

A BIMAS-Based Assessment Framework of Digital Readiness: Evidence and Institutional Patterns

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Abstract

Digital transformation (DT) has become increasingly important in higher education as institutions integrate technology into teaching, learning, governance, and administration. In Islamic Higher Education Institutions (IHEIs), DT is shaped by specific organizational values and governance structures, making digital readiness (DR) a critical prerequisite for successful and sustainable implementation. DR determines an institution's capacity to adopt, manage, and institutionalize digital initiatives effectively. However, existing digital readiness frameworks (DRF) primarily emphasize technological and human factors, while sustainability and environmental aspects remain insufficiently addressed. To address this gap, this study proposes the BIMAS framework, which integrates sustainability and environmental dimensions with business model, infrastructure and technology; management and organization; and audit and quality control. Moreover, the framework is empirically tested using a quantitative approach based on online survey data collected from 15 IHEIs. Multiple regression analysis is employed to examine the influence of each BIMAS dimension on DR. The findings indicate that all five BIMAS dimensions have a significant impact on DR. Also, Infrastructure and technology, together with sustainability and environmental factors, emerge as the strongest predictors. These results suggest that DR in IHEIs should be understood as a multidimensional institutional capability rather than a purely technical condition.

Keywords: Digital Readiness; Assessment, Readiness Level, Readiness Index, BIMAS Framework

I. INTRODUCTION

DIGITAL transformation (DT) is widespread and much research in recent, and it has fundamental issues in the global imperative development of organizations, increasingly recognizing strategic priorities from both nations and sectors in the worldwide adoption for acceleration with advanced digital technologies. The previous works of DT have focused on the number of selected specific studies (e.g., digital maturity (DM), and digital readiness) since the implementation of digitalization in the organization's field, beginning with governments [1], industries [2], [3], and educational institutions[4]. Indirectly, the emerging concept of DT has been widely conducted by many researchers who investigated almost over the past decade, so that strengthening new theoretical foundations, paradigm shift in information system research, development of advanced methods, and modified models until an optimized framework becomes prime concerning. Moreover, the introducing method, presented model, and establishing framework had been subsequently explored with customized selecting studies

become worthwhile study as well as numerous finding investigations. Therefore, with emerging on which factors and distinctively specific definite dimensions, DT in scientific research is evolving rapidly toward the relevance of the field, scope of interest, and quantity of literatures[5].

Some organizations were encouraged to adapt either advanced digital or innovative products to support to transforming process of business, besides the infrastructure and environment. In fact, the domain of studies such as governments, educations and industrial institutions was primarily categorized as a challenging area. According to empirical findings, studies have claimed that enhancing administration efficiency and optimizing resource allocation have been achieved remarkably within the department of government by preparing a digital initiative with robust engagement of stakeholders. Thus, supportive institutions require refinement in governance and establish public service for efficiency. Also, the platform of learning provided accessibility with personalized learning trajectories in Higher Education Institutions (HEIs) to accommodate varied requirement contexts[7]. In industry fields, specifically in competitiveness, DT was revealed as a strategic enabler when cyber-physical systems, advanced analytics, and automation were integrated to align the process of production and value-chain reinforcement[8].

Despite its strategic significance, firstly, insufficient financial resources, high investment costs, resistance from workers, a shortage of well-qualified staff, lack of knowledge about technology providers, high IT security requirements, and the absence of a digital transformation-oriented business culture hindered performing DT[9]. Secondly, supporting the leadership faces the demands of the digitalization mechanism, durability to transform was strongly associated with fragmented communication with relationships and inconsistently formulated points[10]. Eventually, the analyzed critical hindrance of digitalization assisted the top management. In addition, the lack of cyber-physical systems limited technological and data security become main contributing factor[11].

Despite the proliferation of DR and maturity frameworks in the literature, established models such as the Technology–Organization–Environment (TOE) framework as articulated by Alkhaldi (2025), the STEP framework (Social, Technological, Environmental, and Policy) proposed by Sait (2022), and the Organizational Readiness Assessment Model (ORAM) developed by Li (2024) reveal several conceptual and operational limitations. Although Alkhaldi's TOE framework provides a robust lens for examining technological, organizational, and environmental conditions, it does not systematically foreground governance, sustainability, or institutional stewardship as core evaluative dimensions. Similarly, while the STEP framework incorporates environmental and policy dimensions, these elements tend to function as parallel components rather than being integrative aligned with organizational values and strategic readiness. ORAM, despite its comprehensive attention to organizational capacity and structural practices, also lacks an explicit integration of sustainability governance and audit mechanisms as foundational assessment criteria [12], [13]. Consequently, these established frameworks primarily focus on operational or structural aspects of readiness and maturity, which may overlook the broader sustainability-oriented and value-driven orientation necessary for contemporary DT, especially in nuanced institutional contexts[14], [15], [16].

To address these conceptual and operational gaps, this study proposes the BIMAS framework as an extended DR model that systematically incorporates Sustainability and Environment as integral evaluative dimensions alongside traditional technological and organizational constructs. Unlike existing models, BIMAS positions sustainability and environmental accountability not merely as contextual or parallel inputs but as fundamental components that shape institutional readiness holistically, particularly in value-driven and mission-oriented contexts such as Islamic higher education institutions (IHEIs). By embedding audit mechanisms, governance structures, and sustainability-driven logics into a unified readiness assessment, BIMAS advances a more holistic and future-oriented approach that aligns digital capability with institutional missions, long-term stewardship commitments, and strategic priorities. This extension enables a deeper analytical interpretation of readiness, which bridges operational preparedness with strategic sustainability integration.

