with a secondary requirements analysis, because the contribution is an artefact and the framework specifying it. Activity sequences follow Delport, Von Solms and Gerber (2024);

Tuunanen, Winter and vom Brocke (2024) argue for explicit management of design complexity across research echelons, which this study addresses by sequencing framework construction before implementation. Eight activities were executed: problem identification; secondary requirements identification; competency framework construction; system design; prototype development; demonstration; evaluation; refinement.

The study is bounded to secondary data. No primary empirical data were collected: no survey, interview, questionnaire or observation was administered, and no human participants were recruited, sampled or assessed. All requirements, domains, competencies, role definitions, required levels, weighting decisions and evaluation criteria were derived from published literature and professional association frameworks through structured documentary analysis. The prototype was then built and verified against those derived requirements.

4.2 Unit of Analysis and Secondary Data Boundary

The unit of analysis is the published document. The analytical corpus comprised peer-reviewed journal articles, conference proceedings and professional association publications published between 2022 and 2026, restricted to Library and Information Science, information literacy, digital and artificial intelligence competency, career development and continuing professional development. No population of people was sampled, so no sampling frame, sample size or representativeness claim applies.

Three user categories are represented in the artefact design - LIS educators, practising librarians and LIS students - because the literature identifies them as the principal competency-development populations, not because individuals from those categories participated. The demonstration dataset seeded into the prototype is synthetic, generated by the researchers to exercise every code path; it is development test data and is not participant data, is not included in any reported result, and must not be read as a sample of Nigerian LIS professionals. Secondary actors - training provider, employer, system administrator and the public - appear in the use case model but were implemented in the MVP only as described in Section 5.

4.3 Secondary Data Collection

A single class of secondary data was used: **published literature and professional association frameworks from 2022 to 2026.** Sources were identified to identify emerging competencies, emerging and changed roles, AI and digital competencies and CPD requirements, covering Scopus- and ScienceDirect-indexed LIS journals, association publications (ALA, IFLA, ACRL), Nigerian LIS journals and Nigerian LIS association literature. The 2022 lower bound was imposed so that the framework reflects current practice rather than superseded guidance; a small number of foundational sources were retained where later work treats them as the reference point against which current practice is measured.

Extraction followed a structured protocol. Each source was read for four elements: competencies or skill statements; role or job definitions; assessment or measurement instruments; and stated development or CPD implications. Extracted elements were coded to a common schema, deduplicated, and consolidated into the eight-domain structure reported in Section 5.1. Where sources disagreed, the disagreement was recorded and resolved by retaining the distinction as a differentiated competency rather than by averaging; the treatment of the Information and Data Management and Knowledge Organisation overlap in Section 6.2 is the worked example. Traceability from every framework element back to its source is maintained in the coding record, and no element was admitted without a source.

4.4 Software Development Approach and Technology Stack

An Agile minimum viable product approach was used: framework data was authored first and versioned in the database, the inference layer built and unit-checked against it, then learner interfaces, then administration and analytics. This ordering ensured the intelligence model was correct before any interface depended on it and made the framework independently reviewable as a research output. A deliberately conventional stack maximised deployability on the shared hosting realistically available to Nigerian professional associations and avoided a build toolchain a small association could not maintain: HTML5, CSS3, Bootstrap 5, vanilla JavaScript and Chart.js in the presentation layer; an installable Progressive Web App with a web manifest as the client platform; PHP 8 with PDO and prepared statements in the application layer; MySQL or MariaDB on InnoDB with foreign keys as the data layer, providing the referential integrity the framework relations require; session-based role-based access control for authentication, which meets the verifiability requirement without infrastructure overhead; and a conformance target of WCAG 2.2 Level AA (World Wide Web Consortium, 2023), directly relevant to Domain 8 and to the association's interest in an inclusive profession.

4.5 Evaluation Framework

Evaluation used two secondary-data-compatible methods; neither involves human participants. Functional conformance tests whether the built artefact performs the requirements derived in Section 4.3, by exercising each requirement end-to-end against the running system and recording the outcome. Conformance is a property of the artefact against a specification, so it is fully reproducible without a participant sample, and its evidence is the pass/fail record reported in Section 6.1.

Literature-criterion appraisal assesses the artefact and its framework against criteria derived from the secondary corpus: coverage of competencies the literature identifies as current; consistency of role definitions with published role descriptions; alignment of the measurement approach with established instrument-

development and information system success literature (Wang, Rau and Yuan, 2023; Lintner, 2024; Alduaij, Alterkait and Alainati, 2024); and stated accessibility expectations (World Wide Web Consortium, 2023). Each appraisal judgement in Section 6.2 and Section 6.3 is therefore traceable to a published source or to a documented artefact property, and is attributed accordingly.

Reliability and construct validity considerations follow Storey, Baskerville and Kaul (2025) and Baskerville, Pries-Heje and Venable (2026); the four-dimension criterion set is a structured appraisal framework rather than a validated psychometric scale, and is reported as such. No usability testing with users, no survey instrument and no statistical generalisation is claimed anywhere in this study.

5. Results and System Development

5.1 Identified Competencies

Structured documentary analysis of the secondary corpus produced eight competency domains containing 32 competencies, four per domain (Table 2). Each domain carries a baseline required level of 4, with level 5 reserved for competencies where professional formation demands mastery rather than proficiency: critical evaluation of AI-generated information, and professional ethics and privacy. The domain distribution gives structural expression to the literature — Domains 1, 2, 3 and 8 correspond to the digital, AI, data and ethical competency clusters identified by Dube, Rammutloa and Matatiele (2024), Kavak and Gültekin (2026), Harper and Groth (2025) and Awan, Soroya and Azhar (2026). Domain 8 is not peripheral: Archer-Capuzzo (2025) shows equity barriers within knowledge organisation standards themselves require competency responses, placing inclusion inside the competency set rather than in an ethics appendix.

Table 2. The NALISE LIS Professional Competency Framework.

#	Domain	Competencies
1	Digital Technology	Operate digital library systems and repositories; Manage library management systems (Koha/SLIMS); Deliver web-based library services; Apply digitisation workflows
2	AI and Emerging Technology	Demonstrate AI literacy for library services; Critically evaluate AI-generated information; Use generative AI for research support responsibly; Evaluate emerging technologies for adoption
3	Information and Data Management	Apply metadata standards (Dublin Core/MARC); Manage research datasets across lifecycle; Execute advanced information retrieval; Promote data literacy among users

#	Domain	Competencies
4	Research and Scholarly Communication	Provide literature search and systematic review support; Advise on scholarly publishing and open access; Apply bibliometric tools for evaluation; Support research data management plans
5	Information Literacy and User Services	Design information literacy instruction; Deliver responsive reference services; Evaluate information credibility with users; Manage digital user engagement services
6	Knowledge Organisation	Create catalogue records (RDA/MARC21); Apply DDC/LCC classification accurately; Build subject indexes and thesauri entries; Maintain authority control
7	Management and Leadership	Lead library teams and change initiatives; Manage projects with plans and budgets; Develop strategic and operational plans; Drive service innovation
8	Professional, Ethical and Inclusive Practice	Uphold professional ethics and privacy; Apply copyright and IP rules correctly; Ensure accessible services for all users; Champion diversity and inclusion

5.2 Requirements

Functional requirements (FR) trace to the R1–R6 constraints: registration capturing account, category, institution, qualification, professional status and specialisation (R1); professional profile management (R1); presentation of all 32 competencies for five-point self-assessment (R1, R2); gap computation, storage and labelling against required levels (R2); retention of full assessment history with change reporting (R3); scoring of all twelve roles by rule thresholds and weighted domain importance (R2, R4); CPD recommendation from identified gaps (R1, R4); CPD enrolment, completion, hours and certificate recording (R1); passport issuance with a unique verification code (R5); unauthenticated third-party passport verification (R5); aggregate administrator analytics (R6); and server-side role-based access control (R1).

Non-functional requirements follow directly. All user input is validated and all database access uses prepared statements to prevent injection. Passwords are stored as adaptive salted hashes. Authorisation is enforced server-side on every protected route to prevent privilege escalation. The interface is responsive from 320 px and targets WCAG 2.2 AA conformance. All inference is reproducible and inspectable by an administrator. The system deploys on shared cPanel or Linux VPS hosting with no build step. Assessment records are retained longitudinally and exportable.

5.3 Documentation Strategy: A Three-Stage Diagram Taxonomy

For a software artefact documented academically or presented to a client, diagrams are not incidental illustration but the primary evidence that the system was designed rather than improvised. They are therefore organised into three stages mirroring the engineering lifecycle: design, which states what the system is and how it is structured before code is written; development, which states how that structure was realised in classes, modules, tables and hosting; and use and operation, which states how the running system computes its answers, defends its boundary and meets external parties. Table 3 records the taxonomy, the purpose each diagram serves, and where it appears. Twelve conventional diagram types are covered; three further diagrams specific to this artefact are added because the research contribution and the deployment constraint make them load-bearing rather than decorative.

Table 3. Diagram taxonomy by development stage, with the figure that realises each type.

