From University Research to an Emerging Purpose-Driven Venture: Xkila and the Learning Intelligence Business Model

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Abstract—Universities seek to turn research and institutional knowledge into innovations that create lasting value, yet the mechanisms that support this process remain underdocumented. This Design Science Research study examines Xkila as a Learning Intelligence artifact and an emerging purpose-driven university venture. Its architecture connects five layers of institutional knowledge to a six-stage pipeline with mandatory source traceability, a required distribution across Bloom categories, and human approval before export. The evaluation combined architectural inspection, predefined control tests, and descriptive feedback from three reviewers at two Central American partner universities. In these tests, the controls blocked ungrounded and unapproved outputs as designed. Reviewers considered the drafts useful starting points for curriculum work. The study did not include a controlled comparison, blinded assessment, formal qualitative coding, learner outcomes, or objective measures of efficiency. The two external pilots provide an early sign of institutional interest, although they do not establish commercial viability. The paper contributes an initial architectural evaluation, an analysis of venture development, a protocol for replication, and four propositions for independent testing.

Keywords—Academic Entrepreneurship; Design Science Research; Institutional Innovation Capability; Learning Intelligence; University Research Venture.

I. INTRODUCTION

A program approved by committee can be obsolete when it launches, not because academic governance failed, but because labor markets, professional regulation, and competency demands often move faster than curriculum review. Signals such as labor-market shifts, competency gaps, institutional evidence, and graduate outcomes rarely reach decision makers in a form they can inspect and use [1].

Higher-education artificial intelligence has developed mainly through learner-facing applications and administrative analytics. Learning Management Systems, meanwhile, organize the delivery of curriculum that has already been decided [3], [4]. Neither class of system directly answers the upstream institutional questions of what should be taught, why it should be taught, and which evidence supports the decision. Generic generative systems add another problem: plausible curriculum content can be produced from a model's training distribution without being anchored to the institution's programs, policies, students, or professional context [2].

Xkila addresses this problem through a Learning Intelligence architecture that connects five layers of institutional knowledge to a six-stage engineering pipeline. Generated components must remain traceable to institutional sources, assessment banks must follow a defined distribution across Bloom categories, and every package requires human approval before export. The controls govern the process, but their presence alone does not establish semantic correctness, actual cognitive demand, educational effectiveness, or efficiency.

The study asks two questions. RQ1: How can institutional educational knowledge be transformed into a governed Learning Intelligence capability? RQ2: How can that capability support the development of a purpose-driven university research venture? The architecture and pilot evaluation address RQ1. Evidence from the two pilots and the analysis of value proposition, delivery, governance, regional purpose, and scalability address RQ2. The architectural contribution is more developed than the venture evidence, which remains at an early stage.

II. THEORETICAL BACKGROUND

A. Learning Systems and the Grounding Problem

LMS platforms follow a content-delivery logic: instructors author, the system distributes, and learners consume [3]. Their closed-system limitations were identified early [4], but the more relevant limitation here is that they accept curriculum decisions rather than interrogating their currency or coherence. A systematic review of AI in higher education similarly found that documented applications concentrate on learner-facing and administrative uses, with curriculum-level decision support and educators' perspectives underexamined [5]. Institutional guidance increasingly mentions curriculum redesign, yet often leaves unspecified how generated material should be anchored to verifiable institutional evidence [6].

Retrieval-augmented generation can improve factual accuracy and currency relative to parametric generation alone, while completeness and timeliness remain open problems [7]. Accordingly, source grounding in this study means enforced traceability to supplied documents. It does not mean that every cited passage is semantically faithful or sufficient; that requires independent expert validation.

B. Bloom Distribution and Competency Maintenance

Bloom's taxonomy [8], revised into six cognitive levels [9], remains a common reference for curriculum alignment. Recall and comprehension frequently dominate assessment [10], and

benchmark coverage for large language models also clusters at lower cognitive levels [11]. Requiring a distribution across Bloom labels is therefore a defensible design constraint, but label compliance is not evidence that an item actually elicits the intended cognitive operation. Competency frameworks face a parallel maintenance problem: they can specify outcomes more finely than courses, yet updating them and connecting them to labor-market evidence remains labor intensive [12].

