

Systematic Review

Developing an Education Framework for MIS Professionals Aiming at Social Impact: A Systematic Review and Design-Oriented Synthesis

Jeong-Eun Soh ¹  and Tae-Sung Kim ^{2,*} 

¹ Department of Management Information Systems, Chungbuk National University, 1 Chungdae-ro, Seowon-gu, Cheongju 28644, Republic of Korea; sso4387@cbnu.ac.kr

² Department of Management Information Systems, Cybersecurity Economics Research Institute, Chungbuk National University, 1 Chungdae-ro, Seowon-gu, Cheongju 28644, Republic of Korea

* Correspondence: kimts@cbnu.ac.kr

Abstract

This study develops the Socio-Technical Impact (ST-Impact) model, a sustainability-oriented curriculum design framework for management information systems (MIS) education, aimed at preparing future professionals to design and govern digital systems in socially and environmentally responsible ways. The rapid diffusion of emerging technologies, particularly generative AI, has intensified the need for MIS professionals who can integrate technical competence with social responsibility, ethical reasoning, responsible digital design, and public-value-oriented problem solving—competencies that remain unevenly addressed in existing MIS curricula. To address this gap, the study adopts a design science research approach, conducting a systematic review, reported in accordance with PRISMA 2020, and a design-oriented narrative synthesis of 120 international studies published between 2010 and 2025. Learning activities, student-produced artifacts, and assessment mechanisms were extracted as curriculum design units, while governance-related indicators were coded according to stakeholder requirements, accountability, equity, accessibility, privacy, safety, explainability, and sustainability. The resulting ST-Impact model comprises six iterative modules and a three-layer evaluation system. Its design coherence and practical plausibility are examined through an evidence-to-model traceability mapping, an illustrative comparative analysis of publicly visible curriculum structures, and an adaptable 15-week syllabus architecture. By translating abstract concepts of societal impact, responsible digital design, and digital sustainability into actionable curriculum design elements, this study contributes a literature-grounded foundation for future empirical validation in MIS education.

Keywords: management information systems education; societal impact; sustainability-oriented education; IS2020; corporate digital responsibility; design science research; systematic review; curriculum design; activities–artifacts–assessments framework



Academic Editor: Fernando Moreira

Received: 2 June 2026

Revised: 30 June 2026

Accepted: 2 July 2026

Published: 14 July 2026

Copyright: © 2026 by the authors.

Licensee MDPI, Basel, Switzerland.

This article is an open access article distributed under the terms and conditions of the [Creative Commons Attribution \(CC BY\)](https://creativecommons.org/licenses/by/4.0/) license.

1. Introduction

Digital transformation is fundamentally reshaping organizational value creation, public service delivery, work practices, and social participation. Emerging technologies such as artificial intelligence, data analytics, platforms, blockchain, and automated decision systems have substantially expanded the strategic scope of information systems, but they have also generated complex socio-technical concerns, including algorithmic bias, surveillance, exclusion, privacy intrusion, information inequality, and unequal access to digital

resources [1–3]. These developments have elevated the importance of responsible digital transformation and corporate digital responsibility (CDR), which emphasize accountability, transparency, fairness, privacy, digital quality, and stakeholder-oriented value creation in technology design and use [4,5].

The digital economy is likewise reshaping the competencies required of future information systems professionals. In digitally transformed organizations, these professionals are expected not only to implement information technologies and improve operational efficiency, but also to address the broader organizational, ethical, and societal implications of digital innovation. They must interpret socio-technical problems, evaluate the organizational and societal consequences of digital solutions, communicate with multiple stakeholders, and make design decisions that reflect ethical and sustainability concerns. Global discussions on the future of work similarly emphasize analytical thinking, complex problem solving, technological literacy, resilience, and responsible decision-making as essential capabilities for technology-intensive professions [6].

These developments carry direct implications for management information systems (MIS) education. MIS has traditionally occupied a boundary-spanning position among technology, organizations, and managerial decision-making, which makes the field well suited to educating for responsible digital transformation. MIS graduates must understand technical functions, organizational processes, user needs, governance mechanisms, and social consequences in an integrated manner. Curriculum standards such as CC2020 and IS2020 have already moved toward competency-based education, emphasizing knowledge, skills, and dispositions that include ethics, sustainability, and social implications [7,8]. However, these standards are intentionally flexible and high-level; they do not fully specify how societal value and responsibility can be operationalized through concrete learning activities, student outputs, assessment tasks, and feedback structures within MIS curricula.

Prior research on service-learning, community engagement, capstone education, digital ethics, AI ethics, and sustainability in higher education provides important pedagogical and conceptual resources [9–11]. Recent work on generative AI in education further shows that digital education must address not only tool adoption but also critical thinking, academic integrity, ethical judgment, privacy, fairness, transparency, and responsible AI use [12–15]. Nevertheless, the literature remains dispersed across domains and often focuses on single courses, local interventions, or conceptual arguments. A curriculum-level model is therefore needed to translate these values into structured educational functions aligned with the competency logic of MIS education.

This study addresses this gap by developing the Socio-Technical Impact (ST-Impact) model through a design science research approach drawing on a PRISMA 2020-guided systematic review and design-oriented synthesis of international literature. The model's name reflects its underlying intent: to connect socio-technical problem understanding, digital solution development, responsibility-oriented evaluation, and field-linked impact creation within a single curriculum-level structure. The manuscript is not positioned as an expert validation or field implementation study; rather, it is a literature-based design study that identifies recurrent educational elements and reorganizes them into a coherent curriculum-level structure. Accordingly, the study addresses three research questions: (RQ1) What activities, artifacts, assessments, and responsibility-related design elements are reported in international studies on digital and MIS education for societal impact? (RQ2) How can these elements be translated into recurrent educational functions and aligned with the IS2020 competency structure? (RQ3) What curriculum-level model can support responsible MIS education for societal impact?

Because the term sustainability is used throughout this study, its conception is clarified at the outset. Sustainability-oriented MIS education, as used here, does not denote environ-

mental sustainability alone. It is conceived primarily as a combination of two orientations: social sustainability, which concerns inclusion, equity, accessibility, and the long-term distribution of digital opportunity across stakeholders; and responsible digital sustainability, which concerns the governance, accountability, privacy, and explainability of digital systems over their design and operational lifecycle. Environmental and resource-related considerations, together with the United Nations Sustainable Development Goals, are treated as a complementary reference point for situating socially meaningful project contexts, rather than as the primary theoretical anchor of the model. This conception is adopted consistently throughout the manuscript and is further specified in Section 2.3.

2. Literature Review

2.1. Socio-Technical Responsibility in MIS Education

The role of information systems has expanded from providing internal organizational support to shaping the design, mediation, and governance of complex socio-technical systems [1–3]. Accordingly, MIS education can no longer be limited to the acquisition of technical tools or the optimization of organizational efficiency; it must also address the organizational, ethical, and societal implications of digital systems in relation to accountability, fairness, privacy, accessibility, transparency, and stakeholder-oriented value creation [4,5], consistent with the expectations embedded in contemporary IS curriculum standards [7,8]. It also requires students to recognize the broader ethical debate surrounding algorithmic opacity, bias, discrimination, and the governance of artificial intelligence in society [16–18], as well as the more specific ethical risks that arise when such systems are deployed within educational settings, including unmitigated bias in automated assessment, opaque decision logic, and insufficient human oversight [19]. On this basis, in this study, MIS education for societal impact is defined as a curriculum orientation that connects digital capability with public value, inclusion, sustainability, ethical reasoning, and responsible design.

Service-learning and community-based educational models have long demonstrated that students can develop disciplinary competence and civic awareness by applying knowledge to real-world social problems [9–11]. In information systems education, such approaches are especially valuable because they require students to connect user needs, organizational constraints, digital artifacts, and societal consequences. The educational value of this type of learning depends not only on selecting socially meaningful topics, but also on structuring problem definition, needs analysis, design, implementation, evaluation, reflection, and feedback.

The recent spread of generative AI further reinforces the need for MIS education to integrate responsible technology use into this socio-technical orientation. Recent studies suggest that generative AI's role in education is shifting from a potentially deceptive disruption to one that can be harnessed constructively when accompanied by deliberate pedagogical redesign [12]. Responsible AI education is therefore not limited to teaching students how to use AI tools; it also requires students to examine transparency, accountability, privacy, fairness, bias, human oversight, and the broader social consequences of AI-supported digital systems, consistent with the ethical principles identified in systematic reviews of AI use in classroom settings [14].

This socio-technical orientation also aligns with the broader mandate of university social responsibility, in which higher education institutions are increasingly expected to contribute to community development, inclusion, and responsible innovation [20]. In this sense, embedding social impact in MIS education is not an additive ethics topic but a curriculum design problem that requires alignment among disciplinary competence, stakeholder engagement, and responsible digital transformation.