Building on the identified theoretical and methodological gaps, this study makes several distinct contributions to the DR literature, encompassing conceptual framework developments, methodological innovation, and empirical application.

1. Conceptual contribution:
This study extends established DR frameworks (e.g., TOE, STEP, ORAM) by explicitly integrating sustainability and environmental dimensions, thereby advancing a more holistic and value-oriented conceptualization of institutional DR.
2. Framework contribution:

The proposed BIMAS framework synthesizes technological, organizational, governance, audit, sustainability, and environmental dimensions into a unified readiness assessment model tailored to higher education contexts.

3. Methodological contribution:

This study advances DR assessment (DRA) by integrating predictive quantitative analysis with an index-based readiness classification approach. Regression analysis is employed to examine the relative influence of multiple organizational dimensions on DR, enabling a systematic evaluation of their predictive significance. In parallel, a readiness index is calculated to translate empirical scores into interpretable readiness levels, thereby identifying which dimensions are sufficiently developed and which remain underprepared. This combined methodological strategy allows the study to move beyond descriptive assessment toward both explanatory and diagnostic insights, offering a more comprehensive understanding of institutional DR. In addition, the scale measurement applied a qualitative degree to convert the numerical scale.

4. Empirical contribution:

By applying the BIMAS framework and the proposed methodological approach to higher education institutions, the study provides empirical evidence that identifies key readiness drivers as well as specific dimensions requiring strategic improvement.

II. LITERATURE REVIEW

This study employed a systematic literature review guided by the PRISMA framework to ensure methodological rigor, transparency, and reproducibility. A comprehensive search was conducted across four major academic databases—ScienceDirect, Emerald Insight, Springer, and IEEE Xplore—yielding 831 records. After deduplication, preliminary screening, and technical exclusions, 536 articles were retained for retrieval, of which 208 accessible full-text studies constituted the final set for further analysis.

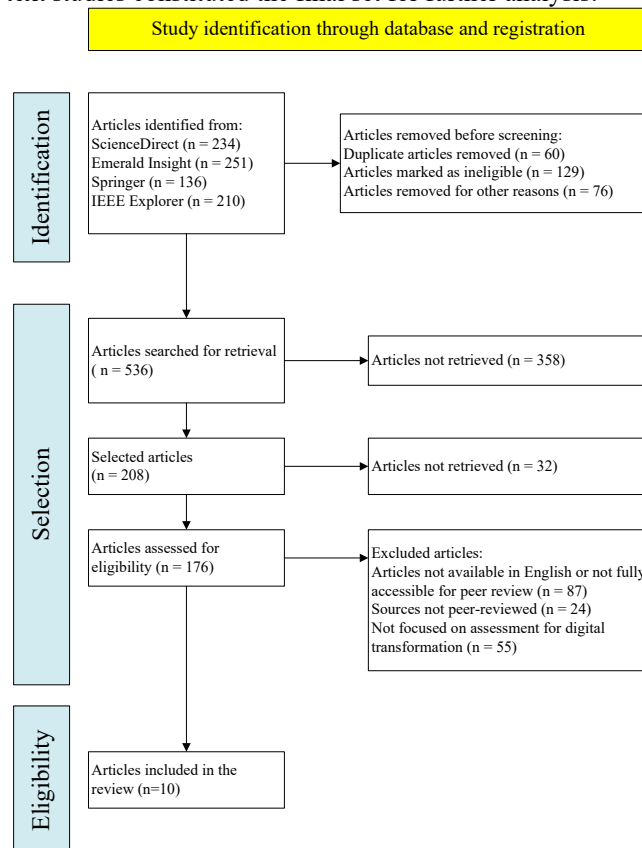


Fig. 1. Literature Review Protocol using PRISMA.

The PRISMA-guided selection process in Fig. 1 analytically demonstrates that, although a substantial volume of literature initially addressed themes related to DT in higher education, only a markedly limited proportion of studies satisfied the stringent methodological and thematic criteria required for inclusion. This pattern indicates that a significant share of existing publications remains either conceptually fragmented or methodologically insufficient, particularly when assessed against clearly operationalized DR frameworks. Notably, while the extensive exclusion of non-retrievable and non-peer-reviewed records substantially reduced the corpus, this rigorous filtration was instrumental in enhancing the overall validity and analytical coherence of the review. Moreover, the pronounced attrition observed during the eligibility assessment suggests that, although DT is widely discussed, empirical investigations that systematically evaluate institutional DR remain comparatively scarce. Consequently, this analytical outcome underscores the necessity for more methodologically robust and contextually grounded studies, especially those capable of generating transferable insights for institutional-level DR within higher education systems.

Following the initial identification stage, 358 records could not be retrieved in full text due to several practical and methodological constraints, including restricted access to full-text versions, duplicate records across databases, and documents limited to abstracts or non-peer-reviewed formats. As a result, 208 articles were retained for the screening phase. During further screening, an additional 32 records could not be retrieved in full text, leading to 175 articles assessed for eligibility. In this eligibility assessment phase, all accessible studies were critically and independently evaluated against explicitly defined inclusion and exclusion criteria, including publication language (English), peer-review status, full-text availability, and substantive relevance to DR or DRA. Consequently, 87 articles were excluded due to language limitations or lack of full peer-reviewed texts, 24 studies were excluded for not meeting peer-review standards, and 55 articles were excluded for insufficient focus on DRA. Through this stringent and iterative selection process, a final set of 10 high-quality and thematically relevant studies was conclusively included in the systematic review, providing a robust conceptual and empirical foundation for subsequent synthesis and analysis.