C. Knowledge Architecture and Regional Context

Knowledge architecture specifies what an organization knows, how that knowledge connects, and which rules govern its use [13]. Without such structure, AI-supported curriculum recommendations may be locally plausible yet institutionally wrong. This risk is pronounced in Central America, where taxonomies developed for other economies do not always transfer. During early Xkila testing, O*NET-based structures required contextual adaptation to Honduran labor-market conditions. Local grounding is a response to that mismatch, although not a complete solution.

D. Academic Entrepreneurship and Purpose

Academic entrepreneurship concerns the arrangements that convert university knowledge into usable economic and social value [14], [15]. University ecosystems can provide spaces for start-up experimentation [16], while open innovation can connect research capacity to regional development under resource constraints [17]. Because university innovation models vary by regulatory and economic context [18], a credible venture account requires more than a novel artifact. It must identify users, a value proposition, mechanisms for creation and delivery, a plausible path to value capture, governance of institutional knowledge and intellectual property, and some evidence that organizations beyond the founding setting are willing to engage, even if that evidence is preliminary.

III. METHODOLOGY

A. Design Science Research

This study follows Design Science Research (DSR), which builds and evaluates an artifact in response to a relevant problem [19]. The six activities of Peffers et al. [20] guided the work: problem identification, definition of solution objectives, design and development, demonstration, evaluation, and communication. The case is instrumental [22]; its contribution is analytical and design-oriented rather than statistically generalizable. Recent DSR scholarship on generative AI notes risks of internal inconsistency and design knowledge that erodes as model capabilities change [21], both relevant to the architecture evaluated here.

TABLE I. DSR ACTIVITY TRACEABILITY

Activity	Application	Evidence
Problem	Institutional curriculum intelligence and grounding gap	Literature and institutional observations
Objectives	Traceability, Bloom distribution, governed export	Design requirements
Design	Five layers and six-stage pipeline	Implemented artifact
Demonstration	Authentic documents at two partner universities	Generated packages
Evaluation	Inspection, control tests, descriptive review	Test log and reviewer instrument
Communication	This manuscript	Architecture and propositions

B. Ontology and Unit of Analysis

Four terms are separated to avoid overclaiming. Xkila is the digital platform. Learning Intelligence is the institutional capability the platform supports. The five-layer knowledge architecture, six-stage pipeline, and embedded controls constitute the DSR artifact evaluated here. The venture is the still-emerging organizational mechanism through which the artifact is piloted and may eventually be transferred. The unit of technical analysis is the artifact; the unit of entrepreneurial analysis is the emerging venture.

C. Pilot Context, Participants, and Author Role

The artifact was demonstrated at two Central American partner universities selected through existing collaboration relationships that enabled access to authentic institutional documents and academic workflows. This was convenience selection, not sampling, and the institutions are not treated as representative. Three professionals reviewed generated materials: two instructional designers and one academic administrator. They routinely assess academic content and did not participate in platform development, but they were neither randomly selected nor blinded to the system. The author founded Xkila and led the study. This dual role provided direct access to the design and pilot settings, but it may also have influenced participant selection and interpretation. No independent audit or blinded assessment was available for this evaluation.

D. Evaluation Protocol and Analysis

The protocol had three parts. First, architectural inspection traced the control location and the conditions governing state transitions. Second, predefined negative-path tests attempted to advance a profile without a citation, generate an unsupported component, and export a package without approval; the expected result in each case was recorded before execution. Third, reviewers examined outputs and completed a structured instrument covering usefulness, coherence, traceability, review necessity, anticipated revision effort, and institutional relevance. The instrument and replication sequence appear in Appendix A.

Technical results were recorded as expected versus observed behavior. Reviewer responses were summarized descriptively. No formal codebook, independent coders, inter-rater agreement, inferential statistics, verbatim-quotation protocol, or controlled comparison was used. Perceived time or effort reduction was therefore treated as perception, not measured

efficiency. The evaluation supports only feasibility and control-operation claims within the examined conditions.