#	Diagram	Stage	Purpose	Realised in
1	System context	Design	The system, its external users and systems, and the information exchanged	Fig. 3
2	System architecture	Design	The major technical layers and components of the system	Fig. 4
3	Use case	Design	What each type of user can do	Fig. 5
4	User journey / flow	Design	How a user moves through the application	Fig. 6
5	Functional flow	Design	The major processes and their decision points	Fig. 7
6	Data flow (DFD)	Design	How data moves between users, processes, stores and external systems	Fig. 8
S1	Application site map	Design	The page inventory grouped by access role	Fig. 9
7	Entity relationship (ERD)	Development	Database entities, attributes and relationships	Fig. 10
8	Database schema	Development	Actual tables, fields, keys and constraints	Fig. 11
9	Class diagram	Development	Software objects and their relationships	Fig. 12
10	Component	Development	Major modules/components and their dependencies	Fig. 13

#	Diagram	Stage	Purpose	Realised in
11	Deployment	Development	Where the application, database and services are hosted	Fig. 14
12	API / integration	Use and operation	Communication between the app and external APIs and services	Fig. 15
S2	AI inference pipeline	Use and operation	Stage-by-stage inference and its deterministic fallback	Fig. 16
S3	Security layers	Use and operation	Defensive controls mapped to the threats they address	Fig. 17

Every diagram in this table was generated from the deployed artefact rather than sketched: the schema from the nineteen domain and framework ‘CREATE TABLE‘ statements, the component diagram from the actual file inventory and ‘require_once‘ graph, the class diagram from the two declared classes and their public interfaces, the site map from the page set and its access guards, and the security figure from the specific controls present in the code.

5.4 Stage One: System Design

The design stage establishes the system boundary before implementation. Fig. 3 places the platform in its environment, showing the four user categories and the external institutions with which information is exchanged, and separating exchanges implemented in the MVP from those reserved for later stages.

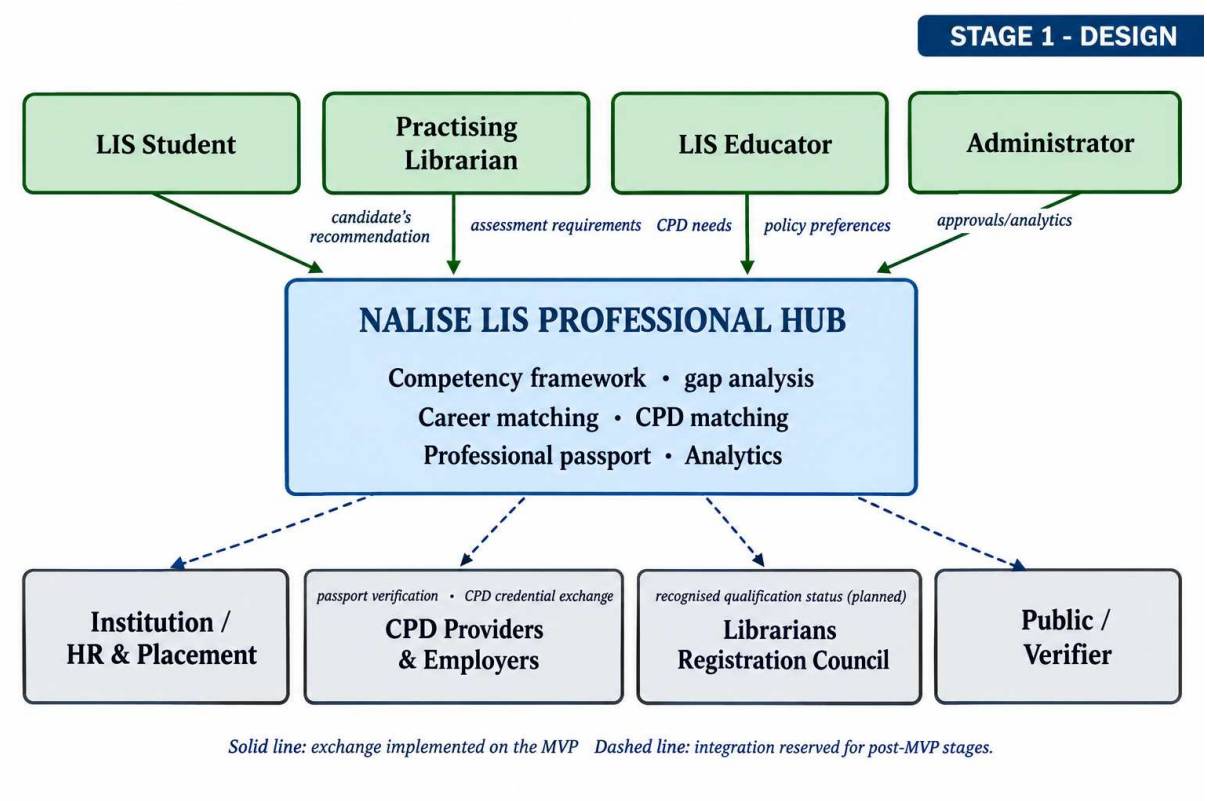


Fig. 3. System context diagram: users, external systems and information flows.

Fig. 4 gives the internal layering. The presentation layer is a responsive web and PWA interface. The application layer comprises authentication, profile management, and the competency, career, CPD and passport engines, plus analytics and administration. The data layer holds users, institutions, competency domains, competencies, assessments, assessment results, career roles, role competency rules, AI role weights, career paths, CPD activities, user CPD records, certificates, achievements and evaluations.

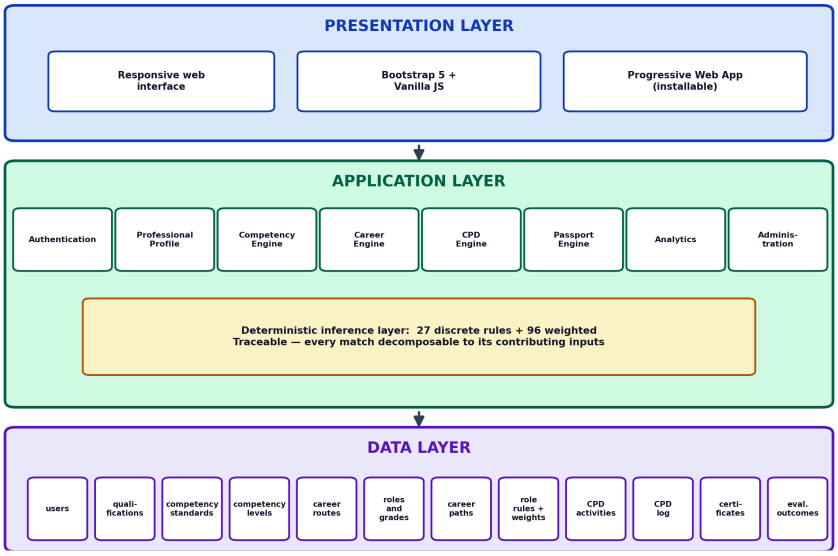


Fig. 4. NALISE LIS Professional Hub conceptual architecture (three-layer).

Fig. 5 presents the use case model. Primary actors are LIS Student, Librarian, LIS Educator and NALISE Administrator. The learner sequence is Register/Login → Create Profile → Assess Competencies → Analyse Competency Gap → View Career Pathways → Find CPD Opportunities → Track Development. The administrator sequence is Manage Framework and View Analytics → Manage Platform.

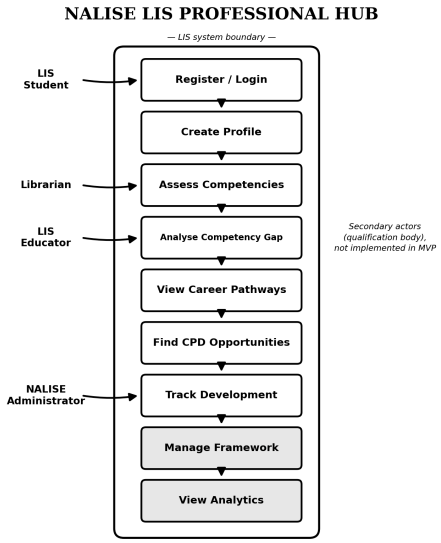


Fig. 5. Use case model for the NALISE LIS Professional Hub.

Fig. 6 traces the learner journey across three lanes - user action, system response and data written - and makes the closed loop explicit: the final re-assessment step is what returns an updated competency profile to the gap computation, so the journey is cyclic rather than terminal. It also shows that after registration the journey is entirely self-service; no administrator action is required for a user to progress, which is the operational property that makes national-scale adoption feasible without additional staffing.

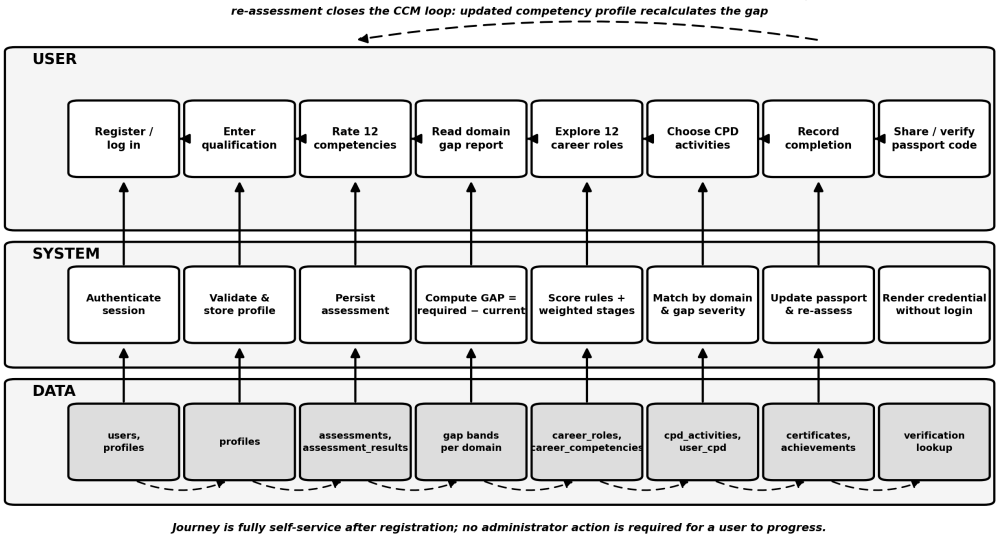


Fig. 6. User journey across user, system and data lanes, showing the closed competency loop.