In response to the identified gap, the BIMAS framework is developed as a conceptually and methodologically grounded approach to address the limitations of existing studies. It operationalizes digital readiness through an integrative structure that translates abstract digital transformation principles into measurable dimensions aligned with the institutional context of IHEIs. Consequently, BIMAS offers a structured, replicable, and analytically robust tool that supports evidence-based strategic digital transformation planning in higher education.

III. RESEARCH METHOD

This study aims to comprehensively assess the digital readiness of IHEIs in Indonesia using the BIMAS framework as the primary analytical lens. Methodologically, it integrates a critical literature review with a cross-sectional survey-based qualitative degree questionnaire to systematically capture institutional perceptions. The data are subsequently analyzed through the calculation of the Digital Readiness Index and qualitative readiness levels, enabling robust and exploratory insights into national-level patterns and variations of digital readiness within a dynamic digital transformation context.

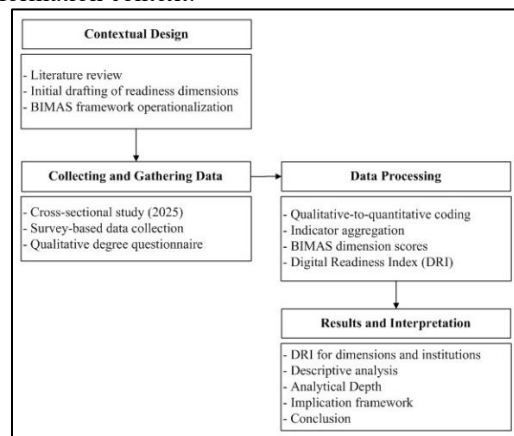


Fig. 2. Proposed Methodology for Readiness Assessment.

As depicted in Fig. 2, the proposed methodology for readiness assessment is structured as a sequential and logically integrated process. The study begins with a contextual design phase, in which a systematic literature review informs the initial drafting of DR dimensions, followed by the careful operationalization of these dimensions through the BIMAS framework. This conceptual grounding subsequently guides the collecting and gathering of data, implemented through a cross-sectional study conducted in 2025 using survey-based data collection and a qualitative degree questionnaire to capture institutional perceptions in a structured manner. The collected data are then processed through a rigorous analytical procedure that converts qualitative assessments into quantitative representations, aggregates indicators, and computes BIMAS dimension scores alongside the overall Digital Readiness Index (DRI). Finally, the results and interpretation stage synthesizes the computed indices through descriptive analysis, providing analytical depth that supports the formulation of an implication framework and the derivation of coherent conclusions regarding institutional DR.

A. Dimensions and subdimensions

To ensure a strong evaluation basis, a clear and systematically formulated set of dimensions is required. Once the core principles are established, these dimensions must comprehensively describe the various aspects that influence the ability of IHEIs to achieve optimal performance. Irene-Angelica Chounta (2024) formally introduced a proposal outlining the key dimensions deemed most relevant for use in developing an assessment framework for IHEIs [17]. A well-defined literature review has built an understanding of the previously developed framework. Seven key dimensions for assessing IHEIs' readiness were identified after the initial proposed framework was consolidated and normalized with reference to assessment frameworks using common dimensions. Given that this review served as the primary reference throughout the research process, we adopted several of their recommended dimensions directly as the conceptual foundation for our framework, then adapted them to our chosen case study, the IHEI. To proceed with the framework design, determining the specific behaviors that should be the focus of the IHEI is a crucial step. In other words, we summarize the dimensions proposed by Irene-Angelica Chounta based on our findings through a qualitative approach due to cross-country cultural differences. Therefore, Table 1 presents the proposed dimensions of DR for IHEIs.

B. Readiness levels and measurement dimensions

One of the most crucial methodological decisions in designing an assessment model is determining the number of levels to be used. To date, the DR literature by Isomar Lima specifies five levels, but these levels are not explicitly described. Based on a comprehensive and systematic review of various existing frameworks conducted by Isomar Lima, the most commonly and empirically used number of levels ranges from four to five [18]. Given our primary principle of ensuring a framework that is inherently simple, practical, and easy to implement by IHEIs, we ultimately chose to formulate seven levels, considered the most proportional to the recommendations of Isomar Lima.

TABLE I
PROPOSED DIMENSIONS OF DIGITAL READINESS

Dimensions	Initial	Description of dimensions
Business Model [19][20]	BM	All aspects related to how an organization operates, offers and innovates products and services.
Infrastructure and Technologies [21][22]	IT	all aspects related to infrastructure provision, building integrated information to support decision making.
Management and Organizations [23][24]	MO	All aspects related to management and leadership, business strategy, innovation-based mindset.
Audit and Quality Control [25][26]	AC	All aspects related to the quality control process through audits support transparency and process improvement efforts.
Sustainability and Environment [27], [25], [28]	SE	All aspects related to impact, implementation and quality on sustainability.

