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Journal of Advanced Research in Computing and Applications

Journal homepage:
https://karyailham.com.my/index.php/arca
2462-1927

AI Becomes Institutional through Practice: Human-Centered and Ethical AI in Supporting Institutional Information Capability in Academic Libraries

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ARTICLE INFO

Article history:
Received 4 March 2026
Received in revised form 28 May 2026
Accepted 2 June 2026
Available online 22 June 2026

Keywords:
Institutional Information Capability; human-centered AI; ethical AI; academic libraries; AI-enabled information practices

ABSTRACT

Artificial intelligence (AI) is increasingly embedded in academic library work, influencing how information is organised, interpreted, validated, and used in higher education. Current discussions on Ethical AI and Human-Centered AI (HCAI) have established important principles for responsible AI use, but the connection between ethical direction, librarian judgement, and Institutional Information Capability (IIC) remains insufficiently integrated. This paper aims to develop a practice-based conceptual explanation of how Ethical AI and HCAI support IIC in academic libraries. A literature-based conceptual synthesis was used to integrate key arguments on responsible AI, human oversight, professional judgement, information reliability, and institutional decision support. The synthesis positions Ethical AI as the normative basis for responsible information conduct, HCAI as the operational logic through which librarians exercise oversight, interpretation, and contextual judgement, and IIC as the institutional outcome produced when AI-supported information becomes reliable, accountable, and decision-ready. The paper argues that AI becomes institutionally meaningful through library practice, rather than through system adoption or technical capability by itself. Librarians are positioned as interpretive actors who scrutinise AI-generated outputs, protect user interests, refine information processes, and align machine-supported information with academic standards and institutional expectations. The paper contributes an integrated conceptual framework that links Ethical AI, HCAI, and IIC as a connected practice-based mechanism. This framework strengthens understanding of how Malaysian public university libraries can sustain informational integrity, trust, and decision-relevant knowledge as AI adoption expands.

1. Introduction

Artificial intelligence (AI) is reshaping the epistemic work of higher education by altering how knowledge is generated, organised, interpreted, and used in institutional life. Academic libraries are drawn directly into this transition through cataloguing, discovery systems, recommendation tools,

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https://doi.org/10.37934/arca.43.1.211234

scholarly support, and advisory services that influence how information reaches academic communities and how it acquires legitimacy in use. Le Dinh *et al.,* [1] situate AI in a broader transformation of higher education environments, where human AI engagement increasingly structures knowledge practices, learning support, and institutional decision-making activity. In librarianship settings, Scott and Ward [2] observe that AI has moved beyond peripheral experimentation and is becoming increasingly tied to the organisation and delivery of core information services. Okpala [3] extends this point by identifying cataloguing, classification, and circulation management as sites where AI is already shaping the processing and delivery of information. In Malaysia, this transition is becoming more visible as national evidence points to substantial AI-related change in professional work, continuing shortages in AI capability, and broader higher education expansion in AI uptake alongside unresolved concerns over ethical preparedness and effective engagement [4-7].

The significance of this shift exceeds operational efficiency and service enhancement. As AI-generated outputs enter academic environments, the issue turns toward informational reliability, interpretive accountability, privacy, bias, and institutional trust. Boateng [8] highlights these pressures in academic library services, arguing that the value of generative AI depends on how such systems are governed, interpreted, and applied in practice rather than being assumed through adoption itself. Tzanova [9] likewise argues that AI use in academic libraries requires critical evaluation and AI literacy, especially when users and institutions engage with machine-generated content in academic settings where uncritical acceptance can weaken responsible information use. Academic libraries thus carry an increasingly consequential responsibility, which AI-assisted information must pass through processes of scrutiny, contextual interpretation, and professional judgement before entering environments in which academic judgement, organisational action, and institutional credibility depend on informational quality.

This institutional responsibility places librarians in a central mediating position. Academic libraries shape how information is organised, interpreted, explained, and trusted in teaching, scholarly inquiry, and university administration. Miltenoff [10] positions academic librarians as key actors in AI literacy, responsibility, and leadership, while Tzanova [9] extends that role into scholarly communication and academic inquiry, reinforcing librarians' contribution to the quality and legitimacy of academic information as AI becomes woven into institutional workflows. As AI penetrates cataloguing, classification, access services, and digital support, librarians assume a deeper evaluative and interpretive function. Mahmud [11] clarifies that AI-supported cataloguing and classification continue to depend on human oversight to preserve consistency and accuracy, while Boateng [8] draws attention to the reliability, ethical, and trust-related pressures surrounding generative AI in library services. McCrary [12] sharpens the issue of agency and responsibility as AI becomes embedded in library environments, and Parandjuk and Ress [13] position human partners as responsible actors in guiding AI-enabled digital library services. Librarians therefore occupy the point at which machine-generated outputs are read critically, screened for distortion or bias, judged for contextual relevance, and aligned with academic standards, professional values, and institutional expectations.

Human-centered AI (HCAI) gives conceptual force to this mediating role by foregrounding explainability, transparency, user empowerment, and the continuing significance of human judgement in AI-supported environments. Le Dinh *et al.,* [1] emphasise human oversight and ethical checkpoints in higher education settings, while Lo [14] positions librarians as active mediating actors whose work remains essential when algorithmic outputs require interpretation, contextual refinement, and professional responsibility before they can support meaningful use. The issue carries institutional weight at this stage. Weak scrutiny allows decontextualised, inaccurate, or poorly

governed information to circulate into settings where trust, academic judgement, and institutional credibility depend on informational reliability. Heersmink *et al.,* [15] explain how opacity in AI systems complicates trust and trustworthiness, and Ghosh *et al.,* [16] draw attention to ethical and implementation pressures in library environments that can erode responsible AI use when oversight loses strength. HCAI therefore enters academic librarianship as a practical orientation toward mediated judgement, interpretive care, and accountable use rather than as a technical design preference.