Fig. 7 restates the same behaviour as a functional flow diagram in which the decision points are explicit rather than implied: whether the session is valid, whether a target role has been selected, and whether any unmet gap exists. The last decision is the model's operational hinge - it determines whether a user receives a CPD recommendation or is recorded as already eligible, and therefore whether the CCIM loop continues or closes.

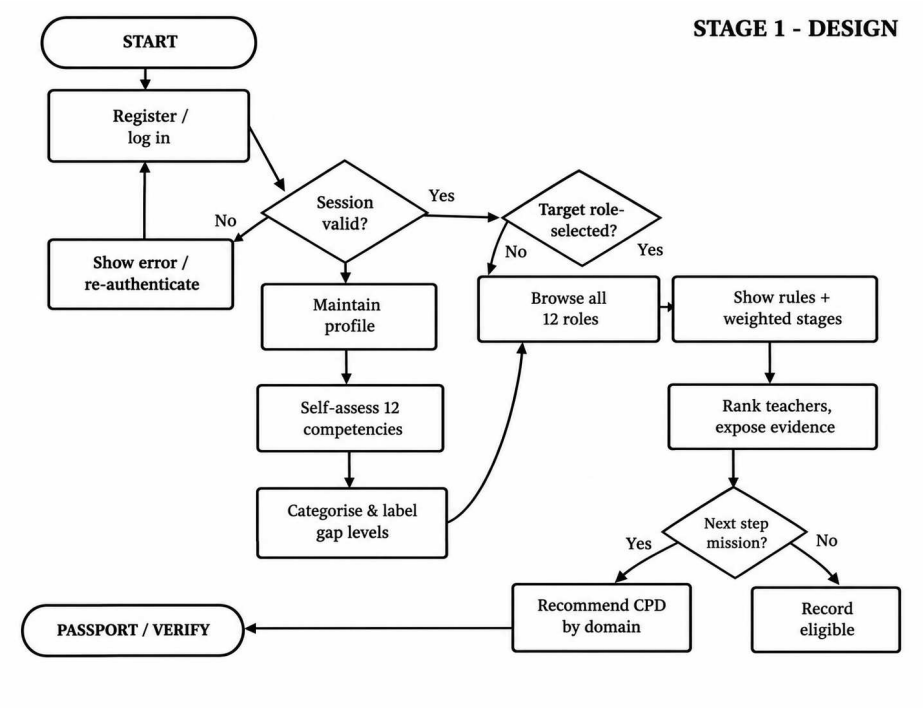


Fig. 7. Functional flow diagram with decision points.

Fig. 8 decomposes the same system into data flows between processes, stores and external entities. The diagram distinguishes the reference data stores - the competency framework and the role rules - which are written once at provisioning and thereafter read-only, from the learner-owned stores, written on every assessment and CPD event. That separation is what allows framework version control to be administered independently of user data.

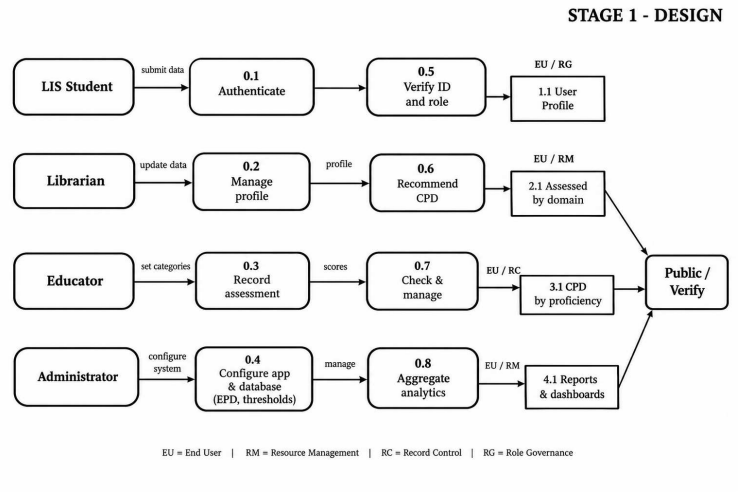


Fig. 8. Level 0 data flow diagram (EU=End User | RM=Resource Management | RC=Record Control | RG=Role Governance)

Fig. 9 gives the page inventory by access role, which is the view a client or association needs in order to verify coverage. The three columns correspond to three distinct guards in the code, not to three nominal user types: public pages, pages behind 'require_login()', and pages behind 'require_admin()', which returns HTTP 403 before any query executes. Fig. 9 is also how the administrator-only provenance of the framework data is made visible: 'install.php' provisions the schema and 'demo_seed.php' populates synthetic records, and neither is reachable by a learner.

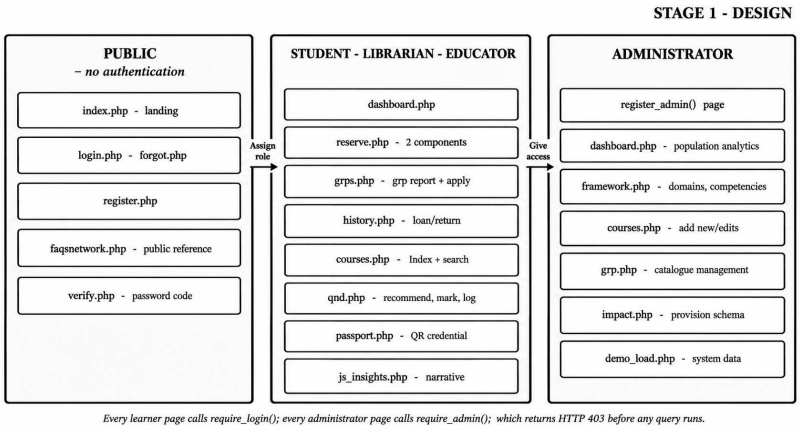


Fig. 9. Application site map grouped by access guard.

5.5 Stage Two: Development

The development stage documents how the design was realised. Fig. 10 is the entity-relationship model, in which a user links to one profile, to many assessments each with many results keyed to a competency; competencies belong to domains; career roles link to domains through competency-level requirements and weighted importance; and users accumulate CPD records, certificates and achievements.

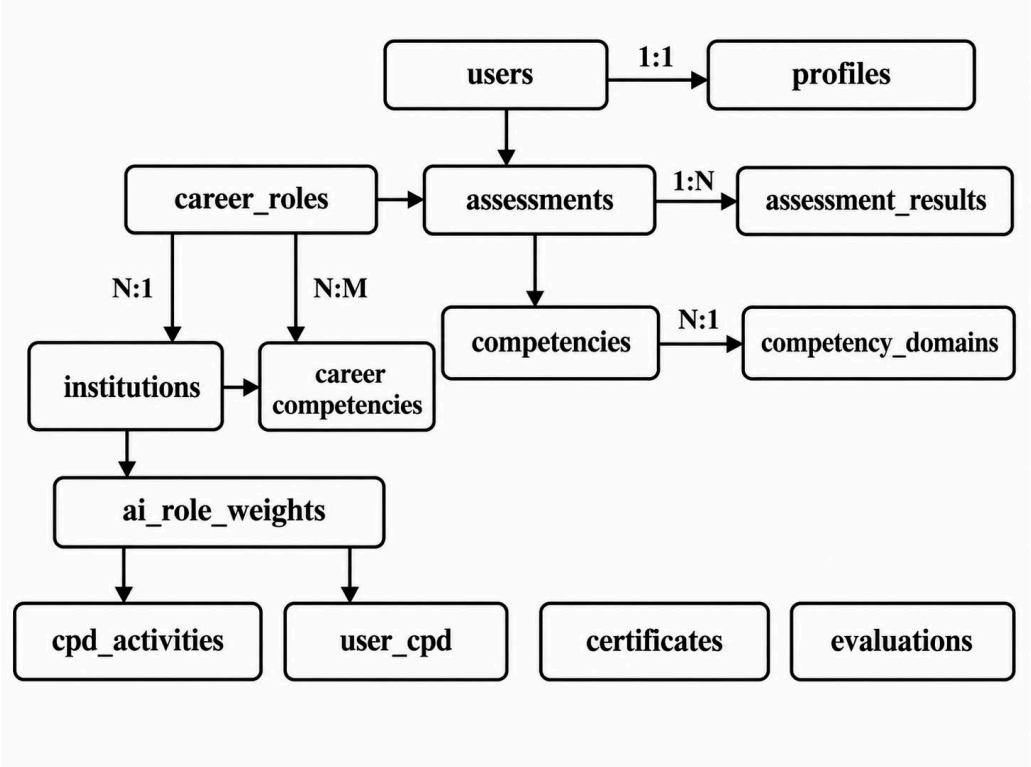


Fig. 10. Entity-relationship model.

Fig. 11 moves from the conceptual ERD to the physical schema, listing the nineteen deployed domain and framework tables with their keys and the fields that carry the research instrument. Four functional groups are visible: identity and access; the competency framework; assessment and career; and development and credentials. The schema is where the framework's integrity guarantees are actually enforced - InnoDB foreign keys mean a result row cannot reference a deleted competency and a rule cannot reference a deleted role, which is precisely the property that makes gap computation defensible over time.

