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Digital quality indicators in higher education: A comparative web analysis of universities in Türkiye's lakes region using the DQTM-6 model

Yükseköğretimde dijital kalite göstergeleri: DQTM-6 modeli ile Türkiye göller bölgesi üniversitelerinin karşılaştırmalı web analizi

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Abstract

This study comparatively analyzes the institutional websites of state universities located in Türkiye's Lakes Region from the perspectives of quality assurance, governance, and digital accountability. Within the scope of the research, an original framework titled DQTM-6 (Digital Quality and Transparency Maturity Model) was developed to measure how institutional quality is produced and represented in the digital environment. Comprising six theoretical dimensions and sixty strategic criteria, the model goes beyond the mere presence of information and systematically evaluates its accessibility, timeliness, and content depth through structured filtering mechanisms. Based entirely on observable and verifiable indicators, DQTM-6 offers a systematic digital quality audit approach. The findings reveal a significant level of digital convergence in relatively static areas such as academic information and research outputs, while identifying structural vulnerabilities in dynamic governance domains, including evidence of the PDCA cycle, traceability of stakeholder engagement, and international digital synchronization. The study conceptualizes institutional websites as digital governance representations of quality culture and proposes an applicable and comparable model for assessing digital quality in higher education institutions.

Keywords: *Higher education quality assurance, indicator-based evaluation, digital quality communication, institutional digital maturity, DQTM-6 model*

Jel Codes: *I23, M14, O33*

Öz

Bu çalışma, Türkiye Göller Bölgesi'ndeki devlet üniversitelerinin kurumsal web sitelerini kalite güvencesi, yönetişim ve dijital hesap verebilirlik perspektifinden karşılaştırmalı olarak analiz etmektedir. Araştırma kapsamında, kurumsal kalitenin dijital ortamda nasıl üretildiğini ve temsil edildiğini ölçmek amacıyla özgün bir çerçeve olarak DQTM-6 (Dijital Kalite ve Şeffaflık Olgunluk Modeli) geliştirilmiştir. Altı kuramsal boyut ve altmış stratejik kriterden oluşan bu model; bilginin yalnızca varlığını değil, erişilebilirliğini, güncelliğini ve içerik derinliğini sistematik filtreler aracılığıyla test eden gözlemlenebilir göstergelere dayalı bir dijital kalite denetimi yaklaşımı sunmaktadır. Bulgular, üniversitelerin akademik ve Ar-Ge bilgilendirmesinde dijital yakınsama sergilediğini; buna karşılık PUKÖ döngüsünün kanıtlanması, paydaş katılımının izlenebilirliği ve uluslararası dijital senkronizasyon gibi dinamik yönetişim alanlarında yapısal kırılganlıklar bulunduğunu ortaya koymaktadır. Çalışma, kurumsal web sitelerini kalite kültürünün dijital yönetişimsel temsili olarak konumlandırmakta ve yükseköğretim kurumları için uygulanabilir ve karşılaştırılabilir bir dijital kalite değerlendirme modeli önermektedir.

Anahtar Kelimeler: *Yükseköğretimde kalite güvencesi, gösterge temelli değerlendirme, dijital kalite iletişimi, kurumsal dijital olgunluk, DQTM-6 modeli*

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Introduction

Quality assurance in higher education is increasingly conceptualized not as a one-dimensional measurement or control mechanism, but as a multi-layered governance domain integrated with the principles of institutional governance, transparency, and accountability. In the literature, quality has been defined through multiple perspectives—such as excellence, fitness for purpose, and transformation (Harvey & Green, 1993)—and the digital manifestations of these perspectives have now become a core component of institutional accountability. Within the European Higher Education Area, the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG) define quality assurance as a governance-oriented approach that renders institutions' responsibilities toward their stakeholders visible and is grounded in continuous improvement (ESG, 2015).