The Malaysian higher education context intensifies this issue through strong policy alignment with digital transformation and ethical AI. National frameworks place AI literacy, ethical awareness, and institutional readiness in the wider agenda of educational reform [17-19]. At the same time, scholarship on AI law and governance in Malaysia points to continuing regulatory and operational tensions as responsible AI principles move into institutional settings [20,21]. This policy direction gains further urgency in recent discussions on Malaysian universities and educational environments, where Wong [22] emphasises responsible and equitable AI use through clearer ethical guidance and a human-centered orientation, while Xu *et al.,* [23] draw attention to uneven infrastructure, limited explicit ethical guidance, and incomplete institutional preparation in Malaysian academic libraries. These developments create a governance environment in which AI is expected to contribute to institutional advancement while remaining aligned with informational integrity, ethical accountability, and public trust.

Xu *et al.,* [23] depict Malaysian academic libraries as entering the AI wave through early experimentation, staff upskilling, and selective service innovation, while operating with limited institutional policy, modest system development, and inconsistent strategic direction. Aman and Zakaria [24] sharpen this picture by arguing that librarians are receptive to AI and human collaboration, although their readiness is shaped by performance expectations, social influence, and the practical limits of institutional support. Read alongside Al-Kumaim *et al.,* [25], who draw attention to data accuracy, privacy, and accountability concerns in Malaysian universities, these contributions suggest that AI uptake is moving faster than the institutional conditions required to govern it responsibly in everyday academic library work. Similar pressures appear in the wider literature, especially in settings where ethical literacy remains thin, oversight fluctuates, and institutional coordination lacks stability [26-29]. The deeper consequence concerns conceptual articulation. Tools, systems, and policy ambition may expand rapidly, while the librarian practices that determine whether AI-generated outputs are questioned, refined, contextualised, and rendered fit for academic use remain underdeveloped in conceptual terms. Akbarighatar *et al.,* [30] sharpen this tension by examining how responsible AI principles are enacted in practice, while Marzouk *et al.,* [31] underline the difficulty of translating ethical principles into workable organisational routines. From the standpoint of information activity, Hirvonen *et al.,* [32] further clarify that AI is already reshaping information seeking and use, making the connection among ethical direction, human judgement, and routine information work increasingly consequential for academic libraries.

This unresolved condition points to the central problem addressed here. Ethical AI is commonly articulated through principles such as fairness, accountability, transparency, and data protection, whereas HCAI is more often developed through interpretability, interaction, and design logic [1,14,33]. Marzouk *et al.,* [31] map responsible AI practice through interlocking elements such as trustworthiness, fairness, transparency, reliability, and privacy, while Akbarighatar *et al.,* [30] shift attention to the harder question of enactment. These strands deepen current understanding, although they stop short of explaining how librarians translate ethical commitments and human-centered engagement into day-to-day information work in academic library environments. The institutional gap becomes sharper when the discussion turns to information capability. Kulkarni *et*

al., [34] connect information capability to analytical decision orientation, and Alalwan *et al.,* [35] link content management capability to decision support. Even so, limited clarity remains on how ethical reasoning and human judgement shape informational quality before information enters institutional use. Hirvonen *et al.,* [32] further clarify that AI is already reshaping information seeking and use, making interpretation, validation, contextual adjustment, and professional scrutiny central to academic library practice. In the absence of a stronger account of this process, AI in academic libraries risks being treated as an efficiency or innovation agenda while the pathway through which responsible AI contributes to reliable, accountable, and decision-relevant information remains conceptually thin. In practical terms, universities may invest in AI-enabled systems while lacking a clear conceptual basis for understanding how trustworthy information is sustained in everyday practice.

Against this background, the guiding question is as follows: How can human-centered and ethical AI practices enacted by librarians be understood as supporting institutional information capability (IIC) in Malaysian public university libraries? To address this question, the article develops a literature-based conceptual synthesis that connects Ethical AI, HCAI, and IIC in a single explanatory structure. This approach suits the article since the central difficulty lies in conceptual separation and weak explanatory integration rather than in the absence of descriptive evidence. The article contributes in three connected ways. First, it repositions AI in academic libraries from a system-focused agenda toward a practice-focused process through which information acquires institutional value. Second, it clarifies librarians' role as mediating actors who carry ethical expectations and professional judgement into everyday information work. Third, it advances an integrated conceptual framework explaining how ethical direction and interpretive engagement shape information that is reliable, accountable, and suitable for institutional decision-making. The article matters for a simple institutional reason: universities require a sharper account of how responsible AI moves from principle and policy aspiration into the practices that secure informational trust, academic credibility, and decision-relevant knowledge. Alduais *et al.,* [36] expose the policy demands surrounding responsible AI in higher education, Díaz-Rodríguez *et al.,* [37] connect ethical principles with trustworthy and responsible AI systems, and Sousa [38] locates that challenge in academic library practice, where implementation, judgement, and accountability converge.

2. Methodology

This paper adopts a literature-based conceptual synthesis to develop an integrated explanation of how Ethical AI and HCAI support IIC in academic libraries. The approach is conceptual rather than empirical, as the central problem concerns weak theoretical integration across three related discussions: responsible AI principles, HCAI practice, and IIC. Prior work has established the importance of HCAI in higher education [1], ethical and practical AI issues in academic library research [38], responsible AI practice in libraries and archives [39], and trustworthy AI principles [37]. However, these discussions require closer integration to explain how librarians translate ethical direction and human judgement into reliable, accountable, and decision-ready information.

The synthesis was developed through a focused reading of literature already positioned in the manuscript. Sources were selected according to their conceptual relevance to AI-supported academic library work, responsible information practice, professional judgement, ethical oversight, and IIC. HCAI literature was used to clarify the role of human oversight, interpretive judgement, transparency, explainability, and user-oriented responsibility in AI-supported environments [1,14]. Ethical AI literature was used to identify the normative concerns shaping responsible information use, especially fairness, accountability, privacy, trust, and transparency [37-39]. Literature on

information capability and decision support was used to position these practices as part of wider institutional capacity for managing information, supporting judgement, and sustaining organisational action [34,35].