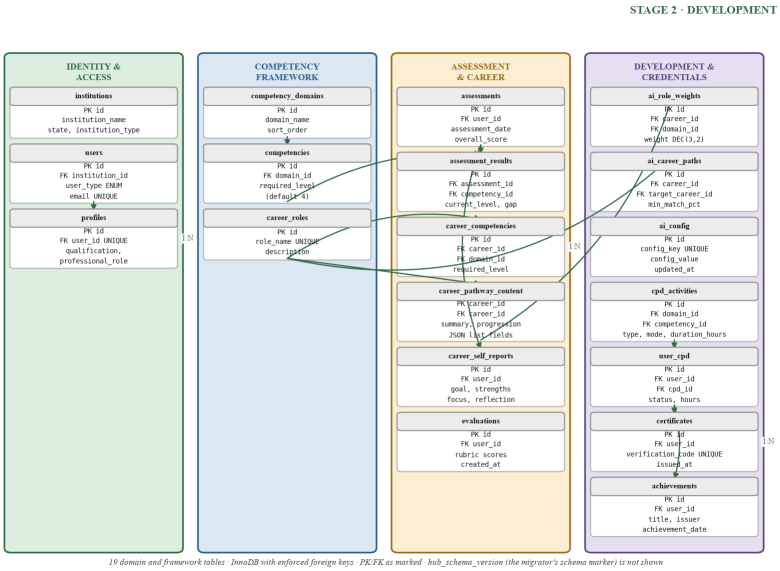


Fig. 11. Database schema: nineteen domain and framework tables grouped by function, with primary and foreign keys. The migrator's own ‘hub_schema_version‘ marker table is omitted.

Fig. 12 is the class diagram. Inspection of the codebase shows that the intelligence layer is genuinely object-oriented while the remaining twenty-three files are procedural: ‘AIService‘ is instantiated by the presentation layer and holds a composition of ‘AIModels‘ created in its constructor, exposes thirteen public methods covering the five inference stages, and reaches the database only through the shared ‘db()‘ PDO singleton. ‘AIModels‘ holds the weight and CPD keyword matrices as static arrays and exposes eleven static methods covering severity scoring, narrative and advice generation, strength and fit labelling, progression lookup and weight resolution. Because only these two types are objects, the class diagram is scoped to them; drawing a wider hierarchy would misrepresent the implementation, and ‘qrlib.php‘ and ‘lib.php‘ are shown as utility modules rather than invented classes.

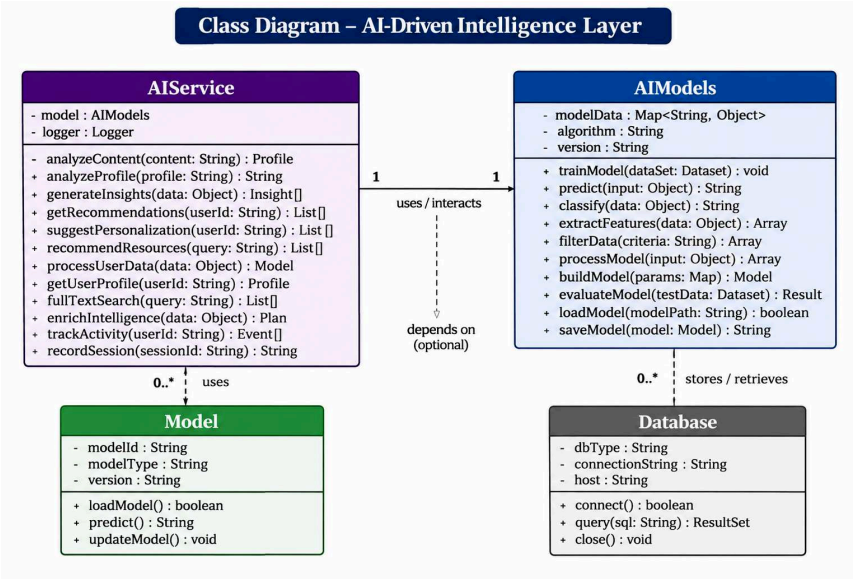
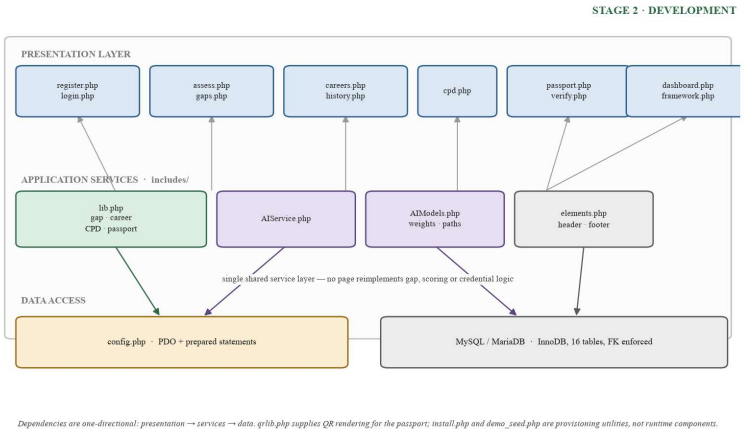


Fig. 12. Class diagram for the object-oriented intelligence layer.

Fig. 13 shows the component structure and, more importantly, the direction of dependency. All pages depend on a shared service layer and none reimplements gap, scoring or credential logic; the shared layer depends on the data tier through a single prepared-statement access path. This is the structural reason the auditable-inference requirement (R4) is achievable: there is exactly one implementation of the gap and scoring logic to inspect.

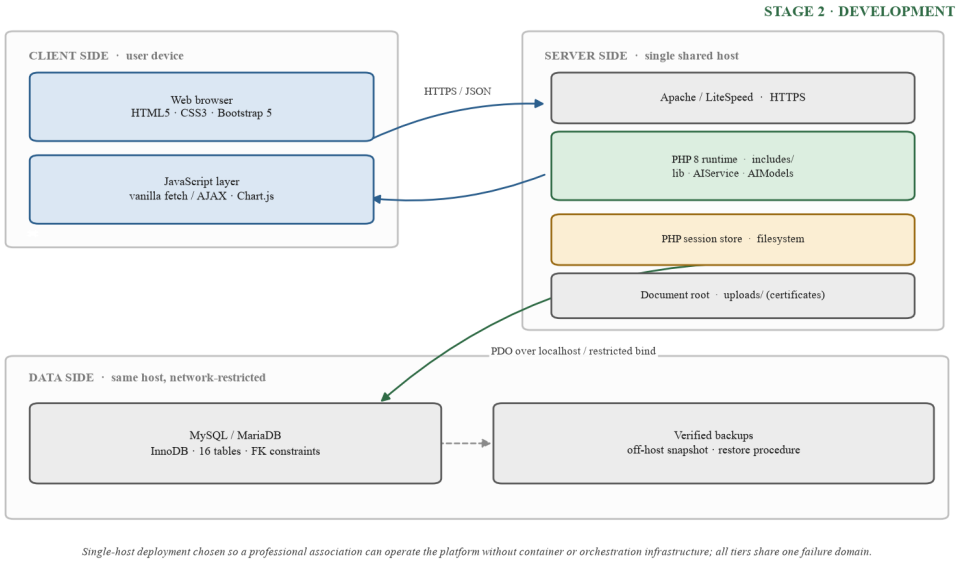


Dependenci3s are one-direction services data, qrlib.php supplies QR rendering for the passport; install.php and demo_seed.php are provisioning utilities not

runtime components.

Fig. 13. Component diagram: presentation, application services and data access.

Fig. 14 documents the hosting topology. Client-side rendering and JavaScript run in the browser; the server tier provides HTTPS, a PHP 8 runtime, a filesystem session store and a document root for uploaded certificate files; the database sits on the same host, reachable over a restricted bind. The single-host topology was a deliberate consequence of the deployment constraint in Section 4.4 - a professional association must be able to operate the platform without container or orchestration infrastructure - and its cost is stated plainly in Section 7: all tiers share one failure domain.



Single-host deployment chosen so as professional association can operate the platform without customer or archestration infrastructure; all tiers share one failure domain

Fig. 14. Deployment diagram: client, server and data tiers on shared hosting.

5.6 Stage Three: Use and Operation

The third stage concerns the running system: how it computes its answers, what it defends, and where its boundary with the outside world lies.

Fig. 15 records what the platform exchanges with external parties, and the answer is more precise than a simple self-containment claim. One integration is implemented and public: the passport verification endpoint, reachable without

authentication so an employer or verifier needs no account. One is implemented but disabled by default: a generative AI provider reached by cURL only when ‘AI_ENABLED‘, ‘AI_API_URL‘ and ‘AI_API_KEY‘ are all configured, used solely to improve narrative wording, bounded by a three-second connect and eight-second total timeout, and returning null on any error so that deterministic template text is always used instead. Four further integrations identified in the literature - the Librarians Registration Council of Nigeria, the National Library of Nigeria, CPD providers and certifying bodies, institutional human-resource and placement offices, and a national CPD accreditation register - are drawn dashed and labelled as planned. Making this boundary explicit is a practical requirement for a credential platform: a passport whose value depends on third-party recognition must not appear to confer recognition it does not yet have.