With the growing prevalence of audit society practices (Power, 1997; Strathern, 2000), universities are no longer expected merely to implement quality processes, but also to verify these processes through evidence and to present them transparently in the public domain (Dahler-Larsen, 2011). As a result of digitalization, universities' governance structures, quality assurance practices, and approaches to stakeholder engagement are increasingly represented through their institutional websites. In this context, websites function not only as technical platforms for information dissemination, but also as key digital arenas in which institutional identity, quality orientations, and reputational claims related to transparency are constructed (Harvey & Stensaker 2008; Wæraas & Solbakk, 2009)

Despite this growing significance, the literature lacks a clear methodological consensus on how university websites should be evaluated in a systematic, comparable, and normatively coherent manner from a quality assurance and institutional governance perspective. A substantial proportion of existing studies focus on digital presence in terms of content density, technical design features, or accessibility criteria, while integrative evaluation models grounded in normative frameworks such as quality assurance, accountability, and stakeholder responsibility remain limited. This fragmentation makes it difficult to distinguish between areas in which universities achieve genuine transparency in digital environments and those in which they merely produce symbolic visibility.

This study considers institutional websites not just as technical instruments for assessing quality outputs, but as public digital representations of universities' philosophies regarding quality assurance, governance approaches, and responsibilities to stakeholders. Instead of relying on perception-based surveys or subjective evaluations, this study examines digital quality communication through indicator-based assessment grounded in established quality assurance standards and regulatory frameworks. Accordingly, institutional websites are treated as document-based public sources, and a document analysis approach is adopted (Bowen, 2009).

The indicator set employed in the study offers a deductive analytical approach, as it is grounded in predefined theoretical and normative frameworks, thereby enabling a comparative evaluation of universities' digital visibility of quality-related practices (Krippendorff, 2019). In this sense, the research shifts the analytical focus away from what universities do in relation to quality and toward how their quality understandings are made visible in the digital public sphere. In this study, digital quality is defined as the extent to which institutional quality assurance processes, governance structures, and stakeholder-oriented practices are made accessible, up-to-date, evidence-based, and transparently communicated through digital platforms.

The primary contribution of this study to the literature lies in its conceptualization of university websites not merely as informational tools, but as strategic communication spaces that reflect the digital projection of institutional quality culture. The remainder of the article is structured into six sections, covering the dimensions of digital quality communication, the analytical methodology, the

presentation and discussion of findings, and practice-oriented implications.

Literature review

This section outlines the approaches that constitute the conceptual foundation of the study within the higher education literature and builds the analytical framework of the research upon these foundations.

Quality Assurance, Governance, and Transparency in Higher Education

In contemporary higher education literature, quality assurance is no longer conceptualized merely as a technical mechanism for evaluating teaching practices. Rather, it is framed as an integral component of institutional governance, encompassing strategic management structures, decision-making processes, and stakeholder relationships (ESG, 2015). This perspective situates quality assurance within a broader framework of institutional responsibility and public accountability, contributing to the construction of organizational legitimacy (Suchman, 1995). Particularly in publicly funded systems, quality assurance plays a critical role in safeguarding academic standards and fostering public trust through transparent performance frameworks (OECD, 2019).

This transformation in higher education governance has gained momentum since the 1980s under the influence of the New Public Management paradigm (Hood, 1991). During this period, the role of the state shifted from direct control toward forms of "steering at a distance," giving rise to what Guy Neave (1998) conceptualized as the Evaluative State. Within this model, universities have been required to demonstrate their societal accountability through quality assurance and transparency mechanisms as a counterpart to their increasing institutional autonomy (Brennan & Shah, 2000). The balance between the state, the market, and the academic oligarchy articulated in Burton Clark's (1983) well-known "Triangle of Coordination" has, in contemporary contexts, been increasingly reconfigured in favor of digital transparency and quality standards.

Within the European Higher Education Area, the normative framework for quality assurance is defined by the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG), which conceptualize quality as a holistic governance process grounded in continuous improvement and open information sharing (ESG, 2015). The ESG framework emphasizes the accessibility and traceability of institutional quality policies and evaluation outcomes for external stakeholders as a core principle. The institutional governance literature similarly positions universities as complex, multi-stakeholder organizations and identifies transparency as a key determinant of institutional trust and sustainability. The clear and comprehensible disclosure of information regarding governance structures and institutional performance is not merely a legal obligation, but a critical component in the construction of institutional legitimacy (Suchman, 1995). Universities are increasingly conceptualized as complex, multi-stakeholder governance systems (Shattock, 2010). In this context, transparency refers to the capacity of quality assurance systems to render their intentions and practices visible in the public domain (EUA, 2018a, 2018c).