2.2. Normative Foundations: IS2020, CDR, and IT Governance

IS2020 provides a global competency model for undergraduate information systems education and is particularly relevant to this study because it moves beyond a fixed course list to adopt a competency-based structure. The model emphasizes knowledge, skills, and dispositions, and organizes information systems education around competency realms and areas [8]. This structure allows curricula to remain flexible while maintaining alignment with disciplinary expectations. However, high-level competency descriptions do not automatically translate into concrete learning activities, student artifacts, or assessment mechanisms. Constructive alignment and competency-based education support this translation, as both emphasize consistency among learning outcomes, learning activities, assessment tasks, and demonstrated performance [21,22].

Corporate digital responsibility (CDR) offers a normative lens for connecting digital innovation with societal responsibility. CDR holds that organizations should manage digital technologies and data in ways that are transparent, accountable, fair, privacy-preserving, secure, and attentive to stakeholder value [4,5]. Because MIS professionals routinely participate in requirements analysis, system design, data governance, platform management, transformation projects, and decision support, CDR constitutes a directly relevant responsibility lens for MIS curricula. AI and data-driven systems, in particular, may give rise to opacity, bias, discrimination, inappropriate surveillance, and accountability gaps, requiring students to identify potential harms, analyze stakeholder impacts, design safeguards, justify decisions, and revise solutions based on feedback [16–18].

For social impact and responsibility to become operational educational criteria, however, they must be connected to governance and evaluation logic. IT governance offers concepts for linking goals, processes, roles, controls, indicators, and feedback. COBIT 2019, for example, emphasizes governance objectives, performance measurement, risk management, stakeholder needs, and alignment between enterprise goals and IT-related goals [23]. Although COBIT was originally designed for organizational rather than educational governance, its underlying logic can be productively reinterpreted as an accountability structure for curriculum design. This study draws on this governance logic to clarify how MIS education for societal impact can be evaluated beyond mere technical task completion.

2.3. Research Gap and Design Premises for the ST-Impact Model

Existing curriculum standards and prior studies provide important foundations, but they do not yet offer an integrated model that connects competency standards, sustainability values, concrete learning activities, student outputs, assessment mechanisms, and feedback loops. Service-learning and capstone studies often provide rich examples of field-linked learning, but they are usually course-specific. Digital ethics and AI ethics studies identify key normative issues, but they often remain at the level of topic identification or conceptual guidance [24]. CDR research provides responsibility principles, but these principles have not been sufficiently translated into MIS curriculum design.

The present study is therefore based on three design premises. First, MIS education for societal impact should be organized around recurrent educational functions rather than isolated topics. Second, the model should align with IS2020 so that social value does not become detached from core MIS competencies. Third, responsibility criteria should be embedded in activities, artifacts, assessments, and feedback procedures so that sustainability and accountability become visible in curriculum operation. Consistent with the conception of sustainability introduced in Section 1, social sustainability and responsible digital sustainability are treated as the two primary orientations underlying the model, while environmental considerations and the SDGs serve a complementary, contextualizing role. For analytical clarity, societal impact is defined through two overarching axes: respon-

sible digital design and public-value-oriented outcomes. Responsible digital design refers to ethical, accountable, accessible, privacy-conscious, secure, explainable, and bias-aware considerations embedded in the design and implementation of digital and information systems. Public-value-oriented outcomes refer to the extent to which educational outputs contribute to communities, stakeholders, sustainability-oriented problem domains, and public problem solving. These two axes are further specified through four interrelated dimensions: social equity and inclusion, ethical and governance responsibility, community and public value, and environmental and long-term sustainability. These dimensions are not mapped onto the M1-M6 modules in a one-to-one manner; rather, they function as cross-cutting design and assessment lenses across the ST-Impact model. The UN Sustainable Development Goals (SDGs) are used as an external reference point for identifying socially meaningful project contexts and articulating the potential social or sustainability relevance of student artifacts, not as internal competency categories or direct measures of SDG achievement. A module refers to a recurrent educational function that can be implemented within a course, across linked courses, or within a capstone or practicum sequence. Core studies are studies that provide direct design evidence through identifiable activities, artifacts, and assessments. Support studies provide complementary evidence for stakeholder linkage, accountability, assessment, or theoretical grounding. AAA refers to activities, artifacts, and assessments and is used as the minimum unit for extracting educational design elements from the literature. The conceptual foundations informing the study are summarized in Table 1.

Table 1. Conceptual foundations informing the study.

Category	Representative Literature	Contribution to the Present Study
IS curriculum standards	Topi et al. [25]; CC2020 Task Force [7]; Leidig and Salmela [8]	Competency-based reference structure for MIS curriculum design
Service-learning and community engagement	Bringle and Hatcher [9]; Eyler and Giles [10]; Hoxmeier and Lenk [11]	Field-linked learning, civic responsibility, reflection, and reciprocal partnership logic
Competency-based curriculum design	Westera [22]; Biggs and Tang [21]	Alignment among outcomes, activities, artifacts, and assessments
Digital and AI ethics education	Mittelstadt et al. [16]; Floridi et al. [17]; Jobin et al. [18]; Paltiel et al. [24]	Ethical reasoning, responsible AI, fairness, transparency, and accountability
CDR and responsible digital transformation	Lobschat et al. [4]; Carl and Hinz [5]; Vial [1]	Responsible design criteria for digital technologies and data
IT governance and evaluation	ISACA [23]; Porter and Kramer [26]; Mertens [27]	Governance, performance measurement, feedback, and social value evaluation logic

3. Materials and Methods

3.1. Research Design: DSR-Oriented Review Synthesis

The primary methodological objective of this study was not to estimate the effects of educational interventions, but to develop an actionable curriculum design artifact. Consequently, this research adopted a design science research (DSR) orientation, which focuses on the creation and evaluation of artifacts designed to address organizational or socio-technical problems [28,29]. The review was used as a design-oriented evidence synthesis to identify pedagogical design units that could inform the ST-Impact model.

This study is positioned as a PRISMA 2020-guided systematic review and design-oriented synthesis. The review was conducted and reported in accordance with the PRISMA 2020 statement. Because the objective was to develop a curriculum design frame-

work rather than to estimate intervention effects, the synthesis used a narrative and design-oriented approach rather than meta-analysis. The review protocol was not prospectively registered in a public registry; therefore, no registration number is available.

This systematic review adopted a streamlined, design-oriented synthesis workflow informed by PRISMA 2020 reporting principles used to construct the evidence base for DSR-oriented framework development [30–32]. The purpose of the review was design-oriented synthesis rather than meta-analysis. Accordingly, the analysis focused on educational activities, student artifacts, assessment methods, and governance-related indicators that could be converted into curriculum components. The methodological alignment between the DSR orientation and the review protocol is summarized in Table 2.

Table 2. Methodological alignment of the AI-assisted systematic review workflow within DSR.

DSR Phase	Review Objective	Human-in-the-Loop Protocol
Problem identification	Define the international scope and the temporal boundary of 2010–2025.	The researcher set the search parameters and exclusion criteria.
Suggestion and screening	Prioritize relevant literature and manage heterogeneous and weakly relevant records in a broad abstract pool.	AI-assisted labeling, prioritization, and provisional scoring supported preliminary organization; ambiguous records were retained for review.
Development and extraction	Identify and extract core pedagogical design units.	The researcher conducted full-text eligibility review and extracted AAA and governance-related indicators.

3.2. Search Strategy and PRISMA-Informed Reporting

The literature search was conducted between 21 November 2025 and 18 December 2025. Data sources included Scopus, Web of Science, and selected journal searches in MIS, technology, computing education, information systems education and higher education. The search strategy was structured around four conceptual axes: higher education context, educational intervention, MIS or digital content as a learning target, and social or sustainability related value.

The publication window of eligible records was restricted to 2010–2025, because this period captures the transition from IS2010 and ISO 26000 to more recent discussions on competency-based IS education, corporate digital responsibility, ESG, and digital ethics [25,33]. Search terms included combinations of higher education, university, course, curriculum, module, capstone, project-based learning, service-learning, information systems, management information systems, digital technology, data analytics, artificial intelligence, software, cybersecurity, societal impact, sustainability, responsible technology, ethics, equity, inclusion, accessibility, and digital divide.