The conceptual analysis followed three stages. First, key ideas from the reviewed literature were grouped under three analytical domains: Ethical AI, HCAI, and IIC. Ethical AI was treated as the normative domain that defines responsible information conduct. HCAI was treated as the operational domain through which librarians exercise oversight, interpretation, correction, and contextual judgement. IIC was treated as the institutional outcome produced when information becomes reliable, accountable, and suitable for academic or organisational use. Second, the conceptual role of each domain was compared to identify how ethical principles, human-centred practice, and institutional information processes interact in academic library settings. This stage was informed by work on responsible AI enactment [30], the building blocks of responsible AI practice [31], and AI's influence on everyday information seeking and use [32]. Third, the relationships among the three domains were synthesised into a practice-based framework that positions librarians as mediating actors between AI-supported systems, ethical responsibility, and IIC.

This methodological position suits the purpose of the paper. The paper does not test hypotheses or measure causal effects. Instead, it builds a conceptual explanation of how AI becomes institutionally meaningful through professional practice in academic libraries. The resulting framework is interpretive and theory-building. It clarifies how ethical direction and human-centred judgement operate together in library work, and how this interaction supports the production of reliable, accountable, and decision-ready information for institutional use.

3 Literature Review

3.1 Ethical AI in Academic Libraries: From Compliance to Practice

In academic libraries, Ethical AI refers to the responsible direction, use, and oversight of AI-supported information processes through which librarians preserve fairness, transparency, accountability, privacy, and user trust as machine-generated outputs enter academic and institutional circulation. Mannheimer *et al.,* [39] position responsible AI practice in libraries and archives through privacy, accountability, and ethical stewardship. Sreeram *et al.,* [40] extend this responsibility through transparency, inclusivity, and ethical leadership in AI-enabled library environments, while Matsieli and Mutula [41] connect AI use in libraries to bias, access, and wider social responsibility. Read together, these contributions establish Ethical AI as a professional and institutional condition tied to the handling of AI-supported information in academic settings.

A substantial part of this discussion has developed through governance, policy guidance, and institutional safeguards intended to secure responsible data practices and protect users. Ivanović [42] surveys the requirements, guidelines, and unresolved questions surrounding AI in library contexts, while Kamińska [43] links responsible generative AI adoption in academic libraries to the structured mitigation of institutional risk. This strand gives academic libraries an essential baseline, since it clarifies the principles through which AI use becomes legitimate, governable, and institutionally defensible. Even so, governance preparedness and policy articulation capture only one layer of the ethical question confronting academic libraries.

The sharper issue emerges in everyday librarianship, where AI-supported information passes through professional judgement before it becomes academically usable and institutionally credible. Kautonen and Gasparini [44] approach trustworthy AI in research libraries through institutional trust and governance responsibility. Michalak [45] positions academic librarians in university AI policymaking. Sousa [38] highlights the ethical and practical pressures attached to AI use in academic

library settings, and Elsayed and Mohammed Abusharhah [26] indicate that ethical literacy remains a continuing concern as AI adoption expands. The combined implication is clear: ethical responsibility acquires practical substance when librarians assess AI-generated content, explain its limits, judge its appropriateness, and regulate its use in relation to academic standards and institutional expectations.

This issue carries particular weight in academic librarianship, where AI is encountered at the point where access, privacy, trust, scholarly communication, and institutional accountability are translated into service action. Kautonen and Gasparini [44] address trustworthy AI in research libraries through institutional trust and governance responsibility, Michalak [45] places academic librarians in AI policymaking, Sousa [38] highlights the ethical and practical pressures surrounding AI use in academic library settings, Bøyum and Khosrowjerdi [46] capture librarians' ambivalence toward opaque black-box functions, and Elsayed and Mohammed Abusharhah [26] identify continuing ethical literacy concerns as AI adoption expands. What emerges from this line of work is a profession exposed to ethical pressure at the point of use, where responsibility is negotiated through professional action rather than secured through policy statement.

This orientation has gained importance as institutional principles, governance instruments, and policy statements lend themselves more readily to formalisation than the situated judgements through which AI is handled in everyday information practice [47-50]. As Ethical AI remains concentrated at the level of formal expectation, the interpretive work through which AI outputs are assessed, questioned, and applied in library settings receives far less sustained attention [38-39,51]. In academic libraries, the practical force of ethics depends on how principles enter the information processes shaping discovery, metadata work, user interaction, and service judgement [40,52-54].

The limits of a compliance-centred view become clearer when ethical risks in AI-enabled library environments are examined more closely. Algorithmic bias, privacy breaches, compromised information integrity, weak transparency, and AI-generated misinformation generate pressures that technical safeguards and formal governance cannot fully resolve [38,53]. These pressures intensify when AI outputs influence knowledge access, information interpretation, and decision support in academic settings, particularly in relation to misinformation risks and weakened informational reliability [55-56]. Under these conditions, ethical alignment acquires meaning through situated oversight, where librarians question outputs, detect inconsistencies, interpret system limitations, and regulate use in relation to informational context, user trust, and intellectual responsibility [38-39]. Related studies further emphasise the importance of ethical cataloguing practices, responsible AI mediation, and professional oversight in academic library environments [52,54,57]

A stronger line of argument, then, treats Ethical AI as a practice-based condition grounded in professional judgement and situational interpretation. From this perspective, librarians do more than implement ethical guidance. Mannheimer *et al*., [39] and Kautonen and Gasparini [44] emphasise responsible oversight and trustworthy AI practices in libraries. Related studies further discuss privacy risks and information reliability in AI-supported environments [55,58,59]. Ethical decision-making takes shape through continuous human evaluation, where professional judgement gives ethical principles operational force in daily library work. Ethical AI thus emerges as an interpretive activity embedded in routine practice rather than as a principle secured at the level of formal expectation.

This distinction between compliance and practice exposes a central limitation in the current literature. Policy-oriented discussions explain what Ethical AI is expected to protect and which governance conditions should guide institutional use. Far less clarity is available on how these principles are translated into daily professional action. The gap becomes especially visible in Malaysian academic libraries, where current work gives stronger attention to readiness, infrastructure, and AI adoption [60-62]. Existing discussions also emphasise governance and policy-

related concerns in academic library environments [38,45], while the enactment of ethical judgement in day-to-day library practice remains comparatively underdeveloped. Ethical AI, in this context, appears as a recognised institutional expectation, while the situated work through which librarians carry ethical responsibility into operational information processes remains comparatively underdeveloped in conceptual terms.