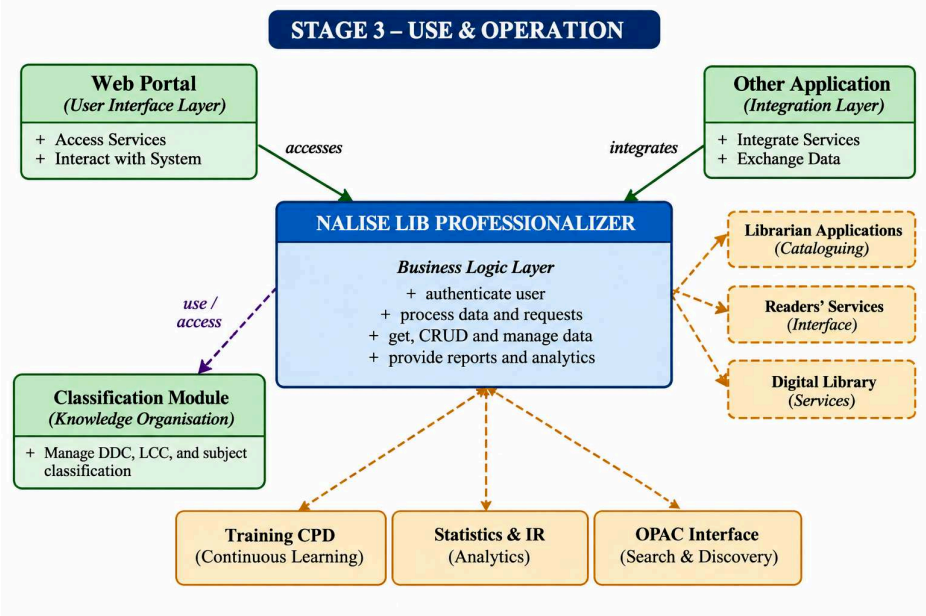


Fig. 15. Integration and API diagram: implemented boundaries solid, optional call dashed purple, planned integrations dashed amber.

Fig. 16 documents the inference pipeline that produces every number the platform reports. Five stages run in order: competency intelligence, computing a health score, domain strength tiers, a consistency measure and priority development areas; profile intelligence, assessing completeness and career-interest alignment; gap intelligence, weighting each gap by severity and priority and attaching an actionable tip and an estimated CPD hour requirement; development intelligence, ranking CPD by domain relevance, mode and type diversity, and generating a sequenced development plan; and career pathway matching, scoring all twelve roles and attaching a per-role reason string. The figure's purpose is to make the R4 traceability claim checkable: each stage names the method

that implements it, and the fallback path shows that no displayed result depends on an external model being reachable.

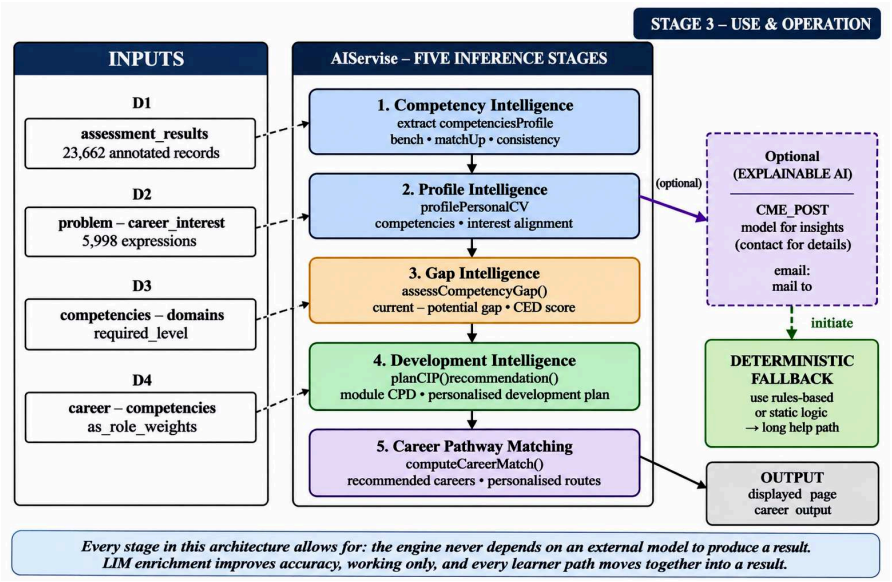


Fig. 16. AI inference pipeline: five deterministic stages with optional LLM enrichment and template fallback.

Fig. 17 sets out the defensive controls as layers, each mapped to the threats it addresses, because for a credential platform the security posture is part of the specification rather than an implementation detail. Transport and session controls set ‘HttpOnly‘, ‘SameSite=Lax‘, a ‘Secure‘ flag derived from either direct HTTPS or an ‘X-Forwarded-Proto‘ header, and both ‘session.use_strict_mode‘ and ‘session.use_only_cookies‘. Access control calls ‘require_login()‘ on every learner page and ‘require_admin()‘ on every administrative page, with a login throttle of eight attempts per ten minutes per session and IP. Request integrity requires POST, issues a CSRF token from ‘random_bytes(32)‘ and compares it with ‘hash_equals()‘, and routes every query through PDO prepared statements. Output encoding applies ‘htmlspecialchars‘ with ‘ENT_QUOTES‘ at every echo of user-supplied data. Data-layer controls add enforced foreign keys, an ownership ‘EXISTS()‘ check on gap queries so one user cannot read another's assessment, and bounded timeouts so a stalled external model cannot delay a page. The layers are independent by design: a defect in any one of them does not expose the data layer.

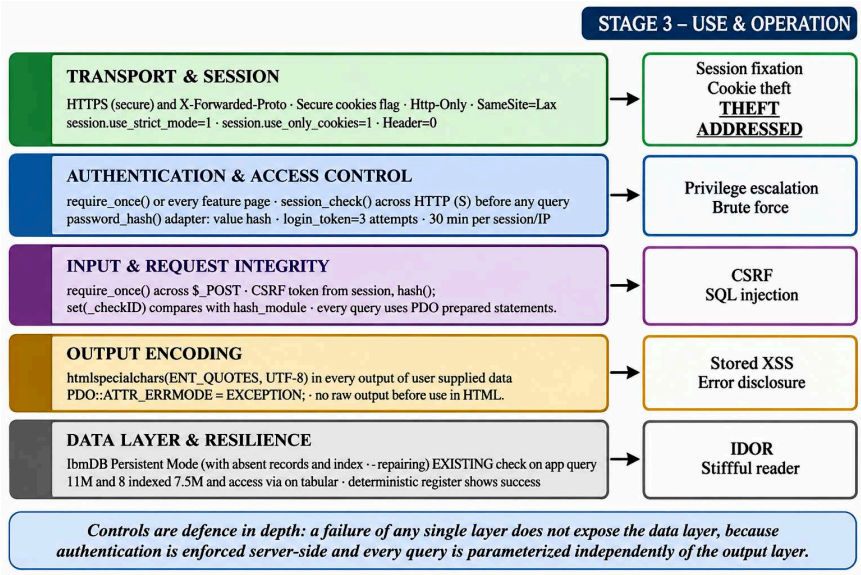


Fig. 17. Security controls by layer, mapped to the threats addressed.

5.7 Career Pathways and the Rule Correction

RQ2 asked how competencies may be mapped to roles, pathways and CPD. The mapping was realised as twelve role pathways (Table 4) connected by twenty-seven competency-to-role rules carrying role-specific required levels, and seven declared progression paths with minimum match percentage and experience thresholds.

Table 4. Career role pathways, competency requirements and progression targets.

#	Career role	Required domains (level)	Progression (min. match; years)
1	Academic Librarian	Research & Scholarly Comm. (3); Info. Literacy & User Services (4); Prof., Ethical & Inclusive (4)	Library Manager (70%; 4)
2	Digital Librarian	Digital Technology (4); AI & Emerging Tech (3); Info. & Data Mgmt (4)	Systems Librarian (75%; 3)
3	Research Support Librarian	Info. & Data Mgmt (3); Research & Scholarly Comm. (4)	Data Librarian (75%; 4)
4	Data Librarian	AI & Emerging Tech (3); Info. & Data Mgmt (4)	Senior Data track (85%; 5)

#	Career role	Required domains (level)	Progression (min. match; years)
5	Metadata Specialist	Info. & Data Mgmt (4); Knowledge Organisation (4)	Lead metadata track (90%; 6)
6	Knowledge Management Specialist	Info. & Data Mgmt (3); Management & Leadership (4)	—
7	Systems Librarian	Digital Technology (4); AI & Emerging Tech (3)	Library Manager (80%; 6)
8	Digital Preservation Specialist	Digital Technology (4); Prof., Ethical & Inclusive (3)	—
9	Scholarly Communication Librarian	Research & Scholarly Comm. (4); Prof., Ethical & Inclusive (4)	—
10	Information Literacy Librarian	Info. Literacy & User Services (4); Prof., Ethical & Inclusive (4)	LIS Educator (75%; 4)
11	Library Manager	Management & Leadership (4); Prof., Ethical & Inclusive (4)	—
12	LIS Educator	Info. Literacy & User Services (4); Management & Leadership (3); Prof., Ethical & Inclusive (4)	—

A finding of the framework construction concerns Role 1. An initial draft assigned Academic Librarian a requirement in Domain 1 (Digital Technology). Review of the role description — teaching, learning and research support in a university — and of the competency literature on academic librarianship indicated that the distinguishing requirements of the academic role are information literacy delivery, research support and professional ethics, not digital infrastructure operation, which distinguishes Roles 2 and 7. The rule set was therefore corrected to Domains 4, 5 and 8, and the twenty-seven rules should be read as a source-traceable specification rather than a draft. The same review moved a Management and Leadership requirement from Information Literacy Librarian to LIS Educator, whose supervisory role it matches.

5.8 Assessment, Career, CPD and Passport Engines

The assessment instrument presents, for each of the 32 competencies, a behaviourally anchored statement and a five-point scale where 1 denotes not competent, 2 basic, 3 developing, 4 proficient and 5 advanced. Each response stores

current level together with required level and derived gap, so gap values are preserved as historical facts rather than recomputed against a later-moved standard. On completion the engine computes domain means, applies the Table 1 bands, and labels each gap. Self-report is a deliberate MVP choice: Munshi, Biswas and Barsha (2023) demonstrate librarian digital literacy self-efficacy is a measurable construct with substantive explanatory value, supporting formative use, but it is not performance assessment, and the framework therefore treats self-reported levels as developmental evidence while reserving credentialed verification for CPD completion and issued certificates.