A total of 1737 international records were identified. Duplicates were removed using DOI as the primary key and conservative bibliographic matching when DOI information was unavailable. This process removed 233 duplicates and produced 1504 records for screening. Following screening and prioritization, 346 records were identified as an upper-priority full-text candidate pool. Before full-text eligibility review, 59 records were removed because of additional duplicate records, bibliographic inconsistencies, or inability to secure the full text. Accordingly, 287 reports were assessed for full-text eligibility, and 120 studies were retained for the final analytical set. The PRISMA-informed review and attrition process is summarized in Table 3 and visualized in Figure 1. Of the 287 reports assessed for full-text eligibility, 167 were not retained for the final analytical synthesis. A single primary reason was assigned to each report not retained. Reports were not retained because they were outside the higher-education or structured educational-intervention scope ($n = 65$);

conceptually or contextually related to the broader review domains, but did not describe a concrete educational design element—such as a learning activity, student-produced artifact, assessment mechanism, or curriculum structure—that could be extracted for framework synthesis ($n = 68$); insufficiently situated in an MIS- or digital-learning context, or lacking a clear curriculum-design linkage ($n = 30$); social impact or sustainability concerns absent or only weakly embedded ($n = 3$); or other insufficient eligibility information ($n = 1$). Consequently, 120 studies were retained for the final analytical set, consisting of 11 core evidence studies and 109 support evidence studies.

Table 3. PRISMA-informed review and attrition summary.

Review Phase	Number of Records	Description and Methodological Action
Identification	1737	Initial retrieval from Scopus, Web of Science, and targeted journal searches
Duplicate removal	1504	Removal of 233 duplicates using DOI and conservative bibliographic matching
Screening and prioritization	346	S/A-grade upper-priority pool identified through scope coding and T/E/S/F scoring
Pre-full-text eligibility check	59	Additional removal before full-text review due to duplicate records, bibliographic inconsistencies, or inability to secure the full text
Full-text eligibility	287	Researcher-led full-text review focused on design extractability and relevance to MIS/digital education for societal impact
Reports not retained for final analytical synthesis	167	Reports were not retained because they were outside the higher-education or structured educational-intervention scope ($n = 65$); conceptually or contextually related to the broader review domains, but did not describe a concrete educational design element—such as a learning activity, student-produced artifact, assessment mechanism, or curriculum structure—that could be extracted for framework synthesis ($n = 68$); insufficiently situated in an MIS- or digital-learning context, or lacking a clear curriculum-design linkage ($n = 30$); social impact or sustainability concerns absent or only weakly embedded ($n = 3$); or other insufficient eligibility information ($n = 1$).
Final analytical set	120	Final international analytical set, including 11 core studies and 109 support studies

3.3. Screening, Prioritization, and Eligibility Review

Abstract-based screening examined whether each record was potentially relevant to higher education, educational intervention, digital or MIS learning content, and societal impact. At the first screening stage, records were coded using six categories: I-SI for records with clear evidence of higher education, an educational intervention, an MIS or digital learning target, and an explicit societal-impact dimension; I-Base for records meeting the same criteria but lacking explicit societal-impact evidence; U for records with ambiguous or uncertain evidence on any of these dimensions; and E1, E2, and E3 for records excluded for being situated outside higher education, outside the relevant subject domain, or using technology merely as a delivery medium rather than a learning target, respectively. The coding scheme was designed to minimize premature exclusion. Records were excluded only when they clearly fell outside higher education, lacked an educational intervention, or

used technology merely as a delivery medium without digital competence as a learning target. Ambiguous records were retained for later confirmation.

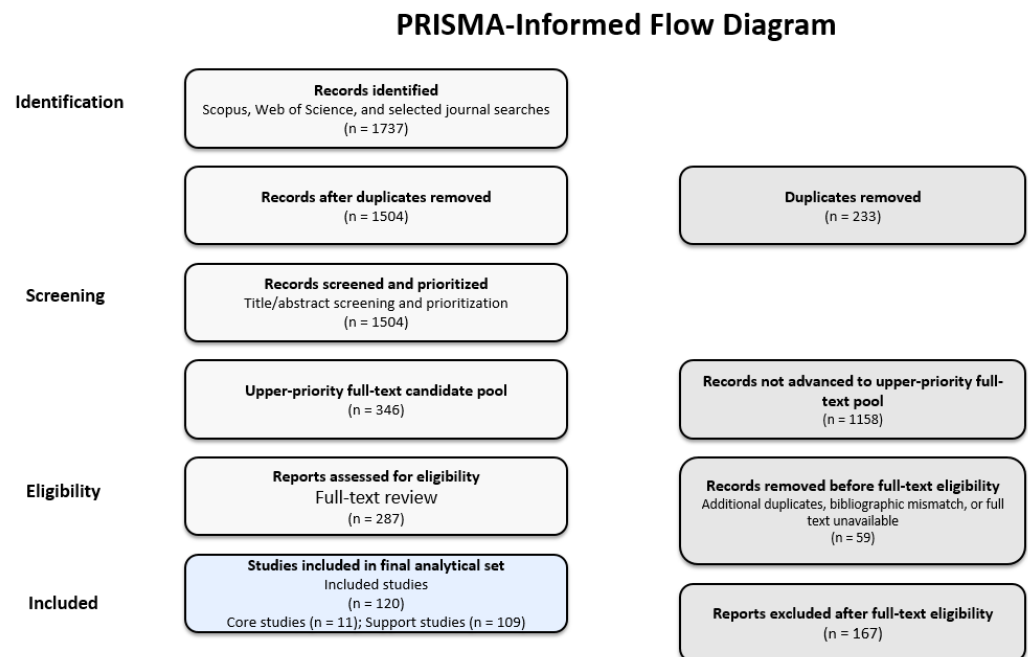


Figure 1. PRISMA-informed flow diagram for the international literature review and analytical set construction.

Because the abstract pool was large and heterogeneous, a second-stage prioritization procedure was used to organize the order of full-text review. All 1504 de-duplicated records were coded on four dimensions: higher education intervention, MIS or digital content as a learning target, societal-impact linkage, and evaluation or validation evidence. A T/E/S/F-based 10-point scoring system was also applied to evaluate the density of design evidence. T indicated technological implementation level, E indicated the degree of educational structuring, S indicated the explicitness of societal-impact evidence, and F indicated the presence of evaluation, validation, or design-model evidence. The functional composition of the final international analytical set is summarized in Table 4.

Table 4. Functional composition of the final international analytical set.

Category	Number of Studies	Role in Model Development
Core: direct design evidence	11	Direct input for deriving recurrent educational functions, activities, artifacts, and assessment structures
Support evidence (complementary evidence for narrative synthesis and model refinement)	109	Complementary evidence for societal impact logic, sustainability, responsibility criteria, stakeholder linkage, governance, and assessment refinement
Total international analytical set	120	Full systematic review corpus used for descriptive, narrative, and design-oriented synthesis

3.4. Human-in-the-Loop Use of AI

Following the completion of the literature search, the screening and coding scheme was iteratively piloted and refined before full-scale application. AI-assisted abstract-level organization, labeling, prioritization, and provisional scoring were then conducted between January and February 2026 using ChatGPT (OpenAI; paid web interface, as deployed

between January and February 2026). This period refers specifically to the preliminary abstract-level screening, prioritization, and scoring stage. The ChatGPT web interface was used as a platform-level tool rather than as a fixed API model endpoint. Accordingly, the AI assistance is reported in terms of the tool/platform and deployment period rather than a precisely verified model version. The AI-assisted procedure used the search-record information available for each record, including titles, abstracts, keywords where available, publication year, journal or source, DOI where available, and database information. These metadata were used for record identification and organization. However, relevance assessment, prioritization, and provisional scoring were conducted primarily at the abstract level. Full texts were not provided to ChatGPT at this stage. The prompts were structured around predefined review criteria, including higher education context, educational intervention, MIS or digital learning content, social or sustainability-related relevance, and the presence of design or evaluation evidence. A T/E/S/F-based scoring logic was used to assess the density of design-relevant evidence and to organize the order of full-text review. Recent methodological discussions of AI-supported reviews and hybrid intelligence emphasize that such tools should remain within human-in-the-loop workflows and under researcher control [34–36]. AI-generated outputs were therefore treated only as preliminary abstract-level labels, prioritization aids, and provisional scores; they were not used as automatic inclusion or exclusion decisions.

To reduce the risk of false exclusion, the screening logic was intentionally high-recall. Records with ambiguous, partial, or weak relevance were not automatically excluded; rather, they were retained as weak or uncertain candidates for subsequent researcher review. The researcher reviewed the AI-assisted labels and provisional scores against the predefined inclusion and exclusion criteria. Final inclusion and exclusion decisions, full-text eligibility review, extraction of activities, artifacts, assessments, and governance-related indicators, core/support classification, synthesis, and ST-Impact model development were conducted by the researcher.