Viewed through the realities of academic librarianship, Ethical AI extends into the design, deployment, interpretation, and critical evaluation of AI-supported information processes [38,39,45]. Ethical considerations sit inside the informational process itself, shaping how discovery tools are used, how metadata is generated or checked, and how outputs are explained to users in academic library environments [9-10]. Related studies further highlight the importance of regulating machine-generated suggestions before they enter academic use [63,64]. Ethical AI is enacted through routine practices such as AI-supported cataloguing, metadata generation, information retrieval, and user-facing services, where librarians safeguard user data, scrutinise outputs, and guide responsible use [45,51]. Its force lies in repeated acts of human intervention through which machine-supported processes are interpreted and regulated in context [10,13]. Additional studies further reinforce the importance of human oversight and contextual mediation in AI-supported library environments [64-66].

Seen from this position, enacted Ethical AI resides in the routine judgements through which librarians carry ethical responsibility into practice. Sreeram *et al.,* [40] locate this responsibility in ethical leadership for AI-integrated library environments, Adewojo [58] demonstrates its practical weight in librarians' encounters with AI-based tools, Sousa [38] ties it to the ethical pressures surrounding academic library work, and Mannheimer *et al.,* [39] reinforce the importance of responsible oversight in library and archival contexts. Elsayed and Mohammed Abusharhah [26] further indicate that ethical literacy remains central as AI use expands, while Michalak and Ellixson [67] connect ethical AI literacy to human-centered practice. Ethical AI, in this sense, captures the point at which librarians evaluate outputs, interpret limitations, protect user interests, and regulate machine-supported information before it enters academic use.

Ethical AI in academic libraries is best understood, then, as a dynamic practice-oriented process through which ethical principles are carried into action through human judgement. This understanding directs attention to lived professional practice, where the integrity of AI-enabled information systems depends on how librarians interpret, regulate, and apply machine-supported outputs in institutional settings. Information reliability, transparency, accountability, and user trust are sustained through these continuing acts of interpretation and regulation [40,54]. Related studies further emphasise that ethical commitments acquire practical force through routine professional judgement and human-centered mediation in everyday library work [67,68]. Read in this way, Ethical AI leads directly to HCAI, since the operational meaning of ethics rests on the human capacities through which AI-supported information is scrutinised, explained, moderated, and rendered suitable for institutional use. HCAI sharpens this argument by specifying the oversight, interpretive judgement, transparency, and responsiveness to user needs that enable ethical commitments to become workable in context [40,67]. Related studies further reinforce the importance of human-centered mediation, accountability, and contextual responsiveness in AI-supported environments [69-71].

3.2 HCAI as an Operational Logic for Librarian Practice

HCAI positions AI as a sociotechnical arrangement in which human agency, oversight, and interpretive responsibility remain central to how systems operate and how outputs acquire meaning in use. Rather than treating automation as an endpoint, HCAI articulates AI as a form of augmented intelligence that extends human capability while remaining subject to human judgement, contextual awareness, and institutional accountability [72,73]. This orientation holds relevance in academic libraries, where machine-supported outputs gain institutional significance only after they are interpreted, evaluated, and validated through professional practice.

Core elements of HCAI-human control, transparency, explainability, accountability, and augmentation-provide the conceptual basis for this orientation [74-77]. Human control preserves the authority to question, pause, refine, or redirect AI-supported outputs when they conflict with academic standards or service context. Transparency and explainability enable librarians to interpret how outputs are generated and to justify their use in professional settings. Accountability anchors responsibility for outcomes in human roles and institutional structures rather than in automated systems. Augmentation, in turn, positions AI as a mechanism that strengthens analytical and interpretive capacity, particularly in environments where relevance, credibility, and trustworthiness must be assessed in real time. These elements collectively position HCAI as a logic of mediated judgement rather than as a design preference or usability principle.

In academic libraries, this logic redirects attention from system performance to the human work through which AI-supported outputs become usable, credible, and contextually appropriate. A productivity-oriented reading of generative AI privileges speed, convenience, and scale [33], while a library-centered reading prioritises evaluative judgement, interpretive mediation, and epistemic care in environments governed by credibility, trust, and professional accountability [2,78]. AI-generated outputs enter library workflows as provisional informational material. Librarians verify accuracy, detect hallucination, identify distortion or bias, judge relevance, and determine whether generated content satisfies the interpretive standards required for academic use [14,79]. Institutional usefulness emerges through this evaluative process, where human judgement tests and qualifies generated output before it supports discovery, metadata work, user guidance, or decision support.

Empirical work on generative AI reinforces the necessity of this mediating function. Previous studies [80-82] identify a recurring vulnerability in generative systems: outputs often appear fluent and immediately usable while still carrying unverifiable claims and epistemic risk. Spennemann and Oddone, Hazarika *et al.,* and Diyaolu *et al.,* [83-85] extend this concern into library contexts by highlighting stereotyped representation, metadata-related judgement, and the continuing requirement for human oversight in AI-assisted work. These findings strengthen the analytical value of HCAI by locating informational reliability in the human processes that validate and regulate machine-supported output.

This mediating role becomes particularly visible in-service encounters. Chen, Ravuri and Mardis, and Lo [86-88] place librarian guidance at the center of AI-assisted interaction, especially when users engage conversational systems that require clarification, scaffolding, and critical review. Adetayo and Oyeniyi and Adewojo *et al.,* [54,89] indicate that AI can strengthen reference interaction and information literacy support, although its practical value depends on the librarian's capacity to explain system limitations, qualify generated responses, and guide interpretation. Through these acts of explanation and judgement, AI outputs are transformed from system-generated responses into information that is contextually appropriate, professionally mediated, and institutionally defensible. HCAI becomes analytically visible at this point, where informational quality is preserved through human intervention rather than assumed from computational fluency.