The quality assurance system for higher education in Türkiye has grown within a centralized structure that is still in line with international standards. The Higher Education Quality Council of Türkiye (YÖKAK) administers the Institutional Accreditation Program (KAP), which simultaneously evaluates leadership, governance, education, research and development, as well as societal contributions (YÖKAK, 2023). KAP establishes a distinct link between quality assurance and public accountability by providing a framework of guidelines for the national integration of ESG principles. Empirical studies indicate that quality processes in Türkiye primarily emphasize adherence to regulations and reporting practices. In contrast, aspects related to communication, such as transparency and stake-

holder engagement, exhibit considerable variability across universities (Taşcı & Lapçın, 2023; ESG, 2015)

Within this framework, institutional websites constitute the primary public digital platforms through which universities represent their quality assurance approaches and accountability practices. The information on university websites shows not only that there are quality systems in place, but also how these systems are communicated to stakeholders and used in institutional communication. This study frames quality assurance, governance, and transparency as interrelated and supportive aspects, expressed through the notion of digital quality communication.

Digital Quality Communication in Higher Education

Digitalization has profoundly transformed not only the teaching, learning, and research processes of higher education institutions, but also their approaches to institutional governance, quality assurance systems, and modes of communication with stakeholders. Universities increasingly render their quality policies, strategic priorities, and evaluation processes visible through digital platforms. As a result, quality assurance has evolved from an inward-oriented "management practice" into a public "communication arena" in which social trust is constructed (Wæraas & Solbakk, 2009; Meijer, 2015).

In this study, the concept of digital quality communication is conceptualized at the intersection of quality assurance, digital governance, and institutional transparency, in a manner that allows for systematic analysis through university websites. This approach seeks to explain how universities construct and communicate their managerial priorities and understandings of public responsibility within digital environments. Rather than focusing on quality outcomes per se, digital quality communication emphasizes how processes, documents, and institutional commitments are structured and presented online. In this context, digital platforms are positioned as critical instruments that transform transparency into an organizational "culture," thereby strengthening anti-corruption efforts and democratic accountability mechanisms (Bertot, Jaeger, & Grimes, 2010).

Figure 1. Conceptual Map of Digital Quality Communication in Higher Education

Source: *Developed by the author based on the relevant literature.*

The digital governance literature increasingly points to the capacity of digital platforms to support, rather than automatically guarantee, transparency, accountability, and stakeholder participation within public institutions. Institutional websites, in particular, operate as the primary digital interfaces through which governance structures and performance-related information are made visible. In practice, they play a key role in the production of public value (Meijer, 2015; Manes Rossi et al., 2018).

Importantly, these websites should not be understood merely as technical repositories where documents are stored. Rather, they function as strategic communication spaces in which institutions actively frame their governance approaches and, to some extent, shape their organizational identities.

Research focusing specifically on higher education reinforces this view. University websites are widely recognized as essential instruments for institutional reputation building and for cultivating stakeholder trust over time (Wæraas & Solbakk, 2009; Meijer, 2015; Manes Rossi et al., 2018). From this perspective, the accessibility of information related to quality policies, strategic plans, and accreditation processes can be interpreted as a digital manifestation of the priority universities assign to quality assurance.

The digital representation of quality assurance makes visible the degree of alignment between

universities' *quality discourse* and their institutional practices. The systematic and accessible presentation of quality-related content signals that quality assurance is not merely a legal requirement, but has been internalized as an integral component of institutional governance and quality culture (Harvey & Stensaker, 2008).

Conversely, fragmented or outdated information may indicate that quality assurance is perceived primarily as a reactive and reporting-driven process. The literature conceptualizes institutional websites as public accountability arenas in which governance structures, performance information, and stakeholder responsibilities are digitally constructed and rendered visible (Meijer, 2015; Manes Rossi et al., 2018; OECD, 2020a). The integrated presentation of governance structures, research and development activities, internationalization strategies, and quality cycles on institutional websites serves as a key indicator of the institutionalization level of digital quality communication. Ultimately, digital quality communication functions as a symbolic bridge between universities' quality assurance narratives and their public responsibilities, contributing to the development of a sustainable transparency ecosystem in higher education (Westerheijden et al., 2007).