3.5. Data Extraction: AAA and Governance Indicators

Data extraction was conducted according to the functional distinction between core and support studies. This distinction was a functional evidence classification rather than a quality ranking of the included studies. Core studies were defined as studies that provided direct and extractable curriculum design evidence, including identifiable learning activities, student-produced artifacts, and assessment mechanisms. They also had to be situated in higher education and include MIS-relevant digital, data, AI, analytics, or information-system-related learning targets connected to social impact, sustainability, responsibility, or stakeholder-oriented value. Support studies contributed relevant conceptual, normative, evaluative, or contextual evidence but did not provide a complete set of extractable AAA elements. They were used to refine the sustainability framing, governance indicators, responsibility criteria, stakeholder linkage, assessment logic, and theoretical grounding of the model. Supplementary Table S1 reports the classification criteria, Supplementary Table S2 provides the core evidence extraction matrix for the 11 core studies, and Supplementary Table S3 lists the full analytical set of 120 included studies.

To support coding consistency, the AAA categories were defined before full-text extraction and applied consistently during review. Activities were defined as observable learning tasks or instructional processes performed by students, such as problem exploration, stakeholder analysis, requirements gathering, design, prototyping, reflection, or presentation. Artifacts were defined as tangible student-produced outputs, such as issue briefs, stakeholder maps, requirements documents, data maps, process diagrams, prototypes, dashboards, reports, portfolios, or reflection essays. Assessments were defined as

mechanisms used to evaluate student learning, artifact quality, responsibility reasoning, or field relevance, including rubrics, surveys, pre–post measures, instructor or peer evaluation, stakeholder feedback, presentations, and reflective assessment. Borderline cases were repeatedly checked against the same AAA definitions. Studies were classified as core evidence only when all three AAA components were explicitly identifiable from the full text; studies without a complete activity-artifact-assessment sequence were retained as support evidence when they provided relevant conceptual, governance, sustainability, or responsibility-related insights. The AAA extraction framework is summarized in Table 5.

Table 5. AAA data extraction framework.

Pedagogical Dimension	Operational Definition for Extraction	Examples of Extracted Target Data
Activities	Learning tasks, instructional methods, and educational processes used to foster socio-technical problem solving	Problem exploration; stakeholder inquiry; needs analysis; design activities; prototyping; presentation; reflection
Artifacts	Observable student outputs that demonstrate technical, managerial, reflective, or responsibility-oriented learning	Issue briefs; stakeholder maps; requirements reports; design documents; prototypes; dashboards; reflection reports; portfolios
Assessments	Evaluation mechanisms used to judge learning performance, responsibility reasoning, or artifact quality	Rubrics; pre–post measures; reflective essays; peer or instructor evaluation; external feedback; qualitative assessment

The second component involved the extraction of governance indicators. This component captured evidence related to stakeholder requirements, accountability, public value, equity, accessibility, privacy, security, safety, transparency, responsible AI, quality assurance, field feedback, and program improvement. Following the initial extraction, thematic synthesis was conducted to cluster fragmented AAA units into cohesive educational sequences [37,38]. The extracted AAA elements and governance indicators were then synthesized into recurrent educational functions, aligned with the IS2020 competency structure, and reorganized into the ST-Impact model.

Table 6 summarizes the seven-step procedure used to derive the ST-Impact model. This procedure connects the data extraction process described in Section 3 with the synthesis of pedagogical design elements presented in Section 4 and the development of the ST-Impact model in Section 5.

Table 6. Procedure used to derive the ST-Impact model.

Step	Procedure	Design Output
1	Identify international studies through database and selected journal searches	Broad international literature pool
2	Screen and prioritize records using scope codes and T/E/S/F scoring	Upper-priority full-text review pool
3	Conduct full-text eligibility review and classify studies as core or support evidence	Final international analytical set
4	Extract activities, artifacts, and assessments from core studies	Direct educational design inputs

Table 6. *Cont.*

Step	Procedure	Design Output
5	Extract societal impact, sustainability, responsibility, and governance-related indicators from core and support studies	Responsible design criteria
6	Cluster recurrent design elements into educational functions	Module-level design functions
7	Align educational functions with IS2020 and specify the ST-Impact model	Six-module model and three-layer evaluation system

4. Results: Pedagogical Design Elements

4.1. Thematic Landscape and Functional Classification

The final analytical set of 120 international studies showed a shift from lecture-centered ethics instruction toward experiential and field-linked educational interventions. Representative formats included service-learning, community engagement projects, project-based learning, capstone practicums, digital ethics modules, AI ethics education, and sustainability-related computing activities. These interventions suggest that societal impact is most meaningfully operationalized when students connect digital knowledge with real or simulated social, organizational, or community problems.

The corpus of 120 included studies was synthesized in two complementary stages. First, a descriptive narrative synthesis was conducted across all 120 studies to characterize the thematic landscape, educational contexts, and responsibility- or sustainability-related curriculum concerns represented in the international literature. Second, a design-oriented synthesis was conducted to derive the structural components of the ST-Impact model, in which the 11 core studies and 109 support studies contributed in functionally distinct but complementary ways: core studies provided direct evidence for extracting activities, artifacts, and assessment elements, whereas support studies informed the refinement of governance, responsibility, stakeholder-linkage, and assessment logic. This core/support distinction reflects a functional evidence classification within the synthesis, not an inclusion hierarchy or a quality ranking; all 120 studies constituted the full systematic review corpus.

To translate this thematic landscape into design inputs for the ST-Impact model, the corpus was functionally classified into 11 core studies and 109 support studies. The core studies provided explicit and extractable AAA elements that served as direct inputs for constructing instructional modules. The support studies provided complementary evidence for governance principles, external stakeholder engagement, responsibility criteria, and multi-layered evaluation logic. This distinction allows the framework to be grounded in direct pedagogical evidence while also incorporating broader normative and evaluative insights. The characteristics of all 120 included studies, together with their corresponding reference numbers, are provided in Supplementary Table S3.

4.2. Synthesis of AAA Elements for Framework Design

The extraction of AAA elements from the core literature confirmed that socio-technical competency requires a staged but iterative configuration of pedagogy. Activities emphasized social issue exploration, stakeholder mapping, requirement gathering, process mapping, design, prototyping, feedback, and reflection. Artifacts included issue briefs, needs-analysis reports, diagnostic data maps, process maps, prototypes, dashboards, reflection reports, and capstone portfolios. Assessments commonly involved rubrics, reflective essays, external feedback, pre-post measures, and responsibility-oriented evaluation criteria.

To operationalize these findings for the DSR process, the extracted AAA units were synthesized and mapped to progressive phases of technological problem solving. This synthesis also incorporated responsibility and governance-related indicators, including public value, equity, accessibility, explainability, accountability, privacy, security, sustainability, stakeholder responsiveness, and program feedback. The resulting synthesis provides the design basis for the six modules of the ST-Impact model, which are described in detail in Section 5.2.

5. Development of the ST-Impact Model

5.1. Derivation Logic and Design Principles

In this study, the proposed curriculum design framework is formally named the Socio-Technical Impact (ST-Impact) model. The term “socio-technical” reflects the MIS perspective that digital systems are jointly shaped by technological, organizational, and social conditions, while “impact” indicates the model’s orientation toward public value, sustainability, stakeholder responsiveness, and responsible digital transformation.

The ST-Impact model was developed through a traceable synthesis of three evidence layers. First, core studies provided direct evidence on what students do, what they produce, and how they are assessed. Second, support studies provided complementary evidence on ethics, sustainability, digital responsibility, stakeholder linkage, governance, and evaluation. Third, IS2020, CDR, and IT governance logic provided the disciplinary and responsibility-oriented reference structures. The design process clustered repeated AAA patterns into educational functions, aligned these functions with IS2020, and embedded responsibility criteria into each module. This procedure clarifies that the model is not an arbitrary instructional sequence but a literature-based design synthesis.

The model is grounded in three design principles. First, social impact and ethics should not be treated as isolated topics; responsibility-related criteria should be embedded across the technological problem-solving process. Second, stakeholder feedback and reflective revision should be incorporated so that student-produced artifacts can be refined through review and structured reflection. Third, evaluation should consider learner competence, responsible design quality, and program-level feedback rather than relying solely on technical completion.

5.2. Six-Module Structure of the ST-Impact Model

The ST-Impact model operationalizes the synthesized AAA elements into six sequential yet iterative modules. Each module represents a recurrent educational function rather than a mandatory stand-alone course and may be implemented within a single course, across linked courses, in a capstone sequence, or as part of a curriculum track.

M1. Social Problem Definition. This module translates broad societal challenges into structured MIS educational tasks. Students define the public dimensions of an information systems problem and identify affected stakeholders. The module focuses on clarifying the public significance of a problem, the affected stakeholder scope, and the relevance of the issue to information systems.

M2. Needs and Context Analysis. This module expands the problem definition by analyzing organizational, user, community, and environmental conditions. It emphasizes needs collection, stakeholder mapping, contextual diagnosis, and requirement traceability, with attention to representation, digital equity, accessibility, and contextual fit.