C. Readiness Level Classification and Threshold Justification

The thresholds used for readiness level classification in this study are theoretically grounded rather than arbitrarily defined. They are derived from a maturity-oriented assessment logic in which readiness levels are conceptualized as cumulative and hierarchical stages of institutional development. Consistent with established readiness and maturity frameworks, the classification thresholds function as interpretive benchmarks that translate continuous readiness scores into meaningful developmental categories. This approach is commonly adopted in organizational readiness and maturity assessments, where threshold ranges are used to support structured interpretation rather than statistical discrimination. Accordingly, the thresholds applied in this study are intended to facilitate analytical clarity and comparative interpretation of institutional readiness levels, rather than to impose rigid or deterministic categorizations.

D. Instrument and collecting data for readiness assessment

The BIMAS readiness assessment framework is operationalized through five core dimensions: Business Model, Infrastructure and Technology, Management and Organization, Audit and Quality Control, and Sustainability and Environment. Data were collected in Indonesia via a structured online questionnaire distributed using Google Forms and organized into five sections to enhance clarity, with participation conducted in accordance with institutional privacy policies. The cross-sectional data collection, carried out 2025, involved IHEIs across major geographic regions from Sumatra to Papua and employed a qualitative degree scale with nominal measurement to support demographic and readiness analyses. Although data were collected 2025, the study employed a cross-sectional design, as each participant was surveyed only once and no temporal comparisons were conducted. The extended data collection period reflects administrative and access-related constraints rather than a longitudinal research intent. Due to the long data collection period and considerations of heterogeneity, to support quality, stratified random sampling was applied, primarily to the student group, while cluster random sampling was used for employee data. Additionally, we ensured that anomalies such as blank foreign elements and incomplete frames were mitigated during data collection.

To ensure the conceptual rigor, contextual relevance, and measurement validity of the study, a structured instrument development and validation procedure was undertaken. The questionnaire instrument was developed through a systematic multi-stage process. First, measurement items were adapted from established and widely cited studies on DR, organizational capability, and technology-enabled transformation in higher education to ensure theoretical grounding and content relevance. Second, the items were reviewed by a panel of domain experts consisting of academics and institutional practitioners to assess clarity, relevance, and contextual suitability. Based on their feedback, minor wording refinements were made to enhance interpretability and alignment with the higher education context. Third, the revised instrument was pilot-tested with a small group of respondents to evaluate item comprehensibility and completion time.

E. IHEI digital readiness measurement and scale calculation

Respondents, consisting of students, completed an online survey that was subsequently collected and classified according to IHEI size categories (University, Institute, and College). The dataset, obtained from Google Forms and tabulated accordingly, was organized not only by institutional group but also across five questionnaire groups, following the construction of multiple statement items representing each subdimension of the BIMAS readiness framework. In line with the framework's non-weighted assessment logic, all dimensions were treated as equally important, and readiness was evaluated using a qualitative degree of digitalization implementation practices adapted from Isomar Lima's CMMI-based maturity assessment approach. Specifically, implementation levels were captured using ordered qualitative categories—Fully Performs (FP), Largely Performs (LP), Partially Performs (PP), Does Not Perform (DNP), and Not Applicable (NP)—which were systematically translated into numerical degrees of practical implementation (4, 3, 2, 1, and 0, respectively). This dual qualitative–quantitative mechanism enables a consistent, maturity-oriented evaluation of DR across dimensions and institutional types. For each institution, a dimension-level readiness index was calculated by averaging the numerical scores of all items within the corresponding dimension.

$$\text{Dimension Readiness Index}_d = \sum_{i=1}^{n_d} x_i \quad (1)$$

The overall Digital Readiness Index (DRI) for each institution was computed as the arithmetic mean of all dimension-level readiness indices, consistent with the non-weighted design of the BIMAS framework.

$$DRI_{Institution} = \frac{\sum_{d=1}^D Dimension\ Readiness\ Index_d}{D} \quad (2)$$

TABLE II
 PROPOSED READINESS INDEX CLASSIFICATION

Readiness Level	Category	Index Range
Level 1	Immature	0.00 – 0.99
Level 2	Unstructured	1.00 – 1.99
Level 3	Structured	2.00 – 2.99
Level 4	Advanced	3.00 – 4.00

After calculating the Digital Readiness Index (DRI) in Table II for readiness levels were classified into four categories adapted from the maturity logic proposed by Rui Pedro Silva. Since the BIMAS framework uses a non-weighted scoring scheme with a 0–4 numerical scale derived from qualitative implementation levels, the index ranges from 0.00 to 4.00. An equal-interval classification was applied to ensure clarity and consistency. Accordingly, index values of 0.00–0.99 indicate an Immature level, 1.00–1.99 an Unstructured level, 2.00–2.99 a Structured level, and 3.00–4.00 an Advanced level, reflecting progressively higher degrees of institutional DR.

F. Operationalization of Digital Readiness and Maturity

While DR and DM are conceptually distinct, this study operationalizes the distinction through a clear separation between measurement and interpretive logic. Digital readiness is empirically modeled as a latent construct reflecting institutional preparedness, capacities, and enabling conditions across the BIMAS dimensions, which are directly captured through the measurement indicators. In contrast, DM is not treated as an independent construct within the measurement model, but rather as an evaluative and interpretive framework that informs how readiness levels are systematically assessed and contextualized. This approach is aligned with maturity-oriented logic, such as staged and cumulative assessment models, in which readiness indicators serve as foundational inputs for maturity interpretation. Accordingly, the measurement model focuses explicitly on readiness, while maturity is analytically employed to interpret the developmental positioning and progression implied by the observed readiness levels.