A similar pattern appears in the organisation of AI-enabled services around user comprehension and responsible engagement. Previous studies [66,90,91] emphasise librarian guidance and

scaffolded AI literacy as central to meaningful interaction with AI-supported systems, while Diyaolu et al., [85] connect user understanding with ethical vigilance in academic environments. Tools such as chatbots and intelligent assistants may strengthen accessibility and responsiveness, although their institutional contribution depends on how librarians guide interaction, interpret responses, and help users recognise the limits of automated support [8,92]. Variation in user competence, confidence, and evaluative capacity further intensifies this responsibility, placing human mediation at the center of meaningful and responsible use.

Foundational HCAI scholarship primarily develops this orientation through design, explainability, and usability perspectives [72-74,76]. Less attention, however, is directed toward the institutional question of judgement, particularly how human actors convert machine-generated outputs into information that carries professional legitimacy and operational consequences. This issue becomes more pronounced in human-in-the-loop environments, where reliability and decision support depend on domain expertise and corrective intervention rather than automated output alone [93-95]. Academic libraries bring this issue into sharper focus because AI adoption depends not only on system usability [84-86], but also on the professional work through which librarians preserve reliability, manage bias, and guide responsible interpretive use [2,54].

From this perspective, HCAI extends beyond interface design and human-centered development into an operational logic of librarianship. AI is positioned as an extension of professional expertise rather than a replacement for human judgement [9,65]. Additional studies further emphasise the continuing importance of professional mediation and interpretive oversight in AI-supported environments [96,97]. Its value depends on the quality of human judgement embedded in its use, particularly when generated outputs enter cataloguing, metadata work, discovery systems, and user-facing services [44,64,65]. The effectiveness of AI-assisted library systems is therefore tied to the depth of human expertise integrated into practice, where interpretive adequacy, ethical reliability, and contextual relevance are continuously produced rather than assumed.

This line of argument also clarifies the governance dimension of HCAI in academic libraries. Librarianship increasingly carries responsibility for shaping trustworthy AI through professional judgement, ethical stewardship, and institutional accountability in everyday service practice [38,40,98]. Librarians act as mediating actors who interpret outputs, safeguard privacy, respond to bias, uphold transparency, and align automated systems with academic values such as inclusivity, accountability, and intellectual freedom [38,40]. This role extends into policy participation, metadata stewardship, digital preservation, and the development of responsible operational standards [14,38,99]. At the same time, uneven AI literacy, regulatory pressure, and institutional limitations continue to shape how effectively this role is enacted in practice [100-102].

HCAI, in this sense, captures the operational conditions through which human judgement, interpretive responsibility, and institutional accountability give shape to AI-supported information processes. It defines how machine-supported outputs are transformed into credible, contextually grounded, and professionally defensible information. This orientation leads directly to the next analytical concern: how such mediated processes contribute to IIC, where the quality, reliability, and usability of information shape organisational decision-making and knowledge use.

3.3 IIC as a Practice-Driven Outcome in AI-Enabled Academic Libraries

IIC becomes decisive when digitally generated outputs must be converted into information that universities can rely on for academic and organisational action. In AI-enabled environments, informational value does not arise at the point of generation. It is produced through the work of assessment, interpretation, validation, and contextual alignment that renders information credible,

meaningful, and actionable for institutional purposes [103]. This issue gains greater weight in higher education as core functions depend increasingly on digitally mediated information flows, integrated platforms, and sustained informational coordination [104,105].

Current capability discourse remains heavily attached to computational advancement, where analytical speed, system sophistication, and processing scale are frequently treated as signs of informational strength [106-108]. Such a reading turns technological sophistication into a proxy for informational quality, as though stronger systems automatically yield more dependable institutional knowledge. What remains underdeveloped is the harder institutional question: information becomes actionable through assessment, interpretation, validation, and contextual discipline rather than through generation itself [109,110]. The core issue lies in how machine-generated outputs are converted into information that institutions can trust, use, and act upon.

Academic libraries bring this problem into sharper view. Evidence from AI-enabled library settings indicates that machine-generated outputs may reproduce bias, weaken semantic accuracy, and unsettle user trust when accepted without professional scrutiny, especially in environments where informational precision carries immediate academic consequence [2,43,51]. This shifts the discussion from informational availability to the disciplined conditions that make information dependable. Reliability emerges as an institutional accomplishment, carried through professional judgement, evaluative practice, and the controlled handling of machine-supported outputs [38,46].

Even so, AI adoption literature still privileges infrastructure readiness, system compatibility, and user acceptance, while the day-to-day work through which librarians test outputs, detect inconsistencies, refine interpretations, and preserve informational standards receives much thinner treatment [58,111,112]. The result is a conceptual break between what institutions can process and what they can genuinely trust. The mechanisms through which decision-relevant information is sustained remain insufficiently articulated, particularly in academic libraries where informational quality depends on continuous mediation rather than automated processing.

IIC is better understood as a practice-driven outcome produced through the interaction of ethical direction and human judgement. Ethical AI establishes the institutional principles that guide responsible information use, including accountability, fairness, and data protection [14,40]. HCAI becomes operational through librarian engagement, where outputs are interpreted, questioned, refined, and aligned with contextual demands [10,38]. Ethical direction supplies the criteria for responsible informational use, while human judgement carries those criteria into action in live informational situations [75,113].

IIC takes form through this interaction. Ethical direction establishes what counts as acceptable, trustworthy, and responsible information, while human judgement determines how those expectations are applied in concrete institutional settings. AI-generated outputs pass through scrutiny, correction, contextual interpretation, and professional filtering before they become suitable for academic or administrative action [38,100,111]. Institutional stability is produced through these acts of practice rather than inherited from output generation. Its reliability depends on how institutions organise judgement around machine-supported outputs [114].

Its practical form appears in core library functions that exceed technical execution. Repository stewardship, metadata control, information literacy support, service mediation, and the coordination of data for institutional use all depend on continuous evaluative work and close alignment with institutional priorities [115-117]. These activities indicate that IIC resides in coordinated informational practice, where librarians sustain standards of reliability, intelligibility, and responsible use through continuous professional intervention [118,119].