M3. Data, Process, and System Design. This module converts conceptual requirements into data models, process flows, system architectures, and design rationales. Responsibility criteria are embedded into design decisions so that explainability, privacy, security, accountability, and bias awareness are considered during technical specification.

M4. Digital Implementation. This module focuses on the realization, testing, and demonstration of digital artifacts. Students develop prototypes, test system outputs, and revise implementation results while considering technical reliability, usability, responsible data handling, safety, and human oversight.

M5. Evaluation and Reflection. This module functions as a responsibility-oriented review point. It examines public value, inclusion, sustainability, accountability, and revision logic through reflection reports, evaluation sheets, feedback summaries, and revision proposals. When risks or unintended consequences are identified, students are expected to reconsider earlier assumptions or design choices.

M6. Field-Linked Integrative Practice. This module synthesizes the preceding competencies through capstone, field, or external presentation activities. It emphasizes final reports, portfolios, external presentations, stakeholder feedback, applicability, field relevance, and evidence of social or organizational value. The integrated synthesis of AAA evidence, IS2020 alignment, responsibility focus, and assessment focus for the ST-Impact modules is summarized in Table 7.

5.3. Iterative and Multidisciplinary Operational Flow

The ST-Impact model treats multidisciplinary integration not as a simple juxtaposition of disciplines, but as an operational principle that connects technology, organizations, society, and educational practice. In practical operation, outputs from one module become inputs to subsequent modules. A problem-definition statement from M1 informs the needs-analysis report in M2. Requirements and stakeholder maps from M2 become design conditions in M3. Design specifications from M3 become implementation requirements in M4. Evaluation and reflection in M5 can revise earlier assumptions, and M6 integrates the process through field-linked or capstone-based demonstration. This logic enables ST-Impact to operate as a cumulative and iterative learning architecture rather than a linear checklist. The dimensions of multidisciplinary integration within the ST-Impact flow are summarized in Table 8. The overall structure of the ST-Impact model, including the cumulative module sequence, recursive feedback logic, and three-layer evaluation system, is illustrated in Figure 2.

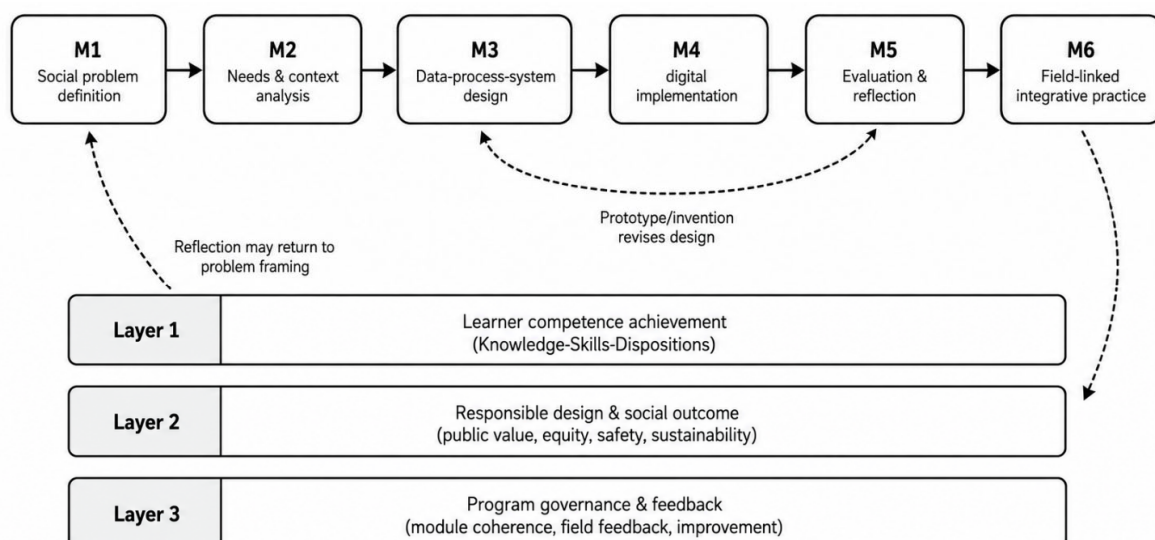


Figure 2. ST-Impact model: cumulative modules, recursive feedback, and three-layer evaluation logic.

Table 7. Integrated synthesis of AAA evidence, responsibility focus, and ST-Impact module design.

Module	Educational Function	Extracted AAA Evidence	IS2020 Alignment	Responsibility/Governance Focus	Assessment Focus
M1. Social Problem Definition	Social issue exploration and stakeholder-oriented problem framing	Activities: social issue exploration, stakeholder mapping. Artifacts: issue briefs, socio-technical problem definitions. Assessments: clarity of public impact and stakeholder scope.	Foundations	Public value, stakeholder identification, community-engaged learning logic	Clarity of problem definition, public impact, and stakeholder scope
M2. Needs and Context Analysis	Needs analysis and contextual diagnosis	Activities: requirement gathering, diagnostic data mapping. Artifacts: needs-analysis reports, stakeholder maps. Assessments: representation, equity, and requirement traceability.	Data/Information; Organizational Domain	Digital inclusion, accessibility, contextual fit, stakeholder analysis	Requirement traceability, representation, and digital equity
M3. Data, Process, and System Design	Translation of needs into data, process, and system design	Activities: process mapping, functional definition. Artifacts: data/process maps, system architecture diagrams. Assessments: design coherence and responsible design rationale.	Data/Information; Technology	Privacy, explainability, accountability, transparency, and bias awareness	Design coherence, explainability, privacy, and bias awareness
M4. Digital Implementation	Digital artifact development, testing, and iterative refinement	Activities: prototyping, user testing, simulation. Artifacts: functional prototypes, dashboards, test logs. Assessments: technical reliability and usability.	Development/Deployment; Technology	Reliability, security, responsible data handling, safety, and human oversight	Functional completeness, usability, privacy/security checks, and human oversight
M5. Evaluation and Reflection	Responsibility-oriented review and revision	Activities: reflection, feedback, responsibility review. Artifacts: reflection reports, impact logs, revision plans. Assessments: responsible design review.	Ethics, Sustainability, and Social Implications; Organizational Domain	Accountability, equity, accessibility, safety, sustainability-related externalities, and revision logic	Responsibility reasoning, externality review, and revision logic
M6. Field-Linked Integrative Practice	Field-linked communication, dissemination, and stakeholder feedback	Activities: external presentations, community practicum, dissemination. Artifacts: final reports, portfolios, stakeholder presentations. Assessments: field relevance and stakeholder feedback.	Project Management; IS Practicum/Integration	Public value, stakeholder feedback, community partnership, and SDG-related relevance	Integrativeness, applicability, field relevance, communication quality, and stakeholder feedback

Table 8. Dimensions of multidisciplinary integration within the ST-Impact flow.

Integration Dimension	Meaning	Operationalization Across Modules
Technology–organization integration	Connecting digital technologies, data, processes, and systems to organizational problem solving	Embedded primarily within M2–M4, transforming diagnostic requirements into system architectures and prototypes
Organization–society integration	Connecting organizational IS use to public value, inclusion, sustainability, and stakeholder impact	Positioned within M1, M2, and M5, requiring technical specifications to account for social externalities and digital divides
Education–practice integration	Connecting course-based learning to field problems, capstones, external feedback, and portfolio evidence	Unified across M4–M6, supporting the transition from prototyping to field-linked demonstration
Responsibility–governance integration	Connecting ethical criteria, accountability, risk review, and feedback to curriculum operation	Embedded across M3–M6 through design rationale, risk review, reflection, and stakeholder feedback

5.4. Three-Layer Evaluation and Governance System

The proposed evaluation system consists of three layers. The first layer is learner competency achievement assessment. This layer evaluates what students understand, perform, and dispositionally demonstrate through stage-specific artifacts. The second layer is responsible design and social outcome criteria. This layer evaluates whether artifacts and design decisions reflect public value, equity, accessibility, explainability, accountability, privacy, security, safety, and sustainability. The third layer is program operation and governance feedback. This layer assesses module coherence, external feedback, operational continuity, field applicability, and curriculum improvement. From a governance perspective, early evidence such as requirement traceability, design rationale, risk review, and reflection can be regarded as leading indicators, while field feedback, applicability, and curriculum improvement can be regarded as lagging indicators. The three-layer evaluation system of the ST-Impact model is summarized in Table 9.

Table 9. Three-layer evaluation system of the ST-Impact model.