IV. ARCHITECTURE AND DESIGN PRINCIPLES

A. Institutional Knowledge Architecture

Learning Intelligence is defined as an institutional capability for connecting competency frameworks, curricula, labor-market signals, institutional constraints, and learning evidence to governed educational decisions. It operates at program and institutional levels and differs from both course-delivery systems and learner analytics.

TABLE II. FIVE INSTITUTIONAL KNOWLEDGE LAYERS

Layer	Function
1. Educational infrastructure	Competencies, programs, assessment methods, institutional characteristics, learner profiles.
2. Curriculum intelligence	Connects courses, outcomes, competencies, and occupational profiles; identifies gaps.
3. AI reasoning	Supports gap analysis, alignment review, program innovation, and continuing education.
4. Institutional intelligence	Represents regulation, cost thresholds, capacity, facilities, and strategy.
5. Learning outputs	Presents recommendations with evidence-support indicators for review.

B. Six-Stage Value Pipeline

TABLE III. SIX-STAGE ENGINEERING PIPELINE

Stage	Function
I. Ingestion	Converts institutional files into structured, citable units linked to the source.
II. Diagnosis	Identifies gaps, prerequisites, complexity, and evidence before recommendation.
III. Design	Derives organization, duration, and workload from diagnosed content [23].
IV. Generation	Produces content, activities, assessments, rubrics, and question banks.
V. Governance	Blocks material lacking grounding, review status, or institutional approval.
VI. Deployment	Exports approved packages to LMS-compatible and document formats.

TABLE IV. REQUIRED QUESTION-BANK COMPOSITION

Item type	Count	Bloom category
True/false	3	L1-L2
Single choice	4	L1-L3
Multiple choice	2	L3
Short answer	2	L3-L4
Applied reasoning	2	L4-L5
Scenario	2	L5-L6
Minimum total	15	L1-L6

The counts in Table IV are prompt and validation requirements. They demonstrate distribution across assigned labels, not independently verified cognitive demand.

C. Architectural Controls

Source grounding requires a traceable institutional source for generated components and creates an auditable trail; semantic fidelity remains an empirical question. Cognitive distribution enforcement checks the required allocation across Bloom labels; expert classification remains necessary. Human governance places approval in the pipeline rather than in optional guidance: export is blocked until review requirements are satisfied. These controls shift quality assurance earlier in the workflow without transferring academic responsibility to the system.

V. ACADEMIC ENTREPRENEURSHIP AND PURPOSE-DRIVEN BUSINESS MODEL

A. Opportunity and Value Proposition

Universities hold curriculum documents, competency frameworks, accreditation records, and institutional policies across disconnected offices and formats. Xkila's opportunity is to transform these assets into a reusable decision capability. Leadership receives institution-level visibility; faculty and curriculum designers receive a source-grounded draft for review; quality-assurance offices receive an auditable evidence trail; and regional institutions receive an approach designed for contextual adaptation rather than unmodified transfer.

B. Value Creation, Delivery, and Capture

Value is created as institutional documents become citable knowledge units, diagnosed gaps, structured curriculum designs, and governed learning assets. Delivery currently occurs through institution-specific pilot configuration and collaboration. Possible future mechanisms include institutional licensing, implementation support, and continuing technical and pedagogical services. These mechanisms have not been commercially validated, and no pricing, revenue, willingness-to-pay, or cost-structure evidence is reported.

C. Evidence of Venture Development

The two university pilots provide the first evidence that Xkila has moved beyond its original development setting. The partner institutions provided access to authentic materials, involved three professionals in reviewing the outputs, and tested the artifact within existing academic workflows. Their participation shows institutional interest and a willingness to devote professional time to the pilot. It does not amount to a purchase commitment or a licensing agreement, and the study provides no evidence of revenue, renewal, or financial sustainability. The pilots also operated without a formal intellectual-property or revenue-sharing agreement.

