Sustainable Data Management in Higher Education: A Cross-Institutional Comparative Analysis Using the Green IT Motivation Grid

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Abstract. Higher education institutions (HEIs) increasingly depend on information systems to manage growing volumes of academic, administrative, and accreditation-related data, yet the sustainability dimension of this data management (efficiency, governance, and environmental responsibility) remains underexamined, particularly across differing institutional contexts. This study compares sustainable data management practices at two Indonesian higher education faculties, analyzing the drivers and barriers shaping implementation through the Green IT Motivation Grid. Using a qualitative multi-case design, semi-structured interviews were conducted with twelve informants across both sites, spanning quality assurance, IT, and academic/administrative roles, and analyzed using Braun and Clarke's thematic analysis. Findings show that both institutions pursue sustainable data management through a hybrid model combining digital platforms with persistent manual processes, driven predominantly by eco-legitimacy (accreditation compliance) and eco-efficiency (operational cost reduction) motivations. Cross-case analysis reveals that eco-effectiveness and eco-responsiveness (i.e. the proactive, innovation-oriented dimensions of the Grid) remain structurally underdeveloped at both sites despite differing institutional cultures, leadership styles, and resource environments. This convergence suggests that the gap is systemic to accreditation-driven HEI contexts rather than idiosyncratic to a single institution. The study contributes the first cross-institutional application of the Green IT Motivation Grid to higher education data management, strengthening the framework's generalizability, and offers comparative practical guidance for institutions at different stages of digital and governance maturity.

Keywords: Sustainable Data Management, Green IT Motivation Grid, Higher Education, Data Governance, Comparative Case Study, Thematic Analysis.

1 Introduction

The rapid growth of data in higher education institutions (HEIs) has created an urgent need for management practices that are both efficient and sustainable [1, 2]. Universities continuously generate data from academic, administrative, research, and quality

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assurance activities, all of which must be reliably stored, processed, and retrieved to support institutional decision-making [3]. Accreditation-specific data systems further illustrate this tension: well-designed platforms improve productivity and traceability [4], yet effectiveness depends on institutional readiness rather than technology availability alone [5, 6].

Although sustainability has become a central concern in information systems research [7–9], its application to data management in HEIs remains limited, and prior work has predominantly examined single institutions in isolation [10, 11]. This single-site orientation constrains the field's ability to distinguish institution-specific findings from patterns that generalize across organizational contexts. Existing research also tends to emphasize technical infrastructure, such as data storage [12], green data centers [13], and system architecture, while paying insufficient attention to the organizational, cultural, and motivational factors that determine whether sustainable practices become embedded in daily operations.

The Green Information Systems (Green IS) extend traditional Green IT by embedding sustainability principles throughout the information systems lifecycle, rather than confining environmental concern to hardware efficiency alone. The relevent literature emphasizes integrating sustainability principles throughout the IS lifecycle [9, 14], yet few studies examine how these principles translate into practice across different institutional settings. Despite growing research interest, organizations frequently encounter persistent adoption challenges, such as resource constraints, unclear ownership, and weak integration between sustainability goals and operational IT decisions [15].

The Green IT Motivation Grid [16] provides a structured lens for analyzing these dynamics, distinguishing motivations along two axes: internal versus external orientation, and economic versus regulatory focus. Their intersection yields four dimensions (see Table 1) and consisted of several factors. Eco-effectiveness can be identified from the corporate's own strategy while competitor's actions and pressure from clients or customers are considered as eco-responsiveness. Pressure from industry associations and government incentives are categorized as eco-legitimacy. On the other hand, eco-efficiency can be in the form of the cost of greening IT and and IT cost reduction consideration. Prior applications consistently find eco-legitimacy and eco-efficiency dominant, with the proactive dimensions emerging only under sustained leadership commitment [1, 17].

Table 1. Green IT Motivation Grid.