G. Ethical Approval and Data Protection

This study was conducted in accordance with established ethical research principles. Prior to data collection, informed consent was obtained from all participants, who were clearly informed about the purpose of the study, the voluntary nature of their participation, and their right to withdraw at any time without consequence. No personally identifiable information was collected, and all responses were treated with strict confidentiality. The data were anonymized and securely stored, and access was restricted solely to the research team. Given the non-invasive nature of the study and its focus on institutional readiness assessment, formal ethical clearance was not required under the applicable institutional research guidelines.

H. Hypothesis Proposition in Measurement Framework

Fig. 3 presents a conceptually integrated hypothesis framework for the DRA analysis in IHEIs. The model systematically and explicitly posits that BM, IT, MO, AC, as well as SE exert direct and substantively interrelated influences on institutional digital readiness. Accordingly, this framework provides a theoretically grounded and analytically robust basis for empirically examining the multidimensional determinants of DR across IHEIs.

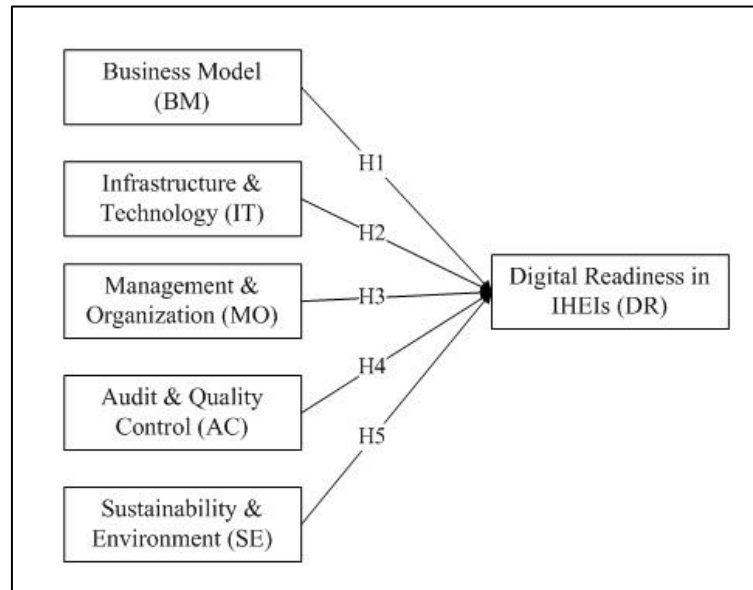


Fig. 3. Hypothesis For Readiness Assessment Analysis

Furthermore, Fig. 3 contextualizes the proposed analytical logic by illustrating how DR in IHEIs is conceptualized as a multidimensional and systematically constructed outcome. The framework delineates that institutional readiness is shaped by interdependent organizational and technological domains, namely Business Model, Infrastructure and Technology, Management and Organization, Audit and Quality Control, and Sustainability and Environment, each of which is hypothesized to exert a direct and meaningful influence on digital readiness. What this model explicitly emphasizes is that DR should be understood not merely as a technical condition but as an integrative institutional capability that emerges from coherently aligned strategic, managerial, governance, and sustainability-oriented practices.

IV. RESULTS AND DISCUSSION

The findings provide a comprehensive and empirically grounded assessment of digital readiness in IHEIs using the BIMAS framework. The results reveal uneven maturity across BIMAS dimensions and notable variation among institutions, indicating context-specific readiness trajectories. Quantitative analyses confirm the validity, reliability, and explanatory power of the model, with statistically significant structural relationships and no critical multicollinearity issues, thereby affirming the methodological robustness of the assessment.

A. Participation student rate in assessment

The demographic composition reported in Table III suggests that the empirical findings primarily reflect students' perceptions of DR within IHEIs, as conceptualized through the BIMAS framework. Importantly, the participation of 548 students drawn from multiple regions—namely Sumatra, Java, Kalimantan, Maluku, and Papua—indicates that the findings capture perspectives across geographically and institutionally diverse Islamic higher education contexts. This geographic dispersion implies that the results are not confined to a single regional setting, but instead reflect broader structural and operational conditions influencing DR across IHEIs. Moreover, the inclusion of both undergraduate and postgraduate cohorts suggests that the observed perceptions encompass varying levels of academic exposure and digital engagement. From an institutional perspective, the predominance of public IHEIs highlights that the implications of this study are particularly salient for publicly governed IHEIs, where coordinated digital strategies, governance alignment, and student-centered digital services are essential. Consequently, the findings underscore the importance of adopting an integrated BIMAS-oriented approach that is responsive to regional diversity while remaining attentive to the structural realities of IHEIs.

TABLE III
 STUDENT PARTICIPATION DEMOGRAPHICS ACROSS REGIONS AND NATIONALLY

Characteristic	Category	n	%
Gender	Male	231	42
	Female	317	58
Age	≤ 20 years	34	6
	21–23 years	360	66
	24–26 years	109	20
	≥ 27 years	45	8
Education Degree	Diploma	23	4
	Bachelor	410	75
	Master	103	19
	Doctorate	12	2
Program of Study	Religion and education	145	26
	Social Science	109	20
	Business and economics	157	29
	Science and Engineering	129	24
	Language and Legal Studies	8	1
Type of Institution	Public	525	96
	Private	23	4

When these findings are considered collectively, the table supports the inference that the obtained response rates are sufficiently robust and reliable to underpin subsequent analyses of DR, especially because the widespread geographic coverage and consistently elevated participation levels enhance the empirical credibility of the results.