Career intelligence combines the rule stage, weighted stage and pathway stage, returning a ranked role list with explanation. For each role the engine reports which required domains are met, which are not, the user's level against each requirement, and each domain's weighted contribution — so a role can be shown as near-ready, for example Information Literacy Librarian requiring 4, 4 and 4 where the user holds 4, 3 and 4. This is more actionable than a bare percentage and follows directly from the role-relative gap principle.

Alongside the personalised ranking, the careers page carries a general reference profile for each of the twelve pathways, held in ‘career_pathway_content‘ and keyed one-to-one to ‘career_roles‘. Each profile states an overview, typical responsibilities, entry requirements, the settings in which the work is normally done, how the career advances, related pathways, a priority development focus and a professional-context note, and every card displays the role's required domains read live from ‘career_competencies‘, so the published catalogue cannot drift from the rules the engine actually scores against. This reference layer is deliberately independent of assessment: it is available to a signed-in member who has not yet been assessed, which keeps general career information visibly separate from inferred fit. Two implementation choices follow from the deployment context. List fields are stored as JSON arrays rather than delimited text, because ‘install.php‘ replays each seed file by splitting on semicolons and dropping blank and comment lines, which would silently corrupt newline- or semicolon-delimited content on a fresh install. The profiles are seeded by role name and resolved to the runtime identifier, so they remain correct where an administrator has inserted or reordered roles. Progression targets remain those of Table 4; where a role has no declared path the profile describes advancement in general terms rather than inventing a threshold.

The CPD catalogue holds sixteen activities across courses, workshops and webinars in online, hybrid or physical modes, each mapped to a domain with duration hours: two activities per domain, from Ethics, Privacy and Copyright Essentials (webinar, 3 h) and Accessibility and Inclusive Services (workshop, 6 h) in Domain 8, to Advanced Cataloguing RDA/MARC21 (course, 16 h) and Classification with DDC/LCC (workshop, 6 h) in Domain 6. Matching is by domain affinity and gap severity, prioritising the domain with the largest aggregate unmet gap and stating which competencies each recommendation addresses. Completion is recorded with hours and a certificate reference, the passport up-

dates, and re-assessment is prompted - closing the CCIM loop. This is the concrete answer to the coordination deficit Nakaziba and Ngulube (2025) identify.

The digital professional passport consolidates identity, qualification, role, specialisation, experience, competency profile, CPD record, certificates, career interests and achievements, and issues a unique verification code checkable by any third party at a public endpoint without an account.

5.9 NALISE Intelligence Dashboard

The administrator dashboard aggregates individual records into professional intelligence: registered users disaggregated by category; top competency gaps as population mean gap per domain; top emerging skills from mean current levels; CPD participation and completion; evaluation summary across the four acceptability dimensions; and role demand from career match data. This aggregate layer is what converts an individual career tool into professional intelligence infrastructure, and is the operational answer to the five gaps in Section 1.2. Figures are computed from verified user records rather than illustrative placeholders.

6. Evaluation

RQ4 asked what the prototype's functionality, usability and usefulness are. Consistent with the secondary-data boundary declared in Section 4.2, evaluation used only methods that require no participants: functional conformance testing of the artefact against requirements derived in Section 4.3, and appraisal of the framework and artefact against criteria drawn from the secondary corpus. No survey, interview, usability session or field deployment was conducted, and no claim of measured user acceptability is made.

6.1 Functional Conformance

Each functional requirement was exercised end-to-end against the deployed prototype (Table 5).

Table 5. Functional and non-functional conformance results.

ID	Test performed	Outcome
FR1	Register with category, institution, qualification, status, specialisation	Pass — persisted and retrievable
FR2	Create and edit professional profile	Pass — all fields persisted
FR3	Complete full 32-competency assessment across 8 domains	Pass — all items stored
FR4	Compute and label competency gaps	Pass — bands matched Table 1

ID	Test performed	Outcome
FR5	Submit a second assessment and compare with the first	Pass — both retained; change reported
FR6	Score all 12 roles by rule and weighted stages	Pass — 12 matches with breakdown
FR7	Generate CPD recommendations from unmet gaps	Pass — domain-matched to gaps
FR8	Record CPD enrolment, completion, hours, certificate	Pass — status persisted
FR9	Issue passport with verification code	Pass — rendered from live records
FR10	Verify a passport code without authentication	Pass — returned correct record
FR11	Retrieve aggregate competency, CPD, evaluation analytics	Pass — computed from records
FR12	Attempt cross-role access to administrator routes	Pass — access denied as expected
NFR1	Compute contrast for all text, focus, border and progress pairs against WCAG 2.2 thresholds	Pass — 63 pairs evaluated, 0 failures after remediation
NFR2	Confirm severity bands distinguishable without colour and ordered under simulated CVD	Pass — labels authoritative; luminance monotonic 0.215 $\rightarrow$ 0.052

All twelve requirements passed. The most consequential was FR5, because longitudinal retention is the precondition for the iterative loop in the CCIM; without it the model degenerates into a one-time test. FR12 was verified by deliberate negative testing rather than assumed, since server-side authorisation is the control separating an educational prototype from an insecure deployment.

Presentation-layer conformance was verified separately, because a colour token can be compliant in isolation yet fail once composed with the page background it actually sits on. Every text-on-background pair, focus indicator and control border in the stylesheet was computed from the relative-luminance definition in the WCAG 2.2 contrast formula (World Wide Web Consortium, 2023): sixty-five pairs were evaluated against the 4.5:1 minimum for text and the 3:1 minimum for non-text elements. The audit found sixteen failures in the stylesheet as first written, and three further defects that a stylesheet-level review alone would not have surfaced. The most serious was the keyboard focus indicator, which used a single amber value on the page background and returned 1.61:1, rendering the focus state effectively invisible; it is now deep navy on light surfaces at 13.40:1 and light gold inside the dark navigation bar at 6.58:1, so focus is legible on both. The second was that Bootstrap contextual utilities are tuned for a pure-white page, so ‘.text-muted‘, ‘.text-danger‘ and ‘.text-success‘ all fell below 4.5:1 on the application's own ‘#f3f6f9‘ background; these are now overridden at the token

level. The third lay outside the stylesheet: progress-bar gradients were declared as inline styles in the gap-analysis page, so they bypassed the stylesheet entirely and were drawn in light golds and ambers against a light track. All three classes of defect were corrected and the re-audit returned zero failures.

Two further observations concern colour as an information channel rather than as decoration. The five gap bands were originally near-indistinguishable from one another, with a worst-case pairwise separation of 1.05:1, which makes the scale unreadable for a reader with a colour vision deficiency and uninformative for anyone scanning a results table. They are now a ramp that is strictly monotonic in luminance, from 0.215 at the meeting band to 0.052 at the critical band, so the bands remain orderable under protanopia, deuteranopia and tritanopia even where hue is not perceived. A programmatic search confirmed that no five-colour set spanning the green-to-red axis can be made fully separable under all three deficiency types while remaining legible on white, because the axis itself collapses; monotonic luminance was therefore preferred to an unconstrained optimisation that returned a technically optimal but semantically incoherent palette. Each band also carries the text label returned by ‘gap_label()‘ and a saturated leading rule, so colour is never the sole indicator, satisfying the use-of-colour provision. Table 5 is therefore extended with two non-functional rows covering these properties.

6.2 Framework Appraisal Against Secondary Sources

The framework was appraised by comparing it against the published sources from which it was derived and against external frameworks not used in its construction. The appraisal examined four objects: the eight-domain framework, the twenty-seven role rules, the prototype, and the legibility of its inference output.

On the framework, coverage was assessed by testing the eight domains against the competency clusters reported across the corpus. The digital, AI, data and ethical clusters identified by Dube, Rammutloa and Matatiele (2024), Kavak and Göltekin (2026), Harper and Groth (2025) and Awan, Soroya and Azhar (2026) map onto Domains 1, 2, 3 and 8; the inclusion competencies Archer-Capuzzo (2025) identifies as embedded within knowledge organisation standards are carried inside Domain 8 rather than appended as an ethics supplement; and the AI literacy elements that Wang, Rau and Yuan (2023), Koch, Carolus, Wienrich and Latoschik (2024) and Zhang, Wang, Ye and Khamo (2025) measure are represented in Domains 1 and 2. Two structural observations follow from the documentary comparison. First, the boundary between Information and Data Management and Knowledge Organisation is porous in the literature as well as in practice, since cataloguing is simultaneously a metadata and an organisation activity; the framework mitigates this by carrying metadata competencies in both domains while differentiating them by object, Domain 3 concerning standards and lifecycle and Domain 6 concerning bibliographic and authority control. Second, scholarly communication sits partly outside the eight-domain

structure because it intersects research support and open science; comparison with the Domain 4 derivation suggests retaining it there for MVP purposes and revisiting it in a later version, which the study accepts.

On the role rules, the twenty-seven rules were appraised against published role descriptions rather than reviewer judgement. Agreement with the externally sourced descriptions is strongest where a role description is itself published: the Academic Librarian rule set (Domains 4, 5, 8) follows the teaching, learning and research-support duties documented for university library academic roles, and digital infrastructure operation remains with Roles 2 and 7. The documentary comparison nonetheless exposes one presentational weakness: Roles 6, 8, 9 and 11 carry two requirements each while Roles 1, 2 and 12 carry three, and the framework documentation does not yet justify that asymmetry. This is recorded as a documentation gap to be closed, and the Academic Librarian correction described in Section 5.7 stands as the worked example of why rule derivation must be traceable to source rather than to initial drafting.