Institutional Websites as Public Documents and the Evaluation Approach

Institutional websites are widely used by higher education institutions as the main digital space through which governance structures, strategic priorities, and institutional practices are communicated to the public. What matters here is not simply the presence of information, but how institutions choose to organize, emphasize, and make this information visible.

Policy documents, strategic plans, and activity reports made publicly available online function not as neutral administrative records but as symbolic signals through which institutions construct and communicate legitimacy claims (Suchman, 1995; Wæraas & Solbakk, 2009). In this sense, institutional websites operate as digital arenas where governance intentions and quality commitments are actively framed and performed (Prior, 2003).

From a methodological standpoint, this perspective aligns closely with the qualitative research tradition of document analysis. Document analysis allows researchers to examine how organizations define priorities and construct meaning through officially produced texts. Scott (1990), for example, emphasizes that documents must be evaluated in terms of authenticity, credibility, representativeness, and meaning, drawing attention to their role in shaping social reality rather than merely reflecting it. Similarly, Bowen (2009) notes that document-based inquiry enables the study of managerial orientations without relying on direct observation, which is particularly relevant in institutional settings.

Following Prior's (2003) notion of "active documents," this study treats institutional websites not as passive containers of information, but as performative governance tools. In other words, websites are understood as spaces where institutional reality is actively constructed and where stakeholder perceptions are gradually shaped through repeated exposure to selected narratives and evidence.

The evaluation approach adopted in this research is structured around a deductive analytical logic grounded in predefined theoretical and normative frameworks. Rather than employing an exploratory strategy, the analysis is based on indicator sets derived from the quality assurance and digital transparency literature. As emphasized by Krippendorff (2019) and Neuendorf (2017), directed content analysis provides a high level of analytical consistency when assessing the extent to which specific concepts are represented within documents. This approach is particularly suitable for examining how normative standards—such as the ESG or YÖKAK criteria—are reflected in institutional documents in an objective and systematic manner (Mayring, 2014).

Within this framework, the study does not aim to rank universities according to performance scores, but rather to identify relative institutional

profiles of digital quality communication. Comparative profile analysis enables a contextual and descriptive examination rather than an absolute evaluation, thereby offering a learning-oriented and developmental perspective for institutions (EUA, 2018a, 2018b). Ultimately, this approach moves beyond perception-based measurements and provides a comprehensive framework that renders the structural and representational dimensions of digital quality communication in higher education visible through document-based evidence.

Methodology

This section presents in detail the methodological foundations, research design, data collection process, and analytical logic of the Digital Quality and Transparency Maturity Model (DQTM-6), which was developed to analyze the digital transparency and quality assurance performance of higher education institutions. Rather than relying on perception-based measurements or subjective assessments, the methodological approach of the study is grounded in the systematic examination of digital content publicly disclosed by universities, within a normative and structured analytical framework.

Accordingly, the research conceptualizes institutional websites as digital representations of universities' quality assurance understandings, governance practices, and levels of accountability toward stakeholders, and aims to analyze these representations in a comparative manner.

Research Design

The study adopts a qualitative-dominant, descriptive, and comparative research design. It is structured as a multiple case study based on the systematic examination of content presented on universities' public websites (Yin, 2017). Rather than producing a competitive ranking among institutions, this approach enables an analytical interpretation of structural patterns and variations that emerge in the context of digital quality communication.

In this study, institutional websites are conceptualized not merely as technical platforms for information dissemination, but as "frozen" digital representations of universities' quality assurance understandings, governance cultures, and public responsibilities. Accordingly, web content is treated as public documents with institutional documentary value, in line with the perspectives advanced by Prior (2003) and Scott (1990). From this perspective, documents are not neutral repositories of information but active constructors of institutional meaning and governance narratives (Bowen, 2009).The analytical focus extends beyond what institutions formally declare to examine the extent to which these declarations are made accessible, up to date, and substantively rich from the user's perspective.

The methodological framework of the study is constructed around a methodological triangulation approach in order to enhance data validity and analytical depth (Flick, 2018). This hybrid structure integrates document analysis, directed content analysis, and benchmarking-oriented comparative analysis techniques. By combining these approaches, the study moves beyond a purely descriptive web scan and offers a normatively grounded and comparable framework for digital quality assessment (Brennan & Shah, 2000; Harvey & Stensaker, 2008; Neuendorf, 2017).