		Locus of Motivation	
		Internal	External
Focus of Motivation	Economic	Eco-efficiency	Eco-responsive
	Regulatory/Normative	Eco-effectiveness	Eco-legitimacy

This study addresses these gaps through a comparative multi-case design examining two faculties in an Indonesian public university with distinct institutional cultures, leadership structures, and resource environments. Three research questions guide the in-

quiry: (1) How is sustainable data management practiced within each institution's information systems, particularly in accreditation processes? (2) What internal and external factors drive or inhibit implementation at each site? (3) Which patterns of drivers and barriers converge or diverge across institutional contexts?

The study's contribution is threefold. First, it provides comparative empirical evidence across two distinct HEI contexts, addressing the single-site limitation of prior governance-focused research. Second, it extends the Green IT Motivation Grid from a single-case to a cross-case analytical lens, testing whether its motivational dimensions hold consistently across institutional variation. Third, by identifying which barriers persist regardless of institutional context, the study distinguishes structural challenges requiring sector-level policy intervention from contextual challenges addressable through institution-specific strategy.

2 Methodology

2.1 Research Design

This study adopts a qualitative, multi-case comparative design [18], examining two faculties at different Indonesian universities to enable cross-case synthesis of drivers and barriers in sustainable data management. A comparative case design was selected specifically to distinguish institution-specific findings from patterns that recur regardless of institutional context, addressing the single-site limitation identified in prior research.

2.2 Cases and Participants

Case A is a faculty of economics and business undergoing accreditation from LAMEMBA (Lembaga Akreditasi Mandiri Ekonomi, Manajemen, Bisnis dan Akuntansi), the Indonesian independent accreditation body responsible for study programs in the economics, management, business, and accounting cluster. Case B is a faculty in the information technology and computing domain undergoing accreditation from LAM INFOKOM (Lembaga Akreditasi Mandiri Informatika dan Komputer), the corresponding independent accreditation body for study programs in informatics and computing. Participants at both sites were selected via purposive sampling based on direct involvement in accreditation-related data management and a minimum of two years of institutional experience. Twelve informants participated across both sites (six per case), representing quality assurance, IT/information systems, and academic/administrative roles, enabling triangulation across managerial, technical, and operational perspectives within each case (see Table 2).

Table 2. Combined Participant Overview.

Case	Participants Code	Stakeholder Group	n
A	N1-N3	Quality Assurance	3
A	N4-N6	IT Unit	3
B	P1-P2	Quality Assurance	2

B	P3-P4	Academic Service	2
B	P5-P6	IT Unit	2

2.3 Data Collection and Analysis

Semi-structured interviews (45–60 minutes) were conducted at both sites using comparable guides covering current practices, technological infrastructure, organizational/cultural factors, and external drivers/barriers, structured around the Green IT Motivation Grid's internal/external and reactive/proactive dimensions [16]. Interviews were audio-recorded with informed consent and transcribed verbatim.

Each case was analyzed independently using Braun and Clarke's six-phase thematic analysis [19], operationalized following Maguire and Delahunt's step-by-step procedure [20]: familiarization, initial coding, theme searching, theme review, theme definition, and report production. Case-level themes were then synthesized through cross-case comparison, mapping findings from both sites onto the Grid's four motivational dimensions to identify convergent and divergent patterns across institutional contexts. Credibility was established through within-case source triangulation at both sites and member checking at Case B. Dependability was supported by parallel audit trails documenting coding decisions for each case. Transferability is supported by thick description of each institutional context, while cross-case comparability is the primary analytic goal of this design [21].

3 Comparative Findings

3.1 Sustainable Data Management Practices

Both cases enact sustainable data management through a hybrid digital-manual model, rather than full digitalization. Case A relies on Google Sheets, Excel, internal academic systems, and Nextcloud; Case B reports comparable platform diversity but with stronger cross-unit integration feeding directly into accreditation reporting. One of the Case B informants described this as a traceable pipeline: "*Each unit has its own system, so daily work is recorded and, when needed, can be directly downloaded, so that is where traceability begins*" (P2). Case A's digitalization is more fragmented, with accreditation data existing largely in disconnected spreadsheets rather than a centrally integrated pipeline.