Layer	Purpose	Main Content	Reference Logic
Learner competency achievement	Assess what students know, perform, and dispositionally demonstrate	Stage-specific artifacts; knowledge–skills–dispositions evidence; course-level learning outcome achievement	IS2020 competency structure
Responsible design and social outcome criteria	Assess whether designs reflect societal impact and responsibility	Public value; equity; accessibility; explainability; accountability; privacy; safety; sustainability	CDR and responsible digital transformation
Program operation and governance feedback	Assess whether the model is coherently implemented and improved	Module coherence; external feedback; field applicability; operational continuity; curriculum improvement	IT governance and feedback logic

6. Analytical Evaluation and Discussion

6.1. DSR-Based Analytical Evaluation Strategy

In DSR, the evaluation of a proposed artifact is a critical phase for demonstrating whether the artifact is grounded in its theoretical foundations and whether it has potential

utility for addressing real-world problems [39]. Because the ST-Impact model is a normative educational governance model rather than a directly implemented information system, this study does not claim longitudinal empirical validation. Instead, a multi-faceted analytical evaluation strategy was adopted to examine structural coherence and practical differentiation.

Two analytical evaluation approaches were used. First, traceability mapping examined whether the M1–M6 modules were systematically aligned with IS2020 competency realms and CDR principles. Second, an illustrative curriculum-structure comparison examined selected IS/MIS and analytics-oriented undergraduate programs to identify whether responsibility-oriented learning was explicitly visible in publicly available mandatory technical curriculum structures.

6.2. Analytical Evaluation of Internal Coherence via Traceability Matrix

Establishing internal coherence in DSR requires demonstrating that the designed artifact satisfies its targeted theoretical requirements [39]. The core design criteria for this model are grounded in the IS2020 competency architecture and the dimensions of CDR [4,8]. Because IS2020 competency realms and CDR principles function as comprehensive guidelines, operationalization is required to embed them into an educational pipeline. Therefore, a traceability matrix was constructed to show how macro-level CDR principles are translated into module-level control criteria. The traceability matrix linking IS2020, CDR principles, and ST-Impact modules is presented in Table 10.

Table 10. Traceability matrix: IS2020, CDR principles, and ST-Impact modules.

Framework Module	IS2020 Competency Realm	Macro CDR Principle	Operationalized Criteria
M1. Problem Definition	Foundations	Social equity and public good	Securing the project's social legitimacy by identifying public problems and defining stakeholders
M2. Needs and Context Analysis	Data/Information; Organizational Domain	Digital inclusion and accessibility	Ensuring requirement traceability and diagnosing service accessibility or inclusivity for digitally vulnerable populations
M3. Data and System Design	Data/Information; Technology Development and Deployment	Transparency and explainability	Establishing transparency in data and algorithmic decision-making and clarifying accountability for system malfunction
M4. Digital Implementation	Technology Development and Deployment; Technology Delivery and Support	Digital privacy and non-discrimination	Controlling personal data protection and mitigating algorithmic bias during prototype implementation
M5. Evaluation and Reflection	Ethics, Sustainability, and Social Implications; Organizational Domain	Digital accountability and human oversight	Re-evaluating social externalities through responsible design review and confirming human oversight over automation
M6. Integrative Practicum	Project Management; IS Practicum/Integration	Digital sustainability	Gathering external stakeholder feedback and reviewing the socio-environmental sustainability of deliverables

The mapping in Table 10 indicates systematic traceability between technical implementation and reflexive responsibility. The IS2020 ethics, sustainability, and social implications realm and CDR-related control principles are not confined to theoretical planning but are

positioned as review and feedback mechanisms across the technological problem-solving process. This supports the internal coherence of the model as a multidisciplinary educational framework.

6.3. Illustrative Comparative Analysis of Visible Curriculum Structures

Building on the six-module structure presented in Section 5.2 and Table 7, this section uses the ST-Impact modules as an illustrative analytical lens for examining publicly visible mandatory curriculum structures in selected IS/MIS and analytics-oriented undergraduate programs. To reduce arbitrary case selection, a two-step purposive sampling approach was applied. First, institutions with well-recognized undergraduate programs in MIS-related fields and AACSB accreditation were identified, including Carnegie Mellon University (CMU), the University of Texas at Austin (UT Austin), and the Massachusetts Institute of Technology (MIT) [40]. Second, functionally related degree programs were identified using Classification of Instructional Programs (CIP) logic, including programs in Computer and Information Sciences and Business/Management Quantitative Methods [41].

The comparative analysis used the visible structure of mandatory courses in official academic information as the unit of analysis. The internalization level of the ST-Impact modules was evaluated as integrated, fragmented or isolated, or not explicitly visible in the mandatory technical core. Because course-level syllabi, assignments, hidden assessment rubrics, and informal teaching practices may contain additional responsibility-related content, the results should be interpreted as an illustrative curriculum-structure analysis rather than a conclusive program evaluation.

As shown in Table 11, the selected programs make several ST-Impact-related components visible in their mandatory curriculum structures, particularly in relation to needs analysis, data/system design, digital implementation, and integrative practice. However, responsibility-oriented reflection and explicit public-value evaluation are less consistently embedded within the visible technical core. For example, CMU includes socio-technical contextual learning alongside technical design courses, UT Austin strongly emphasizes business systems and development competencies, and MIT Sloan includes analytics-oriented courses with social-good relevance. Nevertheless, because this analysis is limited to publicly visible curriculum structures, these findings should be interpreted as suggestive rather than conclusive.

Table 11. Comparative results with selected U.S. mandatory curricula.

ST-Impact Module	CMU (IS Program)	UT Austin (MIS)	MIT Sloan (Course 15-2)
M1. Problem Definition	△	X	△
M2. Needs and Context Analysis	O	O	O
M3. Data and System Design	O	O	O
M4. Digital Implementation	O	O	O
M5. Evaluation and Reflection	△	X	△
M6. Integrative Practicum	O	O	O

Note. O = explicitly visible as an integrated and required curriculum component in publicly available materials; △ = partially or indirectly visible through fragmented, isolated, elective, or course-level components, but not as an integrated, required program-level component; X = not explicitly visible in publicly available materials and does not necessarily indicate absence from the program.

The results suggest that, within publicly visible mandatory curriculum structures, responsibility-oriented learning is only partially visible as an integrated component of technical education in the selected cases. This illustrative contrast highlights the potential value of the ST-Impact model as a framework for linking technical implementation with responsibility-oriented reflection within the same learning lifecycle.

6.4. Practical Operationalization: Illustrative 15-Week Syllabus Architecture

In DSR, the practical utility of an artifact can be strengthened by showing how it may be instantiated in real-world settings [39]. To support instructional adoption, this section presents an illustrative 15-week syllabus architecture. This architecture is course-agnostic and can be adapted to specific MIS courses, such as database design, systems analysis, business analytics, or AI-related courses.

The modular arrangement is grounded in three educational design principles. First, Bloom's taxonomy suggests that learners progress from knowledge comprehension to application, evaluation, and creation [42,43]. Accordingly, early weeks focus on value planning and needs analysis, mid-semester weeks emphasize technical design and implementation, and later weeks focus on evaluation, reflection, and integrative practice. Second, cognitive load theory implies that technical design and implementation require sufficient time allocation to avoid overloading learners [44]. Third, Schön's reflective practitioner perspective emphasizes the importance of reflection-in-action, supporting the placement of M5 immediately after technical implementation [45]. The ST-Impact-based illustrative syllabus blueprint is presented in Table 12.

Table 12. ST-Impact-based 15-week illustrative syllabus blueprint.

Phase, Week, and Module	Core educational Activities	Required Artifacts and Control Criteria
Phase 1/Weeks 1–3/M1: Problem Definition	Exploration of local or macro social issues; debate on the legitimacy of IT application	Artifact: project proposal. Criterion: social publicness of the problem
Phase 2/Weeks 4–5/M2: Needs Analysis	Identification of internal/external stakeholders and needs; diagnosis of accessibility constraints	Artifact: requirements specification. Criterion: inclusivity and traceability
Phase 3/Weeks 6–11/M3: Design/M4: Implementation	Course-specific design of core technology; implementation and unit testing of operable prototypes	Artifact: system prototype. Criterion: integrity and data privacy
Phase 4/Weeks 12–13/M5: Evaluation/Reflection	Self-diagnosis of responsible design on the implemented system; reflection on unintended biases and externalities	Artifact: impact self-evaluation report. Criterion: bias and CDR control
Phase 5/Weeks 14–15/M6: Integrative Practicum	Final demonstration with stakeholders and feedback integration; connection to field application	Artifact: final capstone report. Criterion: social sustainability

As an illustrative implementation guideline, assessment weights may be distributed across three competency domains: value planning competency (20%; M1–M2), technical implementation competency (40%; M3–M4), and social responsibility and practicum competency (40%; M5–M6). This 20:40:40 ratio should be understood as an adaptable design guideline rather than a fixed universal standard. The structure is intended to support the integration of technical rigor and social responsibility throughout the system development lifecycle, but the weighting may be modified according to institutional context, course type, learner level, and stakeholder partnership conditions.