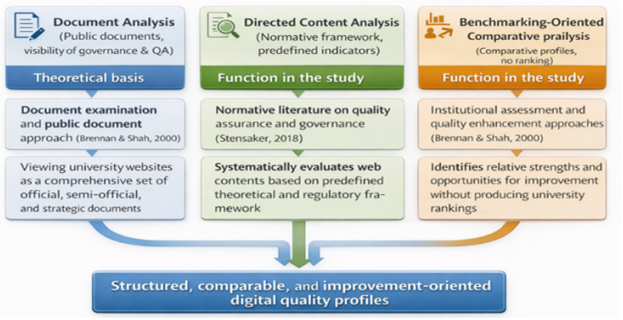

Figure 2. Hybrid Analytical Framework for Web-Based Quality Assessment

Source: *Developed by the author based on Flick (2018) and Brennan and Shah (2000).*

Figure 2 illustrates how the three methodological approaches used in this study come together

within a single analytical logic. Rather than operating as separate techniques, these approaches are deliberately combined to address different dimensions of digital quality in a coherent way.

At the core of this framework lies document analysis, which treats university websites as collections of public and strategically produced institutional documents. This is complemented by a directed content analysis, based on predefined indicators drawn from the quality assurance and governance literature, allowing the analysis to remain theoretically grounded rather than purely exploratory. Finally, a benchmarking-oriented comparative perspective is employed, not to generate institutional rankings, but to highlight relative strengths and development areas across cases.

Taken together, this integrated design makes it possible to move beyond a descriptive reading of web content. Instead, the analytical process supports the construction of structured, comparable, and explicitly improvement-oriented digital quality profiles, reflecting both institutional choices and underlying governance priorities.

Table 1. Components of the Hybrid Analytical Framework Used in the Study

Analytical Approach	Theoretical Foundation	Function in the Study	Contribution to the Analysis
Document Analysis	Institutional document analysis and public document approach (Brennan & Shah, 2000)	Conceptualizing university websites as collections of official, semi-official, and strategic institutional documents	Reveals the public visibility of institutional intentions, governance structures, and quality assurance priorities
Directed (Deductive) Content Analysis	Normative quality assurance and governance literature (Harvey & Stensaker, 2008)	Systematic evaluation of web content based on predefined theoretical and regulatory frameworks	Ensures that the analysis moves beyond interpretation and becomes structured and comparable
Benchmarking-Oriented Comparative Analysis	Institutional evaluation and quality development approaches (Brennan & Shah, 2000)	Identifying relative strengths and areas for improvement across universities without producing rankings	Provides an analytical basis oriented toward improvement and policy development rather than competitive performance measurement

Table 1 outlines the analytical architecture of the hybrid framework adopted in this study by mapping its main components onto their theoretical and functional roles. The table does not merely list methodological techniques; instead, it shows how document analysis, directed content analysis, and benchmarking-oriented comparison are combined to address different but interrelated dimensions of digital quality.

By bringing these approaches together, the framework establishes a shared evaluative logic through which institutional digital practices can be examined in a structured and comparable manner. This design is particularly important for the DQTM-6 model, as it anchors comparison in normative governance principles rather than treating digital quality as a purely technical or score-based outcome.

Research Scope, Sample, and Ethical Considerations

The scope of the study comprises the main institutional websites of five (5) public universities located in Türkiye's Lakes Region, which display heterogeneity in terms of institutional scale, year of establishment, and academic structure. The analysis covers universities' main webpages and their associated subpages related to quality assurance, governance, teaching and learning, research, student services, internationalization, and sustainability. Faculty- or unit-level micro webpages were included in the analysis only insofar as they directly referenced content provided at the institutional level.

The sample was selected using purposive sampling, not with the aim of statistical generalization, but to construct a context suitable for the comparative examination of digital quality communication practices (Patton, 2014; Palinkas et al., 2015). The regional focus enables the analysis of institutional differences among universities operating under relatively similar socio-economic and environmental conditions, thereby allowing contextual variables to be comparatively controlled.