B. Description of digital readiness rankings based on five key dimensions (BIMAS)

The Fig. 4 provides a critical and comparative depiction of the overall DR levels across all BIMAS dimensions in IHEIs, revealing uneven performance patterns that merit analytical scrutiny. Comparatively, the Business Model dimension demonstrates a relatively strong tendency toward full performance, while simultaneously exhibiting a notably high score in the “does not perform” category, which suggests that although some institutions have strategically institutionalized digital models, others remain structurally underdeveloped, particularly when organizational digital vision has not been coherently embedded. In contrast, the Infrastructure and Technology dimension shows a more balanced distribution across performance levels, indicating that, although technological facilities are moderately established in many institutions, their utilization and integration are not yet consistently optimized.

Critically, the Management and Organization dimension reflects a predominantly partial-to-moderate readiness profile, which implies that managerial capacity and organizational alignment lag behind technological adoption, especially when leadership commitment and change management mechanisms are insufficiently consolidated. Meanwhile, the Audit and Quality Control dimension comparatively exhibits higher scores in full and largely performs categories, suggesting that governance-oriented processes tend to be more systematically institutionalized, particularly because regulatory compliance and quality assurance are externally reinforced

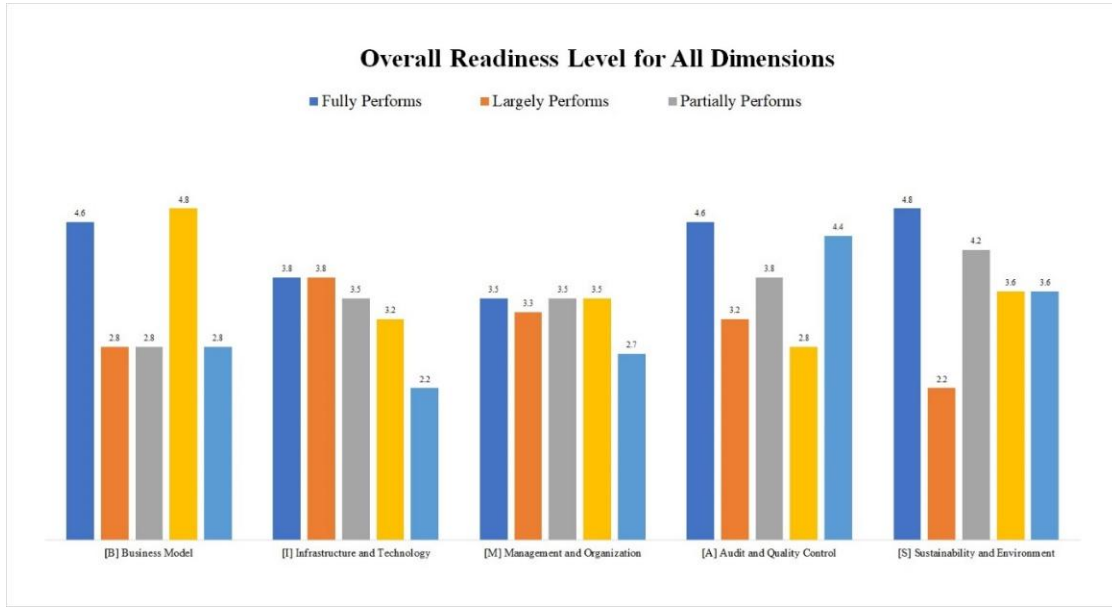


Fig. 4. Overall readiness level for all dimensions

Finally, the Sustainability and Environment dimension reveals a polarized pattern, where strong full performance coexists with relatively low large-scale adoption, indicating that long-term digital sustainability remains contingent upon institutional prioritization. Collectively, these comparative findings substantiate the inference that DR in IHEIs is not a linear construct but rather a differentiated condition, wherein strategic, managerial, and sustainability-oriented dimensions advance at varying paces depending on contextual and institutional determinants.

C. Description of digital readiness rankings based on institutional participation of IHEIs

To contextualize the institutional-level analysis, this section presents a comparative profile of DR across participating IHEIs, which illustrates how varying readiness levels emerge when institutional performance is benchmarked against an ideal reference. This visualization enables an integrated interpretation of current capability gaps and aspirational targets within the proposed BIMAS framework.

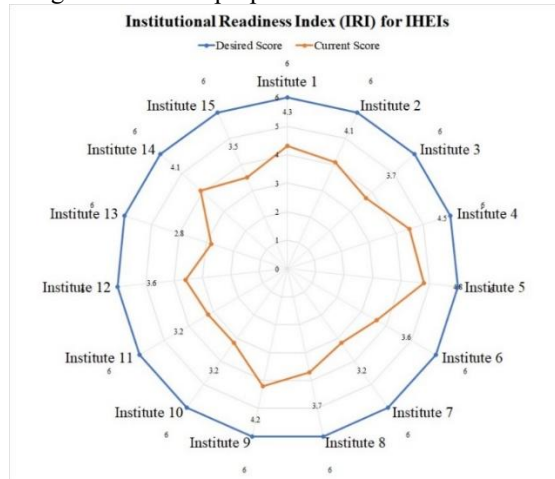


Fig. 5. The Profile of Institutional Readiness in IHEIs

As illustrated in Fig. 5. The Profile of Institutional Readiness in IHEIs, the radar chart contrasts the current readiness scores of each institute with a uniform desired score, thereby revealing both absolute performance levels and relative disparities among institutions. While several IHEIs approach the desired benchmark in

selected dimensions, most institutions exhibit consistently lower current scores, indicating that DR remains unevenly developed across the sample. The observable gaps between the desired and current scores suggest that, although foundational digital initiatives are in place, systematic and institution-wide integration has not yet been fully achieved.