7. Conclusions

7.1. Summary of Key Findings

In the era of digital transformation, fostering IS professionals equipped with both technical proficiency and corporate digital responsibility is increasingly important. This study developed the ST-Impact model as a curriculum design framework for sustainability-oriented MIS education. Adopting a DSR orientation, a PRISMA 2020-guided systematic

review and design-oriented synthesis of 120 international studies was conducted to extract granular educational design units, namely activities, artifacts, and assessments. These design inputs were aligned with the IS2020 competency architecture, resulting in a six-module model encompassing the trajectory from socio-technical problem definition to integrative field practicum.

To analytically evaluate the internal coherence and practical relevance of the proposed artifact, a traceability matrix and illustrative curriculum-structure comparison were used. The traceability matrix indicated systematic alignment between CDR principles and ST-Impact modules. The illustrative comparison with selected U.S programs suggested that responsibility-oriented learning is only partially visible as an integrated component of technical education within publicly available mandatory curriculum structures. Finally, the study proposed an illustrative 15-week syllabus architecture and an adaptable three-tier grading ratio as practical guidelines for contextual implementation.

7.2. Theoretical Contributions

First, this study contributes by transforming abstract discussions of MIS ethics, sustainability, and social responsibility into a systematic educational artifact. Prior research has often emphasized the need for digital ethics, but this study uses DSR logic to organize pedagogical functions, tangible artifacts, and governance criteria into a coherent curriculum design model.

Second, the study highlights a possible structural gap in the visible organization of modern IS education by showing how responsibility-oriented learning may remain only partially integrated with technical implementation in publicly available curriculum structures. The model proposes that technical implementation and externality reflection can be more systematically linked within the same learning lifecycle rather than positioned as unrelated or parallel course components.

Third, the model advances pedagogical theory by shifting the operational logic from a linear project-based sequence to an iterative and cumulative learning flow. By internalizing a structured feedback mechanism, value deficits identified during M5 can inform revisions to problem definition or system design decisions in M1 and M3.

7.3. Practical and Policy Implications

The primary practical value of the model lies in offering higher education practitioners a course-agnostic guideline for curriculum restructuring that supports university social responsibility and responsible digital sustainability. Instructors can adapt the 15-week syllabus blueprint by substituting technical content according to the course domain while maintaining the socio-technical governance structure. The model is therefore intended to be adapted rather than adopted as a fixed template.

Furthermore, the study provides multi-layered quality assurance criteria by adapting the logic of IT governance into academic assessment systems. The illustrative three-tier grading ratio encourages instructors to evaluate value planning, technical implementation, and responsible practicum components together rather than focusing solely on technical outputs.

Finally, from a higher education policy perspective, the model offers pathways to foster multidisciplinary convergence linked to communities and public sectors. By formalizing stakeholder requirement gathering and field-demonstration feedback, the model can support educational policies that position universities as institutional platforms for addressing socio-technical, regional, and societal challenges.

7.4. Limitations and Future Research

Although this study developed a model through international literature synthesis, analytical mapping, and illustrative curriculum-structure comparison, it is limited by the absence of longitudinal empirical implementation in an actual educational setting. Therefore, the findings should be interpreted as a design-oriented framework contribution and grounded design proposal rather than evidence of classroom effectiveness or institutional impact. In addition, the core evidence base comprised only 11 studies; although these studies were systematically identified through a transparent screening process, this relatively small set means that the resulting module structure should be treated as an initial synthesis rather than a saturated or exhaustive representation of the field. The use of AI-assisted tools during preliminary screening, while subject to human-in-the-loop safeguards, also means that the screening process cannot be fully replicated without access to the same tool version and underlying record metadata; this represents an inherent limitation of AI-assisted and streamlined systematic review workflows more broadly. In addition, the review was conducted by a single researcher with AI-assisted support and researcher verification rather than by two or more independent reviewers. Although high-recall screening logic and full-text researcher verification were used to reduce premature exclusion, this may limit the reproducibility of the screening and extraction process. A formal risk-of-bias or methodological quality appraisal of the included studies was not conducted because the review aimed to extract design-relevant educational elements for framework synthesis rather than to estimate intervention effects or compare effect sizes. Future systematic updates should incorporate dual independent screening and a formal appraisal instrument appropriate for heterogeneous educational design evidence.

Future research should implement courses designed based on this model within actual undergraduate programs and longitudinally analyze learners' multidisciplinary competency development. Given the rapid diffusion of generative AI in higher education, future studies should also examine how the ST-Impact model supports responsible AI use, critical thinking, ethical reasoning, and social-value-oriented digital artifact development [13,15]. In addition, because the analytical evaluation in this study relied primarily on traceability mapping and illustrative curriculum comparison, future research should expand to Focus Group Interviews, Delphi surveys, or expert panel reviews with MIS educators and IT industry experts. These approaches would enable further refinement of modular adaptation guidelines for different institutional contexts.

Supplementary Materials: The following supporting information can be downloaded at <https://www.mdpi.com/article/10.3390/su18147170/s1>, Table S1, Classification criteria for core and support studies; Table S2, Core evidence extraction matrix for the 11 core studies; Table S3, Full analytical set of 120 included studies and study-level characteristics; Table S4, PRISMA 2020 checklist.

Author Contributions: J.-E.S. conceptualized the study, conducted the data analysis, and drafted the original manuscript. T.-S.K. contributed to the study design, supervised the research, and provided critical revisions to the manuscript. All authors have read and agreed to the published version of the manuscript.

Funding: This work was supported by Institute of Information & communications Technology Planning & Evaluation (IITP) grant funded by the Korea government(MSIT) (RS-2024-00438796, Development of cloud-based cyber range establishment technology and cyber training scenario description language(K-SDL)).

Institutional Review Board Statement: Not applicable. This study was based exclusively on previously published literature and did not involve human participants, human data, animals, or survey-based expert validation.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data supporting the findings of this study were derived from published literature. The coded extraction dataset and screening records can be made available by the corresponding author upon reasonable request, subject to reasonable restrictions related to bibliographic database licensing and copyright.

Acknowledgments: During the preparation of this manuscript, the author used AI-assisted tools, including ChatGPT (OpenAI; paid web interface, as deployed between January and February 2026), to support the preliminary organization of screening and coding outputs, structural drafting, and language editing. The AI-assisted outputs were not used as independent evidence, inclusion/exclusion decisions, or final analytical judgments. The author reviewed, revised, verified, and edited all outputs and takes full responsibility for the content of the manuscript.

Conflicts of Interest: The authors declare no conflicts of interest.