The research adopts a cross-sectional design, conducted within a defined time frame. During the evaluation process, only content directly published

by the universities and publicly accessible on their official websites was considered. Third-party platforms, media coverage, and external institutional links were excluded from the analysis. This methodological choice was made in order to attribute evaluative responsibility directly to the institutions themselves.

In line with research ethics and principles of institutional neutrality, the names of the universities were not disclosed; instead, institutions were coded as University A–E throughout the analysis. This approach aims to shift the focus of the study away from producing performance rankings and toward examining the structural and content-related characteristics of digital quality communication. Furthermore, as the study is limited to publicly available content, the findings are not intended to be directly generalized to the entire higher education system; rather, the study offers a contextual and analytical model for understanding digital quality communication in higher education (Creswell & Poth, 2018).

Development of the Indicator Set: Digital Quality and Transparency Model in Higher Education (DQTM-6)

In this study, an original analytical framework titled the Digital Quality and Transparency Model in Higher Education (DQTM-6) was developed in order to assess universities' digital quality and transparency performance through their institutional websites. The construction of the model is based on a holistic synthesis of universal quality standards in higher education, national regulatory frameworks, and the digital governance literature.

The theoretical backbone of the model was established with reference to the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG, 2015), the Institutional Accreditation Program (KAP) framework of the Higher Education Quality Council of Türkiye (YÖKAK, 2023), and international digital governance principles emphasizing transparency and accountability in public institutions (OECD, 2020a). The DQTM-6 model conceptualizes institutional quality not merely as a documentation-based output, but as a dynamic ecosystem nourished by transparency, accountability, and stakeholder engagement.

Table 2. Theoretical Structure of the Digital Quality and Transparency Model in Higher Education (DQTM-6)

Main Theoretical Dimension	Theoretical Logic and Measurement Focus	Theoretical / Regulatory Basis
1. Institutional Governance, Transparency, and Accountability	Assesses the extent to which universities present their governance bodies, decision-making mechanisms, and use of financial resources in the public domain in accordance with the principles of open data. It measures the digital representation of institutional integrity and accountability.	ESG (2015); Shattock (2010); YÖKAK (2023); OECD (2019)
2. Quality Assurance and Continuous Improvement (PDCA)	Examines whether quality processes are presented not merely as documentation, but as a living culture embedded within the Plan–Do–Check–Act (PDCA) cycle. The focus is on the digital visibility of improvement-related evidence.	Harvey & Green (1993); Deming (1986); YÖKAK (2023)
3. Teaching and Learning and the Digital Learning Ecosystem	Measures the extent to which program competencies, course syllabi, and digital learning resources are made accessible and transparent for all stakeholders, in line with student-centered learning principles.	ESG (2015); EUA (2018b)
4. Stakeholder Engagement, Alumni Relations, and Career Management	Represents the interactive feedback mechanisms through which universities move beyond being "closed boxes" and engage with students, alumni, and employers. The focus is on participatory governance and lifelong career support.	ESG (2015); EUA (2018c); Meijer (2015)
5. Internationalization, Digital Accessibility, and Inclusiveness	Evaluates the capacity to provide information in line with global standards (multilingual content) and to ensure technical and content-level accessibility for all users, including individuals with disabilities, in accordance with WCAG 2.1 principles.	OECD (2020); W3C, 2018; García-Sánchez et al. (2011); UNESCO (2021)
6. Research and Development, Societal Contribution, and Sustainability	Examines digital evidence related to universities' knowledge production capacity (R&D), their tangible contributions to regional development (Lakes Region), and sustainability strategies aligned with the UN Sustainable Development Goals (SDGs).	Brennan & Shah (2000); OECD (2019); United Nations (2015)

The model consists of six main theoretical dimensions, each representing a distinct aspect of quality in higher education, and sixty operational criteria that render these dimensions analytically measurable. The full set of indicators, including their operational definitions and three-level evaluation logic (0–1–2), is presented in Appendix A, thereby enhancing methodological transparency and ensuring the replicability of the DQTM-6

framework. The underlying logic and focal points guiding the selection of these dimensions are detailed in Table 2.