Manual processes persist at both sites for wet-signature documents and sensitive records, indicating that full digitalization is neither fully achieved nor universally desired at either institution where it shows an early signal that the underlying barrier is structural rather than site-specific.

3.2 Drivers and Barriers of Both Cases

The cases observed in this research converge on eco-legitimacy and eco-efficiency as dominant drivers, and on a near-total absence of eco-responsiveness, despite differing

institutional cultures and resource levels. This convergence is the study's central empirical finding: it suggests the pattern is structural to HEI accreditation contexts rather than an artifact of either institution's specific circumstances [15]. Table 2 summarizes the drivers and barriers in both cases.

Table 3. Drivers and Barriers Mapped to the Green IT Motivation Grid.

Dimension	Type	Case A	Case B
Eco-legitimacy	Driver	BAN-PT/LAMEMBA compliance; assessor energy queries	Accreditation requirements; inter-institutional benchmarking
Eco-efficiency	Driver	Paper/time reduction; cost savings	Resource adequacy; no reported funding constraints
Eco-effectiveness	Driver	Smart classrooms, solar panels (physical infrastructure only)	Responsive IT support; feature-level innovation
Eco-responsiveness	Driver	Not evidenced	Not evidenced
Governance/coordination	Barrier	Inter-unit coordination deficiency	Organizational complexity; weak knowledge management
Data quality	Barrier	Redundancy from non-standardized entry	Redundancy from untraceable cloud storage
Capacity	Barrier	Limited HR competency; no Green IS training	Legacy-system incompatibility
Regulatory	Barrier	Absence of Green IS-specific mandate	Absence of explicit sustainability regulation

Divergence appears in eco-effectiveness: Case A's innovation is confined to physical infrastructure, disconnected from data systems, while Case B shows innovation occurring within data systems themselves, driven by a responsive internal IT culture: "*Our IT team has demonstrated high responsiveness in meeting the unit's needs... when we requested a year-based search and Excel download option, the IT team responded promptly and implemented it*" (P4). This suggests institutional culture, not resource availability alone, determines whether eco-effectiveness can take root.

Barrier origin also diverges. Case A's barriers center on human resource and training gaps. Case B's center on technical and knowledge-continuity constraints, illustrated by a Case B informant describing data duplication risk in shared cloud storage: "*If the person who uploaded the data is no longer with the organization, information about the actual storage location becomes hard to trace. This causes data duplication to occur continuously*" (P2). The absence of explicit sustainability regulation specific to data governance, as distinct from general accreditation data requirements, is the most significant convergent barrier. It was observed at both sites despite their differing technical and cultural conditions.

4 Cross-Case Discussion

Three insights emerge from comparing the two cases, each strengthened by an analytical point not previously available: the two faculties operate under different sector-specific accreditation bodies where Case A is under LAMEMBA (economics, management, business, and accounting) and Case B is under LAM INFOKOM (informatics and computing), rather than a single uniform national process.

Structural convergence despite differing regimes. Eco-legitimacy and eco-efficiency dominance, and the corresponding eco-effectiveness/eco-responsiveness deficit, appear consistently at both sites despite differing institutional cultures, resource levels, and differing accreditation standards entirely. This strengthens rather than weakens the structural interpretation: if the same motivational pattern holds even when the accrediting body, evidentiary requirements, and disciplinary domain differ, the pattern is unlikely to be an artifact of either accreditor's specific criteria. It more plausibly reflects a general property of Indonesia's LAM-based accreditation architecture itself, which emphasizes evidence-based traceability [4, 10], without explicitly incentivizing data governance sustainability as a distinct evaluative criterion at either body.