Its strength is also conditioned by organisational realities. Resource constraints, uneven expertise, system discontinuities, and ethical concerns related to data use influence the extent to

which information can be interpreted and mobilised effectively [38,111-120]. IIC therefore emerges as a dynamic institutional accomplishment shaped by how expertise is organised, how ethical standards are applied, and how AI-supported processes are handled in practice rather than as a by-product of digital investment [121,122].

Seen in this way, IIC marks the institutional outcome of responsible AI use and human-centred interpretive work in academic libraries. Ethical AI provides the normative discipline that governs informational conduct. HCAI operationalises that discipline through oversight, interpretation, and contextual judgement. Through their interaction, information becomes reliable, accountable, and decision-ready, positioning academic libraries as critical institutional sites for sustaining informational integrity in AI-enabled environments [9,51,123].

3.4 Integrating Ethical AI, HCAI, and IIC as Practice in Academic Libraries

Current scholarship on AI in academic libraries remains distributed across three related but insufficiently connected domains: Ethical AI, HCAI, and IIC. Ethical AI clarifies the normative discipline of responsible information use, HCAI brings forward the human work through which AI-supported outputs are interpreted and controlled, and IIC identifies the institutional condition in which information becomes reliable and usable for action [9,45,78]. What remains less fully developed is the mechanism that links these domains into a coherent explanation of how AI-supported information acquires institutional value in academic library settings.

The conceptual difficulty lies in the way these domains are usually treated as parallel discussions rather than as interacting conditions of practice. Ethical AI is often concentrated around policy guidance, compliance structures, and normative expectations [38,39]. HCAI is commonly developed through design logic, explainability, and user interaction, while its practical life in professional library work receives thinner articulation [14,124,125]. IIC, in turn, is frequently associated with infrastructure, integration, and organisational performance, while the processes through which information becomes dependable, interpretable, and decision-ready remain less explicit [103,106,107]. Read separately, these domains illuminate important dimensions of AI-enabled librarianship. Read together, they expose a more consequential issue: the field still lacks a strong account of how ethical direction enters practice, how human judgement is organised in routine informational work, and how their interaction produces IIC.

Academic libraries bring this issue into sharp focus. AI carries institutional significance in these settings through professional activity rather than through autonomous system performance. Librarians interpret outputs, identify inconsistencies, refine meaning, qualify use, and guide users in contexts where informational precision carries academic and administrative consequences [24-26]. Additional studies further highlight the ethical pressures, evaluative responsibilities, and institutional implications surrounding AI-supported library practice [38,58,111]. This makes academic libraries especially important for conceptual development, since AI cannot be reduced here to a technical instrument, a regulatory concern, or a service interface taken in isolation. Its institutional role emerges through the professional work that connects ethical direction, interpretive judgement, and informational reliability.

The same point becomes clearer when academic library work is considered more closely. Repository stewardship, metadata control, information literacy support, service mediation, and the coordination of data for institutional use all depend on repeated professional intervention rather than technical execution alone [115-117]. Additional studies on institutional information practices further support this argument [126-131]. These activities indicate that reliable information is produced through organised informational practice. IIC, from this perspective, is carried through the

disciplined work of scrutiny, contextual interpretation, and responsible informational handling rather than inherited automatically from system capacity [118,119,132].

A more defensible conceptual explanation positions AI in academic libraries as practice. Ethical AI provides the normative discipline through which acceptable informational conduct is defined in terms of accountability, fairness, and data protection [14,40]. HCAI gives this discipline operational force by locating scrutiny, interpretation, refinement, and contextual judgement in the work of librarians [10,14,79]. IIC emerges through the interaction of these two conditions, where machine-supported outputs are examined, corrected, validated, and rendered suitable for academic or administrative action. Information becomes dependable through organised practice. Institutional capability, in this reading, rests on the quality of interpretive and ethical work surrounding AI-supported outputs rather than on technological sophistication by itself.

This integrated account also explains why organisational conditions remain central to capability. Resource constraints, uneven expertise, and system discontinuities shape the extent to which AI-supported information can be effectively interpreted and sustained in institutional settings [111,120]. Additional studies further emphasise the role of institutional coordination and information practices in maintaining reliable AI-supported environments [130,131]. Ethical concerns related to data use and responsible information handling further complicate these conditions in AI-supported environments [38]. IIC is thus better understood as a dynamic institutional accomplishment shaped by how expertise is organised, how ethical standards are applied, and how AI-supported processes are handled in practice rather than as a fixed return from digital investment [121,122].

Responsible AI use and human-centered interpretive work are inseparable in explaining how academic libraries sustain informational integrity. Ethical direction establishes the standards of responsible use. Human-centred enactment carries those standards into live informational situations. IIC emerges when that interaction consistently produces reliable, accountable, and decision-ready information [9,51,123]. The contribution of this paper lies precisely here: it clarifies the practice-based mechanism through which ethical AI and HCAI operate together in supporting IIC in academic libraries.

To clarify this integrated mechanism more explicitly, Table 1 presents the practice-based sequence linking Ethical AI, HCAI, and IIC in academic libraries

Table 1
A practice-based mechanism linking Ethical AI, HCAI, and IIC

Stage	Conceptual role	Librarian role	Practice expression	Institutional outcome
Ethical AI	Establishes the normative discipline that defines responsible informational conduct in AI-enabled academic libraries	Ethical stewards who regulate acceptable use, protect user interests, and uphold accountability in informational processes	Evaluating fairness, privacy, transparency, trust, and ethical risk in the use of AI-supported outputs	Normative discipline for responsible information handling
HCAI	Translates ethical direction into operational practice through human oversight, interpretive judgement, and contextual responsiveness	Interpretive mediators who scrutinise outputs, explain limitations, refine responses, and guide responsible use	Questioning outputs, detecting inaccuracies or bias, contextualising machine-generated information, and aligning use with academic expectations	Credible, intelligible, and contextually appropriate information

Stage	Conceptual role	Librarian role	Practice expression	Institutional outcome
IIC	Represents the institutional capability that emerges when ethical discipline and human-centred practice stabilise informational quality	Professional actors who sustain reliable and decision-relevant information through coordinated evaluative work	Validating outputs, filtering machine-supported information, supporting metadata quality, strengthening information literacy, and sustaining informational reliability	Reliable, accountable, and decision-ready information for the institution

The table clarifies that IIC does not arise from AI adoption alone. It emerges through a connected mechanism in which ethical discipline defines responsible informational conduct, human-centred practice carries that discipline into live library work, and coordinated professional judgement stabilises information for institutional use.