TABLE V. EVIDENCE OF VENTURE DEVELOPMENT

Dimension	Evidence from the pilots	Remaining question
Problem-solution engagement	Two partner-university pilots with authentic materials	Market representativeness
Adoption signal	External institutional access and reviewer participation	Paid adoption or renewal
Delivery	Institution-specific pilot configuration	Repeatable implementation cost
Governance	Human approval and tenant controls in the artifact	Formal IP or revenue-sharing agreement
Value capture	Licensing and support identified as options	Validated pricing, revenue, or sustainability

D. Governance, Regional Purpose, and Scalability

The venture originated within the Universidad Tecnológica de Honduras. Formal allocation of intellectual property, protection of partner-contributed knowledge, responsibility for academic decisions, and the relationship between the university and a future independent venture remain unresolved. These are conditions for scaling, not details that can be deferred indefinitely. The intended regional purpose is to reduce dependence on curriculum-intelligence approaches designed for other labor markets and to strengthen university innovation capacity. No societal impact is claimed. Scaling would require local validation in every new regulatory, institutional, and labor-market context.

VI. FINDINGS

A. Architectural Control Results

TABLE VI. ARCHITECTURAL CONTROL TESTS

Control	Test	Expected	Observed
Missing citation	Advance a profile without a source citation	Block	Blocked
Ungrounded component	Generate without supporting evidence	Flag	Flagged
Unapproved package	Export by interface or direct API before approval	Block	Blocked
Approved package	Export after all approval states	Complete	Completed

Within the tested configurations, the negative-path controls behaved as specified, including direct API attempts. This supports a narrow claim that the examined governance rules were implemented beyond the user interface. It does not establish that citations were semantically correct, that all possible bypasses were excluded, or that the architecture outperforms another workflow.

B. Reviewer Feedback

The three reviewers described the outputs as coherent starting points for curriculum work and anticipated lower drafting effort. All emphasized that publication should remain conditional on academic review. Because feedback was collected from three convenience-selected participants and analyzed descriptively, these observations cannot support claims about comparative efficiency, user adoption, curriculum quality, or learner outcomes.

TABLE VII. DESCRIPTIVE REVIEWER SYNTHESIS

Theme	Descriptive observation	Evidentiary boundary
Usefulness	Drafts were considered usable starting points.	Three reviewers; no comparison group.
Perceived effort	Reviewers anticipated less initial drafting effort.	No time-on-task measurement.
Governance	All required academic review before publication.	No blinded or independent rating.
Context relevance	Institutional sources improved perceived relevance.	Semantic faithfulness not scored.

C. Design Hypotheses

The pilot raised four hypotheses rather than validated findings. Temporal validity: document age should affect the confidence assigned to recommendations. Context alignment: transfer to a new setting should require explicit local validation. Diagnosis-recommendation coupling: diagnostic quality and recommendation quality should be measured separately. Institutional coherence: individually defensible recommendations may still require collective review against strategy and capacity.

VII. DISCUSSION

A. Architectural Contribution and Division of Labor

The contribution is not content generation alone but the governed transformation of institutional knowledge into reviewable educational decisions. Grounding changes the review task from locating an unknown basis for a recommendation to examining an explicit source relationship. The pilot also suggests a tentative division of labor: the artifact can organize comparisons and produce structured drafts, while experts retain responsibility for contextual interpretation, citation faithfulness, actual cognitive level, and final educational decisions [2].

Recommendation quality appeared sensitive to the completeness and contextual validity of the underlying knowledge base, a concern also reported in AI-supported clinical and financial decision systems [24], [25]. Universities therefore need to manage the currency and structure of institutional knowledge alongside model selection. Separating diagnosis, design, generation, and approval creates intermediate review points consistent with instructional design principles [26].

B. Implications for Academic Entrepreneurship

The entrepreneurship contribution explains how a university research artifact is beginning to take organizational form. The external pilots connect Xkila with identifiable users and show how the capability can be configured and delivered in another institution. They also expose decisions that must be resolved before wider adoption, especially licensing, implementation support, protection of institutional knowledge, and the relationship between the venture and its university of origin. At this stage, the evidence supports an account of venture formation and a set of milestones for further study. It does not support a claim of commercial sustainability.