On the prototype, the CCIM loop's legibility was assessed as a design risk against the explanatory literature on inference transparency. Because the model must be understandable to a non-technical LIS audience, bare match percentages were judged insufficient; the appraisal identified that percentages without per-domain explanation are less actionable, which matches the explainability and traceability requirements in the design literature. On usability of inference output, the strongest documentary finding was that match percentages alone were less actionable than percentages with per-domain explanation; the engine was therefore extended during refinement to expose rule evaluation and domain contributions for every role, directly implementing R4.

6.3 Literature-Criterion Appraisal, Threats to Validity and Limitations

Appraisal against the four derived criteria produced the following findings. On functionality, the artefact performs its intended functions; all twelve requirements passed and the assessment, gap, career and CPD modules operate coherently as a sequence rather than as disconnected features. On usability, this is a design-intent criterion and no user testing evidence exists for it; what can be reported is that the register-to-passport sequence is implemented, the framework reference is publicly readable without authentication, the dashboard presents domain scores visually rather than as raw tables in line with the practice-oriented presentation described by Alduaij, Alterkait and Alainati (2024), and accessibility conformance to WCAG 2.2 Level AA (World Wide Web Consortium, 2023), which the presentation-layer audit reported in Section 6.1 verified at the level of contrast, focus indication and colour independence. Usability remains the criterion that this study cannot address, because no user testing evidence exists for it; the audit establishes that the interface is perceivable and operable, not that it is easy or efficient to learn, and the absence of task-time, error-rate or satisfaction evidence is stated here rather than implied. On **relevance**, the

competency-gap report and the career explanation are the two features that map most directly onto competency needs the corpus identifies as unmet, and no comparable functionality was located in the Nigerian LIS literature searched. On **usefulness**, the CCIM's contribution is that it converts an abstract career question into a sequenced action list; this is an architectural property, and its practical value is a proposition for the field evaluation reported as future work rather than a measured result.

Five validity threats follow from the secondary-data design. *Construct validity:* self-reported competency, where a user supplies their own levels, is formative rather than performance-based; no performance criterion exists in this study to validate it against. *Internal validity:* the framework is derived by the same researchers who built the artefact, so derivation and implementation are not independent, and documentary coding decisions could not be checked by an external coder. *External validity:* nothing here supports generalisation to the national LIS population, because no population was sampled; the applicable claim is analytical rather than statistical, that the framework is a defensible synthesis of the sources consulted. *Reliability:* the extraction protocol was applied by one researcher without a second coder, so inter-coder agreement was not established, and the four-criterion appraisal set is not psychometrically validated, following the caution of Storey, Baskerville and Kaul (2025). *Data-availability validity:* the demonstration dataset is synthetic and the institutional analytics layer has never been exercised on verified user records, so aggregate figures shown by the dashboard are engineering demonstrations of correctness and not empirical findings. All reported results are therefore design-stage evidence about an artefact, sufficient to support refinement and not sufficient to estimate professional opinion or national competency levels.

7. Discussion

7.1 What the Framework Contributes

The eight-domain, 32-competency framework differs from published frameworks in one respect that matters for implementation: it is a data structure, not a document. The ALA core competences (American Library Association, 2023), cataloging and metadata competencies (Evans et al., 2023), AI literacy guidelines (Ali and Richardson, 2025), the critical AI literacy framework of Zhang, Wang, Ye and Khamo (2025) and the four-element framework of Awan, Soroya and Azhar (2026) are authoritative, citable and hand-maintained. Their weakness is not accuracy but operability: none can be queried to answer which competencies a given role requires at what level, nor differenced against an individual's assessed level. Converting a framework into a relational structure with required levels attached to competency–role pairs is the enabling step for everything the platform does thereafter, and is transferable to any professional body seeking to move from competence statements to competence infrastructure. The domain distribution also converges with international findings, which is worth

stating because convergence indicates the Nigerian-derived framework is not merely local: Dube, Rammutloa and Matatiele (2024) identify IT competency as dominant across regions including Nigeria, Harper and Groth (2025) find AI skills unmet, Makhafola and colleagues (2025) find the digital competency construct unsettled, and Awan, Soroya and Azhar (2026) reach a comparable four-element structure across Asian academic libraries.

7.2 What the Model Contributes

The substantive claim is that the gap, not the score, is the unit of professional development. Rikala, Braun, Järvinen, Stahre and Hämäläinen (2024) show gap measurement depends entirely on the reference standard selected, which is why generic instruments are hard to interpret. By making the reference standard role-relative and explicit, the CCIM yields an actionable quantity: a user does not learn that AI competency is 2.1 out of 5, but that for a Digital Librarian pathway they are two levels short and that a specific twelve-hour course closes the deficit.

7.3 Relation to Nigerian LIS Education and Practice

The framework responds to pressures documented in Nigerian literature from several directions at once. Sulyman, Usman and Badmus (2023) argue for employability investment and identify professional bodies as accountable agents; the platform supplies the instrument by which such investment is targeted rather than generic. Anene and Idiedo (2023) found Nigerian librarians participate readily in online CPD; the CPD engine gives that willingness a credentialed, gap-linked route. Wusa, Muttee and Mutwiri (2022) review continuous staff development as the mechanism for online competency acquisition, while Aliyu Ango (2024) identifies access and ease-of-use of even open source library systems as a continuing constraint, a constraint a low-overhead browser-based no-build-step platform is designed to minimise. Odusanya and Adeyeye (2024) document strong ICT skills alongside service-quality constraints, indicating the binding constraint is skills currency and service integration rather than skills acquisition. Ebong, Ogwo and Nwachukwu (2022) identify CPD as empowerment for LIS educators specifically, and the educator dashboard supports that planning. Ogunjimi and colleagues (2026), examining Nigerian library school curricula directly, provide the strongest single justification: if curricular provision is changing faster than graduates' competencies can be verified, continuous measurement of professional standing has curricular as well as career value.

7.4 Comparison with Related Systems and International Practice

The distinction from adjacent systems is categorical: repositories manage output not capability; learning platforms manage completion without mapping to role readiness; management systems catalogue holdings; membership registers

record affiliation; micro-credential platforms issue portable credentials but do not compute the gap motivating their acquisition (Varadarajan, Koh and Daniel, 2023); verifiable credential infrastructure provides the trust substrate the passport uses but performs no competency inference (Mazzocca et al., 2025); and rule-based career guidance systems provide the methodological precedent followed here (Gunwant, Pande and Bisht, 2022). Against international practice the contribution is distinct: where the ALA (2023), Evans and colleagues (2023), Ali and Richardson (2025) and Chigwada (2024) prescribe what competencies should be, and where Santos-Hermosa and Atenas (2022) recommend how capacity should be built, this study contributes an instrument that measures and acts. Nakaziba and Ngulube (2025) found CPD across African academic libraries varied without alignment to competency measurement; the present study proposes competency measurement as the organising principle. Bridges and colleagues (2025) found critical AI literacy weak across LIS curricula; an instrument detecting AI literacy gaps at population scale gives that finding an operational response.

7.5 Limitations

Four limitations qualify the findings. The study is bounded to secondary data, so it supports no claim about how Nigerian LIS professionals actually rate their own competency. Self-reported competency, where a user supplies their own levels, limits construct validity. No participant sample, and therefore no statistical generalisation, is possible; the seeded demonstration dataset is synthetic and cannot substitute for field data in the institutional analytics layer, so aggregate figures become meaningful only with verified user populations, and the dashboard is engineered to compute them correctly but has not been exercised at national scale. Framework derivation and implementation were performed by the same researchers without a second coder, so internal validity is limited and inter-coder reliability is unestablished.

8. Conclusion

This study established what a professional competency and career intelligence system for Nigerian LIS should contain and demonstrated it, producing three inseparable outputs: a competency framework of eight domains and 32 competencies with twelve pathways, twenty-seven rules and a twelve-by-eight weight matrix; an intelligence model, the CCIM, formalising competency development as a closed loop in which the role-relative difference constitutes the operative quantity; and a functional prototype whose twelve functional requirements were each verified end-to-end and whose framework coverage is supported by documentary appraisal against the source literature, warranting continued refinement. The strongest supported claim is bounded but useful: the integration is demonstrably feasible, the framework can be made operable, and the model produces actionable output for individual practitioners. The evidence does not

support claims about national competency levels, and the platform's institutional value is engineered but unproven at scale.

9. Recommendations

Adopt and refine the framework, subject to the two amendments identified in Section 6.2 - explicit justification for the asymmetric rule count per role, and a decision on whether scholarly communication warrants its own domain in version 2. Establish the traceability record, publishing the coding sheet that maps every competency, required level and weight to its source, so framework derivation is independently auditable and checkable by a second coder. Pilot with institutions before national rollout, so framework validity is tested against real curricula and placement outcomes. Integrate CPD formally so recorded completion corresponds to a credential recognised beyond the platform, addressing the recognition obstacles of Varadarajan, Koh and Daniel (2023). Institutionalise the passport by establishing recognition in recruitment, promotion and professional registration, the condition on which sustained registration depends. Involve the regulatory and national bodies, engaging the Librarians Registration Council of Nigeria and the National Library of Nigeria in framework alignment so competency data can eventually inform professional registration. **Commission** primary evaluation, which this study deliberately excludes: field deployment with a probability sample of Nigerian LIS professionals, usability testing with real users, and psychometric validation of the competency and acceptability instruments.