D. Quantitative Analysis

1) *Validity and reliability evaluation*

Measurement validity and reliability in Table IV were evaluated using established criteria in structural equation modeling. Indicator reliability was assessed through factor loadings, where standardized loadings of 0.70 or higher indicate strong representation of the latent construct, while values above 0.60 remain acceptable in exploratory or context-specific research. Internal consistency reliability was examined using Cronbach’s alpha and composite reliability (CR), with threshold values of 0.70 or above indicating satisfactory reliability. Convergent validity was further assessed using the average variance extracted (AVE), where values equal to or exceeding 0.50 demonstrate that a construct explains more than half of the variance of its indicators, thereby confirming adequate convergent validity. These criteria are widely adopted in SEM-based measurement model evaluation.

TABLE IV
 VALIDITY AND RELIABILITY MEASUREMENT

Construct	Item	Factor Loading	Cronbach’s α	CR	AVE
Business Model	BM1	0.73	0.94	0.65	0.77
	BM2	0.68	0.95	0.64	0.83
	BM3	0.83	0.88	0.96	0.88
	BM4	0.95	0.98	0.67	0.86
	BM5	0.96	0.67	0.94	0.93
Infrastructure and Technology	IT1	0.76	0.78	0.96	0.88
	IT2	0.77	0.87	0.67	0.96
	IT3	0.96	0.85	0.88	0.88
	IT4	0.73	0.64	0.76	0.68
	IT5	0.96	0.93	0.93	0.68
Management and Organization	MO1	0.77	0.73	0.68	0.78
	MO2	0.85	0.75	0.78	0.75
	MO3	0.83	0.68	0.67	0.68
	MO4	0.67	0.77	0.76	0.96
	MO5	0.95	0.86	0.66	0.78
Audit & Quality Control	AC1	0.97	0.97	0.78	0.76
	AC2	0.77	0.86	0.87	0.95
	AC3	0.74	0.85	0.96	0.68
	AC4	0.84	0.84	0.74	0.84
	AC5	0.68	0.78	0.84	0.95
Sustainability & Environment	SE1	0.85	0.66	0.75	0.96
	SE2	0.66	0.63	0.75	0.86
	SE3	0.67	0.87	0.83	0.77
	SE4	0.68	0.94	0.63	0.63
	SE5	0.78	0.88	0.94	0.83

2) *Structural Model Results*

The structural model was evaluated using multiple regression analysis to test the hypothesized relationships between the proposed constructs and DR. As shown in Table V, all path coefficients are positive and statistically significant, demonstrating a robust and empirically supported model. These findings confirm that the examined organizational dimensions exert substantive influences on DR.

TABLE V
STRUCTURAL MODEL RESULTS FOR REGRESSION

Hypothesis	Path	β	t-value	p-value	Result
H1	BM -> DR	0.64	4.12	0.014	Supported
H2	IT -> DR	0.88	4.45	0.026	Supported
H3	MO -> DR	0.45	3.08	0.043	Supported
H4	AC -> DR	0.63	6.12	0.038	Supported
H5	SE -> DR	0.78	5.92	<0.026	Supported

The structural model results were evaluated based on the magnitude and statistical significance of the estimated path coefficients, as summarized in Table V. Standardized β coefficients were interpreted to assess the direction and substantive strength of the relationships, where higher absolute values indicate more pronounced effects on DR. Hypotheses were considered supported when the corresponding t-values exceeded the critical threshold of 1.96, which reflects statistical significance at the 5% level, and when p-values were below 0.05, indicating a low probability that the observed effects occurred by chance. As reported in Table V, all hypothesized paths meet these criteria, demonstrating that the proposed organizational dimensions exert statistically significant and meaningful influences on DR.

As presented in Table V, the structural model results indicate that all examined organizational dimensions exert positive and statistically significant effects on DR. The standardized β coefficients are consistently moderate to strong in magnitude, suggesting substantively meaningful relationships, because higher β values reflect greater explanatory influence of each predictor on the dependent construct. The statistical robustness of these relationships is further reinforced by t-values exceeding the critical threshold of 1.96 and p-values remaining below 0.05, so that all hypothesized paths are empirically supported. Although the strength of the effects varies across constructs, the results collectively demonstrate that each organizational dimension contributes significantly to DR, thereby underscoring the practical relevance and theoretical robustness of the proposed structural model.

As shown in Table V, the comparative analysis of the structural paths indicates that Infrastructure and Technology exert the strongest influence on DR, as evidenced by the largest standardized β coefficient accompanied by a statistically significant t-value and p-value. This is followed by Business Model and Management and Organization, which demonstrate moderate yet significant effects. In contrast, Sustainability and Environment and Audit and Quality Control exhibit relatively smaller β coefficients, although their relationships remain statistically significant. Overall, this ordered comparison confirms that the predictors differ in magnitude of influence while consistently supporting the proposed structural model.