Divergent mechanism behind the same gap. Although both cases show weak eco-effectiveness, its origin differs. Case A's deficit reflects a conceptual framing problem: sustainability is institutionally understood as physical infrastructure (smart classrooms, solar panels) rather than data governance, a framing plausibly reinforced by LAMEMBA's general management and accountability focus, which does not foreground technical system design as an evaluative dimension. Case B's deficit, by contrast, reflects an unrealized capacity: its IT culture is demonstrably responsive and innovation-capable, but this capacity is directed at incremental feature requests rather than systematic data governance innovation, since LAM INFOKOM's technical evaluation criteria do not explicitly reward sustainability-oriented data lifecycle management either. In both cases, then, the accreditation body's evidentiary focus shapes where institutional energy is directed, but neither body's criteria currently channel that energy toward eco-effectiveness. This is a more precise diagnosis than either source study could offer independently.

Governance maturity over technology availability. Case B's stronger cross-unit traceability stems from organizational culture and leadership proximity rather than superior technology [11, 22] because Case A also possesses comparable digital tools but lacks the coordination structures to exploit them [6]. This supports treating sustainable data management as a socio-technical governance challenge rather than a technology adoption challenge [2, 14], consistent with findings that institutional readiness, not platform sophistication, determines outcomes [5].

5 Conclusion

This comparative study examined sustainable data management across two HEI faculties operating under different sector-specific accreditation bodies using the Green IT Motivation Grid. Findings show consistent dominance of eco-legitimacy and eco-efficiency motivations and a structurally underdeveloped eco-effectiveness/eco-responsiveness dimension at both sites, despite differing institutional cultures, resource environments, and evidentiary requirements. This convergence across genuinely distinct accreditation regimes strengthens the case that the gap reflects a systemic feature of Indonesia's LAM-based accreditation architecture rather than an institution- or sector-specific failure.

Theoretically, this study offers the first cross-institutional, cross-accreditor application of the Green IT Motivation Grid to HEI data management. It demonstrates that motivational dimension (which drivers dominate) is structurally consistent across HEI contexts, while motivational direction (where institutional energy is channeled) is shaped by each accreditor's specific evidentiary priorities. This is a distinction the Grid alone does not capture, and one only visible through cross-case, cross-accreditor comparison.

Practically, the findings suggest differentiated intervention. Institutions resembling Case A require reframing institutional sustainability discourse to explicitly include data governance, not only physical infrastructure. It can begin concretely by incorporating data lifecycle management indicators into existing internal quality assurance reviews, appointing dedicated data stewards per unit, and piloting Green IS awareness training alongside existing sustainability programs. Institutions resembling Case B require redirecting existing technical innovation capacity toward systematic data governance rather than incremental feature requests such as by starting with establishing a centralized data ownership policy, implementing dark data audits on shared cloud storage, and formalizing knowledge transfer protocols to prevent continuity loss when personnel change. Both would benefit from accreditation criteria, whether LAMEMBA's, LAM INFOKOM's, or the institutional-level framework set by BAN-PT (Indonesia's National Accreditation Agency, which oversees institutional accreditation while LAM bodies handle program-level accreditation), that explicitly reward data governance sustainability as a distinct evaluative dimension. Institutions can proactively anticipate this by documenting current data governance maturity and positioning it as accreditation evidence, addressing the regulatory vacuum identified at both sites.

This study is bounded by its two-site, two-accreditor comparative design; while stronger than single-site studies, broader generalization requires validation across additional institutions, disciplinary clusters, and accreditation bodies. Future research should (1) extend this comparison across a larger sample of LAM-accredited faculties to test whether the convergence pattern holds at scale, (2) examine whether accreditation instrument design changes can measurably shift institutional eco-effectiveness investment, and (3) develop a maturity model integrating the Grid with governance-capability assessment specific to the Indonesian higher education accreditation context.

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