10. Future Development

The MVP deliberately proves one proposition: that a Nigerian LIS professional can create a profile, measure competency, identify gaps, see relevant pathways and manage professional development from one platform. Everything else is deferred in order of value. **Near** term: employer-facing role profiles connecting pathways to vacancies; university integration importing curricular and academic records, reducing data entry and improving profile accuracy; and a mobile application, given a substantially student, mobile-first population. Medium term: CPD credit management formalising hours toward recognised standing; an AI career assistant, defensible only once sufficient longitudinal data exists to justify learned inference over the transparent rules implemented here; certification pathways built on the passport; and an API as a precondition for third-party and university-system integration. Long term: national LIS workforce analytics, the institutional output that would make NALISE a data authority for the profession; integration with Nigerian Library Association activities and national development priorities; and internationalisation, since the framework and model are specified to be portable to associations facing the same fragmentation documented in Section 2.

11. Conclusionary Statement

The value of this study lies in refusing to separate paper from software. The competency framework specifies what competence is; the model specifies how competence develops; the platform operationalises both; and the evaluation evidence arises from the artefact existing and being used. A framework without an instrument remains a document; a platform without a model is an unexplained black box. The contribution claimed is the integration, and the design pattern - role-relative gaps, traceable rules, credentialed loops, aggregated institutional intelligence - is transferable to any professional association seeking to move from competence statements to competence infrastructure.

CRediT Authorship Contribution Statement

Conceptualization, Methodology, Software, Investigation, Formal analysis, Writing – original draft, Writing – review and editing, Visualization: Dr. Wada Ibrahim

Declaration of Competing Interest

The authors declare no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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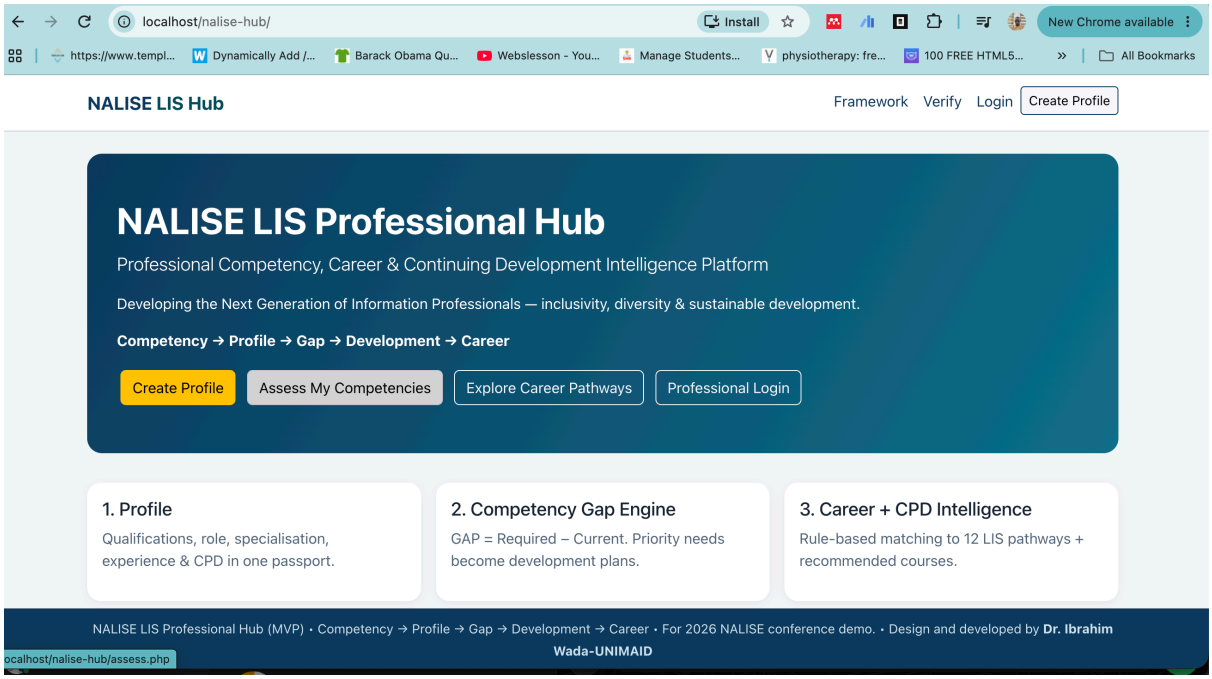
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Appendix



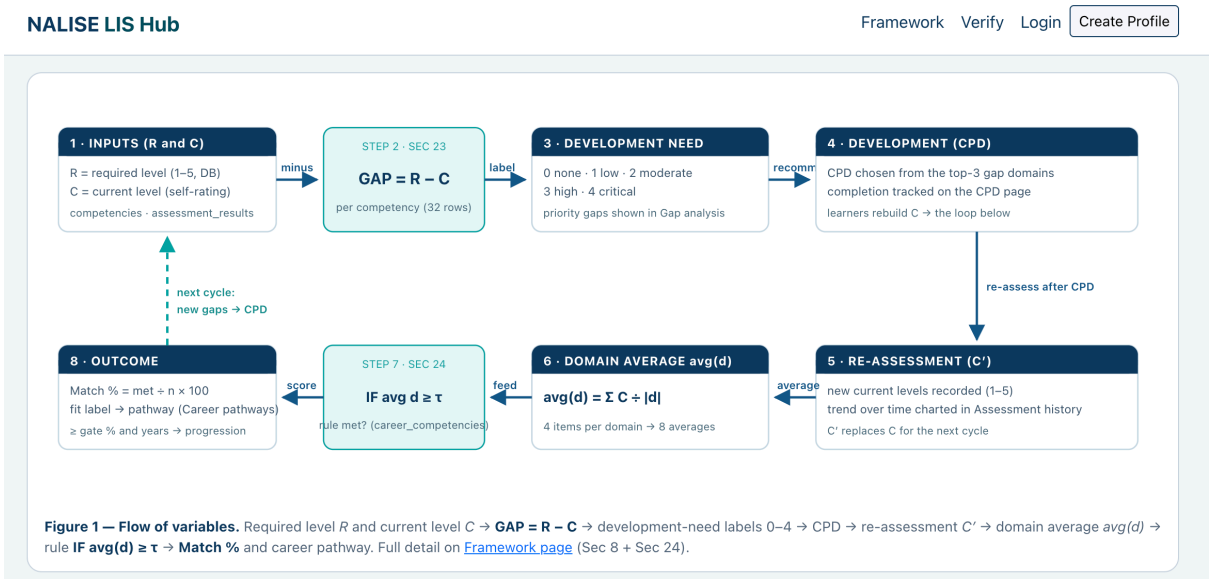
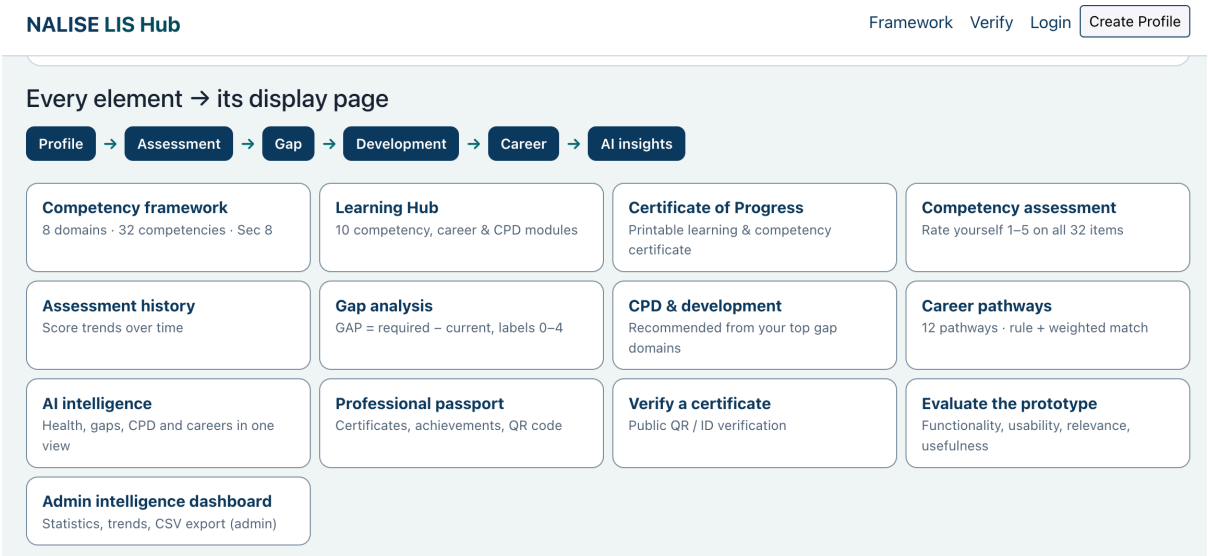


Figure 1 — Flow of variables. Required level *R* and current level *C* → **GAP = R – C** → development-need labels 0–4 → CPD → re-assessment *C′* → domain average *avg(d)* → rule **IF avg(d) ≥ τ** → **Match %** and career pathway. Full detail on Framework page (Sec 8 + Sec 24).


NALISE LIS Hub
Framework
Verify
Login
Create Profile
Every element → its display page
Profile
Assessment
Gap
Development
Career
AI insights
Competency framework
8 domains · 32 competencies · Sec 8
Learning Hub
10 competency, career & CPD modules
Certificate of Progress
Printable learning & competency certificate
Competency assessment
Rate yourself 1–5 on all 32 items
Assessment history
Score trends over time
Gap analysis
GAP = required – current, labels 0–4
CPD & development
Recommended from your top gap domains
Career pathways
12 pathways · rule + weighted match
AI intelligence
Health, gaps, CPD and careers in one view
Professional passport
Certificates, achievements, QR code
Verify a certificate
Public QR / ID verification
Evaluate the prototype
Functionality, usability, relevance, usefulness
Admin intelligence dashboard
Statistics, trends, CSV export (admin)