3) *Coefficient of Determination (R²)*

The explanatory power of the structural model was systematically assessed using the coefficient of determination (R²), which quantifies the proportion of variance in the endogenous construct explained by its predictors. As reported in Table VI, the R² and adjusted R² values indicate a substantial level of explanatory capability, demonstrating that the proposed model performs robustly in accounting for variations in DR. This assessment provides an essential complement to the path analysis by evaluating how effectively the collective predictors explain the dependent construct.

TABLE VI
COEFFICIENT OF DETERMINATION (R²)

Endogenous Variable	R ²	Adjusted R ²	Interpretation
Digital Readiness	0.79	0.76	Substantial

As shown in Table VI, the coefficient of determination (R^2) indicates that the structural model exhibits substantial explanatory power, which demonstrates that a considerable proportion of variance in DR is accounted for by the proposed organizational dimensions. The reported R^2 value exceeds established threshold levels for substantial explanatory capability, suggesting that the model is theoretically robust and empirically well grounded. The consistently high adjusted R^2 , which controls for model complexity, further confirms that the explanatory strength is not artificially inflated. From a theoretical perspective, these findings imply that DR can be meaningfully conceptualized as a multidimensional construct shaped by interrelated organizational factors, thereby reinforcing and extending existing theoretical frameworks in the DR literature.

4) *Collinearity Test*

Collinearity assessment was conducted to ensure that the structural model is statistically sound and free from excessive overlap among the predictor constructs. This diagnostic procedure is essential because high levels of collinearity can adversely distort parameter estimates and weaken the interpretability of regression-based results. As reported in Table VII, the collinearity evaluation provides additional assurance that the estimated structural relationships are stable and reliably estimated. Consequently, this assessment strengthens the credibility of the structural model by confirming that the observed effects are not spuriously driven by redundant explanatory information.

TABLE VII
 COLLINEARITY TEST (VIF)

Path	f ²	Effect Size
BM -> DR	0.18	Medium
IT -> DR	0.36	Large
MO -> DR	0.16	Medium
AC -> DR	0.51	Large
SE -> DR	0.45	Large

As reported in Table VII, the collinearity assessment demonstrates that the predictor constructs exhibit acceptably low levels of multicollinearity, which confirms that each construct contributes a conceptually distinct explanation to DR. Because all variance inflation factors (VIF) values remain below established threshold levels, the structural relationships can be interpreted with confidence, as the estimated effects are not distorted by excessive overlap among predictors. Although some constructs display comparatively higher collinearity than others, these values are still substantially lower than critical cut-off points, indicating that the theoretical domains represented in the model are more clearly differentiated than conflated. From a theoretical standpoint, these findings reinforce the validity of conceptualizing DR as a multidimensional phenomenon, in which organizational dimensions exert independent yet complementary influences rather than redundant effects.

E. *Theoretical Positioning of BIMAS in Relation to Established Digital Readiness Frameworks*

A critical comparison with established digital readiness frameworks further clarifies the analytical positioning of BIMAS. Unlike the Technology–Organization–Environment (TOE) framework, which primarily conceptualizes readiness through broad organizational and environmental contingencies that emphasize contextual determinants rather than evaluative governance mechanisms), BIMAS explicitly incorporates audit, governance, and sustainability dimensions as analytically independent components. In contrast to the Capability Maturity Model Integration (CMMI), which operationalizes readiness through a hierarchical and cumulative process-maturity logic which assumes linear progression across predefined levels, BIMAS adopts a more context-sensitive and value-oriented assessment approach because institutional readiness does not necessarily evolve in uniform or sequential patterns. Similarly, when compared with DigComp, which focuses predominantly on individual digital competencies and skills development that are largely situated at the micro or human-capital level, BIMAS extends the analytical scope toward institutional and governance readiness. Although BIMAS does not seek to replace these established frameworks, it occupies a complementary position when readiness assessment requires alignment between organizational values, governance logic, and long-term sustainability, thereby offering a nuanced lens for examining DR in value-driven higher education contexts.

V. CONCLUSION

This study concludes that DR in IHEIs remains a multidimensional and uneven institutional condition, despite observable progress in several strategic areas. Empirically, the BIMAS-based assessment demonstrates that the Business Model, Infrastructure and Technology, and Audit and Quality Control dimensions have developed at a relatively more advanced pace, indicating that technological provision and governance mechanisms are increasingly consolidated. However, the declining pattern observed in the Management and Organization dimension underscores a critical structural imbalance, particularly because managerial alignment and organizational capacity constitute determining factors for sustainable DT. These findings suggest that digital advancement driven primarily by technology and procedural compliance is insufficient when not accompanied by a strengthening integration of leadership, organizational readiness, and change management.

From an implication perspective, the study contributes theoretically by reinforcing the proposition that dr should be conceptualized as an evolving institutional ecosystem rather than a purely technological construct. Practically, the findings imply that policymakers and institutional leaders should prioritize the developing alignment of managerial capacity, governance structures, and sustainability-oriented strategies in order to mitigate readiness disparities across dimensions. For future research, longitudinal and mixed-method studies are recommended to capture dynamic readiness trajectories and to enhance causal explanation, while cross-national validation of the BIMAS framework would enable broader comparative insights. Collectively, these directions highlight that advancing DRA requires not only refined analytical frameworks but also sustaining commitment to organizational and managerial transformation.

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