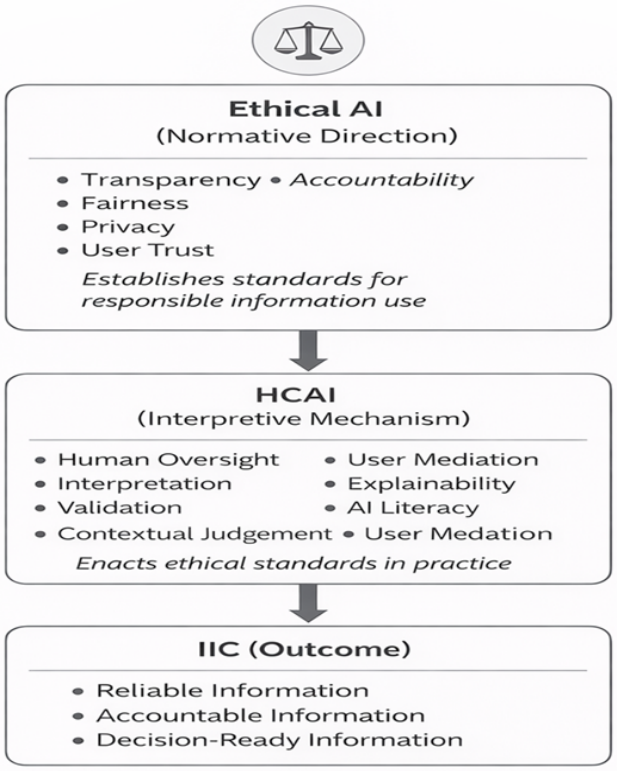

Fig. 1. Integrating ethical AI and HCAI to support IIC in academic libraries

Figure 1 crystallises the paper's central argument by presenting the relationship among Ethical AI, HCAI and IIC as a connected practice-based sequence rather than as separate analytical categories. Ethical AI establishes the normative direction for responsible information use. HCAI carries that direction into practice through human oversight, interpretation, and contextual judgement. IIC emerges as the institutional consequence when AI-supported information is rendered reliable, accountable, and decision-ready through this continuing process of professional mediation. The directional flow in the figure clarifies that IIC does not arise directly from AI adoption. It is produced through the interaction between ethical discipline and human-centred enactment in academic library work.

4. Discussion and Contributions

4.1 Repositioning AI as Practice in Academic Libraries

Scholarship on AI in academic libraries has largely evolved through separate conversations on ethics, human-AI interaction, and institutional capability [45,103]. Existing studies also examine institutional information processes and AI-enabled library environments [126,133,134], although the operational meaning of AI in routine information practice remains comparatively underdeveloped. This paper addresses that gap by repositioning AI as practice, carried through ethical direction and human judgement rather than through technical capability or system performance alone [14,103]. Related HCAI scholarship further reinforces this practice-oriented interpretation of AI-supported institutional work [124,125]. The shift is especially important in academic libraries, where AI-generated outputs enter workflows governed by scrutiny, contextual interpretation, and professional accountability before they can support institutional action [24-26]. Additional studies further highlight the ethical and evaluative pressures surrounding AI-supported library environments [38,135,136]. The argument advanced here places evaluative information work at the centre of AI's institutional significance. Reliable and decision-ready information emerges through the labour of interpretation, qualification, and control enacted in service work, metadata practice, and knowledge support, which gives academic libraries a far more consequential role than adoption-centred accounts usually recognise [38,126-131].

4.2 Librarians as Interpretive Agents of Ethical and HCAI

Current discussions of Ethical AI and HCAI have established a strong vocabulary of transparency, accountability, interpretability, and human oversight [25-27]. Ethical and practical concerns surrounding AI-supported library environments are further discussed in related studies [38-39], although the professional site through which these commitments acquire practical force remains comparatively underdeveloped. This paper positions librarians as interpretive agents through whom ethical standards become situated informational decisions. Previous studies also highlight librarians' roles in guiding users engaging with AI-assisted services and human-AI collaboration in academic library settings [8-9,14,24-26]. Ethical and interpretive responsibilities in AI-supported environments are further discussed by Sousa [38] and related studies [135-137]. Their role carries institutional weight. AI-assisted recommendations, generated text, and discovery outputs acquire academic usefulness through professional judgement, where librarians evaluate relevance, credibility, and contextual appropriateness in relation to user needs and institutional expectations [8,9]. Additional studies further highlight the ethical and evaluative responsibilities surrounding AI-supported outputs in academic library practice [38,79]. Related work also emphasises the interpretive role of librarians in assessing and mediating AI-generated information in institutional environments [136,137]. Librarians, in this reading, carry the practical burden of responsible AI use in academic libraries. They transform abstract ethical commitments into accountable informational handling and, through that work, mediate the credibility of AI-enabled knowledge in institutional life.

4.3 IIC as a Practice-Driven Institutional Outcome

IIC is frequently associated with data integration, infrastructure, and organisational performance [103,107,108]. Less attention, however, is given to the question of how information becomes dependable before entering institutional decision processes. Related studies further suggest that the mechanisms through which information becomes reliable and institutionally actionable remain conceptually underdeveloped [126,127]. This paper repositions IIC as a practice-driven institutional

outcome produced through the alignment of ethical direction and human judgement [14,40,79]. Related discussions on institutional capability further support this relationship [103,135]. Ethical AI establishes the criteria for responsible informational use through principles such as accountability, fairness, and data protection [14,40]. HCAI operationalises these principles through interpretive work in which outputs are questioned, refined, and applied according to contextual demands [79,124,125]. Additional studies further emphasise the importance of human-centred oversight and contextual judgement in supporting responsible AI use [138]. IIC emerges through the interaction of these conditions, where AI-generated outputs are stabilised through scrutiny, correction, and contextualisation before they support institutional action [103,135]. Additional studies further reinforce the importance of institutional information practices in sustaining reliable AI-supported environments [126-131]. This contribution rejects the easy equation of adoption, speed, or efficiency with informational quality [139-141]. What institutions can process and what they can genuinely trust are separate matters. The latter depends on organised professional judgement.