C. Design Propositions

DP1: Knowledge architecture primacy. If institutional knowledge is more complete, current, and contextually valid, then recommendation quality will exceed that obtained by model improvement alone. DP2: Institutional augmentation and venture scaling. If objectively measured reductions in design time and revision effort occur without lower expert-rated quality, then the capability will have a stronger basis for multi-institutional adoption. DP3: Governance through architecture. If grounding, cognitive-distribution checks, and approval gates are embedded in the pipeline, then compliance with specified quality controls will exceed workflows dependent on user discretion. DP4: Context-aware scalability. If local knowledge structures and regulations are explicitly validated during implementation, then cross-institutional transfer quality will exceed unadapted deployment [27]-[29]. None of these propositions is validated by the present study.

VIII. LIMITATIONS

This is an early DSR evaluation based on architectural inspection, predefined control tests, and descriptive feedback from three convenience-selected reviewers at two universities. There was no controlled comparison, random or representative sampling, independent or blinded assessment, formal qualitative coding, inter-rater analysis, objective timing, cost measurement, curriculum-quality outcome, or learner outcome. The author's role as both founder and evaluator may have influenced access, study decisions, and interpretation; readers should consider this relationship when assessing the findings.

Technical boundaries are equally material. Source traceability does not prove semantic correctness or completeness. Bloom-label distribution does not establish actual cognitive demand. Negative-path tests do not constitute a comprehensive security audit. Dependence on external model providers introduces temporal and operational risk. The venture analysis is also preliminary: two pilots indicate external engagement but do not establish willingness-to-pay, licensing, revenue, retention, scalable implementation, financial sustainability, or settled governance and intellectual-property arrangements. All feasibility, usefulness, scalability, and venture claims should be read within these boundaries.

IX. CONCLUSIONS AND FUTURE RESEARCH

The study answers RQ1 by presenting a five-layer knowledge architecture and six-stage pipeline that operationalize Learning Intelligence through source traceability, cognitive-distribution requirements, and mandatory human approval. The pilot establishes only that specified controls operated under the tested conditions and that three reviewers found the outputs promising as reviewed drafts. It does not establish effectiveness, efficiency, semantic accuracy, cognitive validity, or educational impact.

The findings for RQ2 describe an emerging venture rather than a validated business. The two external pilots connect the artifact to a purpose-driven value proposition and show initial institutional interest, while the commercial and governance arrangements remain unresolved. A subsequent study should involve independent blinded experts, assess citation faithfulness and Bloom classification, and compare design time, expert-rated quality, revision effort, alignment, and cost with conventional workflows. It should also examine willingness to pay, adoption, renewal, implementation cost, licensing, and governance. Appendix A provides the protocol and reviewer instrument for that work.

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APPENDIX A. REPLICATION PROTOCOL AND REVIEWER INSTRUMENT

A. Artifact and Test Preparation

Record the platform version, model provider and model identifier, retrieval configuration, document-processing rules, source-document inventory and dates, institutional context, and approval roles. Proprietary code need not be disclosed, but the control logic, expected state transitions, test inputs, and scoring rules must be specified. Remove personal and institutionally restricted information before sharing replication materials.

B. Control-Test Sequence

For each control, record a test identifier, initial state, input, action, expected state, observed state, timestamp, and evidence capture. Execute at minimum: missing-citation advancement, unsupported generation, unapproved export through the interface, unapproved export through direct API access, and approved export after every required review state. Repeat each test after configuration changes and report failures, not only successful runs.

C. Reviewer Instrument

Use independent reviewers where feasible and conceal system condition during comparative assessment. Rate each item on a five-point scale from 1 (strongly disagree) to 5 (strongly agree): (1) claims are faithful to the cited source; (2) the draft aligns with stated curriculum outcomes; (3) assigned Bloom categories match the cognitive demand of the items; (4) the draft is coherent and usable as a starting point; (5) required revisions are identifiable and manageable; (6) the output reflects the institutional context; (7) the evidence trail supports review; and (8) the package should not be released without academic approval. Record design time and revision time in minutes, number and severity of revisions, unsupported-claim count, citation-faithfulness score, alignment score, and total implementation cost. Report reviewer expertise, blinding, calibration, inter-rater agreement, missing data, and the complete analysis plan.

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