References

1. Vial, G. Understanding Digital Transformation: A Review and a Research Agenda. *J. Strateg. Inf. Syst.* **2019**, *28*, 118–144. [\[CrossRef\]](#)
2. Majchrzak, A.; Markus, M.L.; Wareham, J. Designing for Digital Transformation: Lessons for Information Systems Research from the Study of ICT and Societal Challenges. *MIS Q.* **2016**, *40*, 267–277. [\[CrossRef\]](#)
3. Faraj, S.; Pachidi, S.; Sayegh, K. Working and Organizing in the Age of the Learning Algorithm. *Inf. Organ.* **2018**, *28*, 62–70. [\[CrossRef\]](#)
4. Lobschat, L.; Mueller, B.; Eggers, F.; Brandimarte, L.; Diefenbach, S.; Kroschke, M.; Wirtz, J. Corporate Digital Responsibility. *J. Bus. Res.* **2021**, *122*, 875–888. [\[CrossRef\]](#)
5. Carl, K.V.; Hinz, O. What We Already Know about Corporate Digital Responsibility in IS Research: A Review and Conceptualization of Potential CDR Activities. *Electron. Mark.* **2024**, *34*, 27. [\[CrossRef\]](#)
6. World Economic Forum. *The Future of Jobs Report 2020*; World Economic Forum: Geneva, Switzerland, 2020.
7. CC2020 Task Force. *Computing Curricula 2020: Paradigms for Global Computing Education*; Association for Computing Machinery: New York, NY, USA, 2020.
8. Leidig, P.M.; Salmela, H. *IS2020: A Competency Model for Undergraduate Programs in Information Systems*; Association for Computing Machinery: New York, NY, USA, 2021.
9. Bringle, R.G.; Hatcher, J.A. Implementing Service Learning in Higher Education. *J. High. Educ.* **1996**, *67*, 221–239. [\[CrossRef\]](#)
10. Eyler, J.; Giles, D.E. *Where's the Learning in Service-Learning?* Jossey-Bass: San Francisco, CA, USA, 1999.
11. Hoxmeier, J.A.; Lenk, M.M. Service-Learning in Information Systems Courses: Community Projects that Make a Difference. *J. Inf. Syst. Educ.* **2003**, *14*, 91–100.
12. Alier, M.; Garcia-Penalvo, F.J.; Camba, J.D. Generative Artificial Intelligence in Education: From Deceptive to Disruptive. *Int. J. Interact. Multimed. Artif. Intell.* **2024**, *8*, 5–14. [\[CrossRef\]](#)
13. Ruiz-Rojas, L.I.; Salvador-Ullauri, L.; Acosta-Vargas, P. Collaborative Working and Critical Thinking: Adoption of Generative Artificial Intelligence Tools in Higher Education. *Sustainability* **2024**, *16*, 5367. [\[CrossRef\]](#)
14. Tang, L.; Su, Y.-S. Ethical Implications and Principles of Using Artificial Intelligence Models in the Classroom: A Systematic Literature Review. *Int. J. Interact. Multimed. Artif. Intell.* **2024**, *8*, 25–36. [\[CrossRef\]](#)
15. Almassaad, A.; Alajlan, H.; Alebaikan, R. Student Perceptions of Generative Artificial Intelligence: Investigating Utilization, Benefits, and Challenges in Higher Education. *Systems* **2024**, *12*, 385. [\[CrossRef\]](#)
16. Mittelstadt, B.D.; Allo, P.; Taddeo, M.; Wachter, S.; Floridi, L. The ethics of algorithms: Mapping the debate. *Big Data Soc.* **2016**, *3*, 2053951716679679. [\[CrossRef\]](#)
17. Floridi, L.; Cows, J.; Beltrametti, M.; Chatila, R.; Chazerand, P.; Dignum, V.; Luetge, C.; Madelin, R.; Pagallo, U.; Rossi, F.; et al. AI4People—An Ethical Framework for a Good AI Society: Opportunities, Risks, Principles, and Recommendations. *Minds Mach.* **2018**, *28*, 689–707. [\[CrossRef\]](#)
18. Jobin, A.; Ienca, M.; Vayena, E. The Global Landscape of AI Ethics Guidelines. *Nat. Mach. Intell.* **2019**, *1*, 389–399. [\[CrossRef\]](#)
19. Zhu, H.; Sun, Y.; Yang, J. Towards Responsible Artificial Intelligence in Education: A Systematic Review on Identifying and Mitigating Ethical Risks. *Humanit. Soc. Sci. Commun.* **2025**, *12*, 1111. [\[CrossRef\]](#)
20. Vasilescu, R.; Barna, C.; Epure, M.; Baicu, C. Developing University Social Responsibility: A Model for the Challenges of the New Civil Society. *Procedia Soc. Behav. Sci.* **2010**, *2*, 4177–4182. [\[CrossRef\]](#)
21. Biggs, J.; Tang, C. *Teaching for Quality Learning at University*, 4th ed.; Open University Press: Maidenhead, UK, 2011.
22. Westera, W. Competences in Education: A Confusion of Tongues. *J. Curric. Stud.* **2001**, *33*, 75–88. [\[CrossRef\]](#)

23. ISACA. *COBIT 2019 Framework: Introduction and Methodology*; ISACA: Schaumburg, IL, USA, 2019.
24. Paltiel, M.; Cheong, M.; Coghlan, S.; Lederman, R. Approaches and Models for Teaching Digital Ethics in Information Systems Courses: A Review of the Literature. *Australas. J. Inf. Syst.* **2023**, *27*, 1–26. [\[CrossRef\]](#)
25. Topi, H.; Valacich, J.S.; Wright, R.T.; Kaiser, K.; Nunamaker, J.F., Jr.; Sipior, J.C.; de Vreede, G.J. IS 2010: Curriculum Guidelines for Undergraduate Degree Programs in Information Systems. *Commun. Assoc. Inf. Syst.* **2010**, *26*, 359–428. [\[CrossRef\]](#)
26. Porter, M.E.; Kramer, M.R. Creating Shared Value. *Harv. Bus. Rev.* **2011**, *89*, 62–77.
27. Mertens, D.M. *Mixed Methods Design in Evaluation*; Sage: Thousand Oaks, CA, USA, 2018.
28. Hevner, A.R.; March, S.T.; Park, J.; Ram, S. Design Science in Information Systems Research. *MIS Q.* **2004**, *28*, 75–106. [\[CrossRef\]](#)
29. Peffers, K.; Tuunanen, T.; Rothenberger, M.A.; Chatterjee, S. A Design Science Research Methodology for Information Systems Research. *J. Manag. Inf. Syst.* **2007**, *24*, 45–77. [\[CrossRef\]](#)
30. Page, M.J.; McKenzie, J.E.; Bossuyt, P.M.; Boutron, I.; Hoffmann, T.C.; Mulrow, C.D.; Shamseer, L.; Tetzlaff, J.M.; Akl, E.A.; Brennan, S.E.; et al. The PRISMA 2020 Statement: An Updated Guideline for Reporting Systematic Reviews. *BMJ* **2021**, *372*, n71. [\[CrossRef\]](#) [\[PubMed\]](#)
31. Garritty, C.; Gartlehner, G.; Nussbaumer-Streit, B.; King, V.J.; Hamel, C.; Kamel, C.; Affengruber, L.; Stevens, A. Cochrane Rapid Reviews Methods Group Offers Evidence-Informed Guidance to Conduct Rapid Reviews. *J. Clin. Epidemiol.* **2021**, *130*, 13–22. [\[CrossRef\]](#) [\[PubMed\]](#)
32. Tricco, A.C.; Langlois, E.V.; Straus, S.E. (Eds.) *Rapid Reviews to Strengthen Health Policy and Systems: A Practical Guide*; World Health Organization: Geneva, Switzerland, 2017.
33. *ISO 26000:2010*; Guidance on Social Responsibility. International Organization for Standardization: Geneva, Switzerland, 2010.
34. Van de Schoot, R.; de Bruin, J.; Schram, R.; Zahedi, P.; de Boer, J.; Weijdem, F.; Kramer, B.; Huijts, M.; Hoogerwerf, M.; Ferdinands, G.; et al. An Open Source Machine Learning Framework for Efficient and Transparent Systematic Reviews. *Nat. Mach. Intell.* **2021**, *3*, 125–133. [\[CrossRef\]](#)
35. Wagner, G.; Lukyanenko, R.; Paré, G. Artificial Intelligence and the Conduct of Literature Reviews. *J. Inf. Technol.* **2022**, *37*, 209–226.
36. Dellermann, D.; Ebel, P.; Söllner, M.; Leimeister, J.M. Hybrid Intelligence. *Bus. Inf. Syst. Eng.* **2019**, *61*, 637–643. [\[CrossRef\]](#)
37. Cruzes, D.S.; Dyba, T. Recommended Steps for Thematic Synthesis in Software Engineering. In Proceedings of the International Symposium on Empirical Software Engineering and Measurement, Banff, AB, Canada, 22–23 September 2011; pp. 275–284.
38. vom Brocke, J.; Simons, A.; Niehaves, B.; Riemer, K.; Plattfaut, R.; Cleven, A. Reconstructing the Giant: On the Importance of Rigour in Documenting the Literature Search Process. In Proceedings of ECIS 2009, Verona, Italy, 8–10 June 2009.
39. Gregor, S.; Hevner, A.R. Positioning and Presenting Design Science Research for Maximum Impact. *MIS Q.* **2013**, *37*, 337–355. [\[CrossRef\]](#)
40. US News & World Report. Best Undergraduate Business Programs—Management Information Systems & Business Analytics. Available online: <https://www.usnews.com/best-colleges/rankings/business-management-information-systems> (accessed on 3 May 2026).
41. National Center for Education Statistics. *Classification of Instructional Programs (CIP)*; U.S. Department of Education: Washington, DC, USA, 2020.
42. Bloom, B.S.; Engelhart, M.D.; Furst, E.J.; Hill, W.H.; Krathwohl, D.R. *Taxonomy of Educational Objectives: The Classification of Educational Goals. Handbook I: Cognitive Domain*; David McKay Company: New York, NY, USA, 1956.
43. Krathwohl, D.R. A Revision of Bloom’s Taxonomy: An Overview. *Theory Pract.* **2002**, *41*, 212–218. [\[CrossRef\]](#)
44. Sweller, J. Cognitive Load during Problem Solving: Effects on Learning. *Cogn. Sci.* **1988**, *12*, 257–285. [\[CrossRef\]](#)
45. Schön, D.A. *The Reflective Practitioner: How Professionals Think in Action*; Basic Books: New York, NY, USA, 1983.

Disclaimer/Publisher’s Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.