4.4 Conceptual Contribution

Figure 1 gives visual precision to the paper's central claim by making explicit the mechanism through which AI becomes institutionally meaningful in academic libraries. Ethical AI appears as a normative direction. HCAI appears as interpretive enactment. IIC appears as the institutional outcome produced when ethical standards and human judgement operate in concert [14,40,103]. The directional flow does more than connect concepts. Sousa [38] and related studies on HCAI practice [124,125] support this argument, while further work connects these processes to institutional information reliability [135,136,138]. The figure addresses a persistent weakness in existing scholarship, where ethics, human–AI interaction, and institutional capability often appear as parallel domains rather than as interdependent elements of one institutional logic [9,45,103]. Additional studies on institutional capability further reinforce this issue [126,133,134]. Its conceptual force lies in clarifying the pathway through which AI-supported outputs are transformed into institutionally credible information: through the continuing enactment of ethical reasoning and professional judgement in information practice, rather than through technical deployment.

5. Limitations and Future Inquiry

5.1 Limitation

This paper advances a practice-oriented explanation of how Ethical AI, HCAI and IIC connect in academic libraries, although its reach remains tied to the institutional settings most visible in the present body of scholarship. The argument speaks most directly to AI-enabled academic library environments where digital advisory services, metadata work, and discovery systems already have some operational presence. Existing scholarship indicates that such settings often carry stronger infrastructural readiness, wider policy exposure, and more established organisational support, which places the argument closer to relatively prepared institutions than to settings where AI uptake remains tentative, uneven, or highly experimental [24-26].

A further boundary arises from the paper's professional center of gravity. The analysis places librarians at the core of evaluative work, contextual interpretation, and ethical judgement in routine information practice. That emphasis sharpens the paper's central claim by clarifying how responsible AI acquires operational meaning in academic library work. At the same time, this focus gives less analytical space to the roles played by ICT personnel, academic staff, library leadership, and users in shaping how AI-supported information is configured, interpreted, and mobilised. In its present form,

the paper treats the librarian as the principal interpretive site through which AI acquires institutional meaning.

The discussion is shaped further by a landscape that remains highly fluid. Current scholarship indicates that AI use in academic libraries is still moving through an unsettled period, as governance expectations, professional competencies, and operational norms continue to develop [86-88]. The argument advanced here should therefore be read as a conceptual account of present institutional conditions rather than as a settled description of mature and stable arrangements.

5.2 Future Inquiry

Several lines of inquiry follow directly from these limits. One immediate priority concerns variation in digital readiness. Comparative work involving institutions with weaker infrastructures, lower policy maturity, or more tentative AI uptake would sharpen understanding of how ethical judgement and human oversight take shape when institutional support carries less stability [24-26]. Such work would test the strength of the proposed relationship under more uneven conditions and would clarify whether the same practice-based logic holds across different stages of institutional preparedness.

A second direction calls for a wider analytical lens. The present paper gives precise attention to the librarian's interpretive role, although IIC in AI-enabled environments is also shaped through technical configuration, governance decisions, academic use, and user interaction. Inquiry that includes ICT professionals, academic staff, and users would deepen understanding of how reliable and decision-ready information is sustained through interconnected institutional roles rather than through one professional standpoint [142-144].

Temporal development also deserves closer examination. As AI becomes more deeply embedded in academic library routines, the relationship among ethical direction, human judgement, and IIC may become more formalised, more contested, or more uneven. Longitudinal inquiry would be especially useful for tracing how professional judgement adapts as governance structures mature and as expectations surrounding responsible AI acquire greater operational specificity [26,145-147].

Further attention is also warranted on institutional consequences. The paper argues that IIC emerges through evaluative and interpretive work rather than through technological deployment itself. The next conceptual advance lies in clarifying how this work shapes transparency, trust, information reliability, and decision quality over time, particularly in higher education environments where AI-generated outputs increasingly enter formal knowledge processes [139-141].

6. Conclusion

AI has pushed academic libraries into an informational climate where generated outputs acquire institutional value through scrutiny, contextual interpretation, correction, and professional judgement. In this setting, trustworthy information is produced through practice. This paper has articulated a connected conceptual logic linking Ethical AI, HCAI, and IIC in academic libraries. The paper's central contribution lies in shifting AI discussion away from system-centred interpretation and toward the professional practices that sustain informational reliability. Ethical AI establishes the normative discipline of responsible informational conduct. HCAI gives that discipline practical force through oversight, contextual judgement, and interpretive mediation. IIC emerges through their interaction, as AI-supported outputs are examined, refined, validated, and rendered suitable for institutional action. Informational trust, accountability, and decision-readiness arise through organised professional work rather than through adoption, speed, or technical sophistication. The

argument also gives librarians a sharper conceptual position in AI-enabled academic libraries. Their work exceeds system use and service support. Librarians function as institutional interpreters who evaluate machine-supported outputs, detect distortion, protect user interests, refine metadata, and align generated information with academic standards and organisational expectations. Through this repeated labour of judgement, academic libraries become critical institutional sites where AI is translated into credible information. For Malaysian public university libraries, this argument has immediate significance. National digital agendas and ethical AI ambitions acquire institutional force through the daily practices that govern how information is handled, qualified, and circulated in library environments. The long-term value of AI will rest on the strength of Ethical AI, HCAI, and the practice conditions through which IIC is sustained in everyday library work.

Acknowledgement
This research was not funded by any grant. The author would like to express sincere gratitude for those who helped directly and indirectly.

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