The developed indicator set evaluates information presented on university websites beyond a simple presence/absence dichotomy, using a three-point rubric (0–1–2) based on the accessibility, currency, and evidence-based quality of the information. This structure enables a comparative analysis of universities' levels of digital maturity both at the dimensional level and through an overall composite index score.

Data Collection and Analysis Procedure

In this study, data were collected from the official institutional websites of five public universities located in Türkiye's Lakes Region. Given the dynamic nature of digital content, the data collection process was conducted within a fixed time window between 15 and 30 January, in order to control for potential temporal changes in website content. The study employed a comparative content analysis approach based on document analysis techniques. For reasons of analytical neutrality and to avoid performance-based comparisons between identifiable institutions, all universities included in the study were anonymized and coded as University A–E throughout the analysis.

During the data collection phase, the DQTM-6 indicator set, detailed in the previous section, was used as a structured observation form. Each university website was systematically examined against 60 sub-criteria organized under six main theoretical dimensions. To minimize researcher subjectivity and ensure objectivity in scoring, a three-point rubric (0–1–2) was applied. Accordingly, scoring was based not only on the presence of information on the website, but also on (i) the currency of the content (updated within the last two years), (ii) its evidence-based nature (supported by reports, statistics, or official documents), and (iii) its accessibility through a user-friendly interface (reachable within a maximum of three clicks from the homepage).

To enhance objectivity and reliability, scoring across the 60 criteria was conducted simultaneously by two independent observers. Inter-rater reliability was statistically tested using Cohen's Kappa coefficient, yielding a value of

$$\kappa = 0.86 (p < .001).$$

According to the reliability classification proposed by Landis and Koch (1977), this coefficient indicates an "almost perfect" level of agreement between observers, demonstrating that the DQTM-6 measurement instrument possesses a high capacity for objective evaluation.

Table 3. Dimension-Based Inter-Rater Reliability (Cohen's Kappa) Results

Dimension	Level of Agreement	Kappa (κ)	Analytical Interpretation
1. Institutional Governance & Transparency	Very High	0.94	The indicators in this dimension are largely document-based and verifiable (e.g., strategic plans, organizational charts, regulations). Only minor differences emerged due to variations in assessing content scope and timeliness.
2. Quality Assurance & Continuous Improvement	Moderate-High	0.78	This dimension represents the most interpretative part of the model. Particularly, PDCA evidence (2.5) and stakeholder analysis (2.7) led to divergence, as evaluators differed in distinguishing between the existence of evidence and its quality and measurability.
3. Teaching & Digital Learning Ecosystem	Very High	0.92	Indicators are predominantly based on availability and accessibility, resulting in high agreement. Minor discrepancies arose from differences in evaluating the depth and comprehensiveness of content across institutions.
4. Stakeholder Engagement & Alumni Relations	High	0.86	Divergence in this dimension is mainly associated with graduate employment data (4.5). The distinction between general statements and analytical, sector-specific data contributed to slight variations in scoring.
5. Internationalization & Accessibility	High	0.83	Technical indicators, particularly WCAG compliance (5.6), posed challenges in evaluation. Differences in technical expertise among evaluators resulted in minor inconsistencies.
6. Academic Performance & Sustainability	High	0.85	The key source of variation in this dimension is the interpretation of sustainability data (6.4). The distinction between certified/validated data and general institutional statements led to limited differences in scoring.

In addition to the overall reliability score, dimension-specific Kappa coefficients were calculated in order to assess the consistency of scoring across the six dimensions of the DQTM-6 framework. The results reveal consistently high levels of agreement, with minor variations reflecting the degree of interpretative complexity associated with each dimension.

As shown in Table 3, the highest levels of agreement were observed in dimensions characterized by objective, document-based indicators, such as Institutional Governance and Transparency (κ = 0.94) and Teaching and Learning (κ = 0.92). By contrast, relatively lower—yet still high—agreement levels were found in dimensions requiring interpretative judgment, particularly in relation to PDCA evidence, stakeholder engagement outcomes, and sustainability reporting. These findings confirm that the DQTM-6 model provides a robust and reliable measurement framework, while also highlighting that dimensions involving qualitative interpretation naturally introduce limited variability between evaluators.

The data obtained through the analysis were subsequently quantified and subjected to statistical procedures. In the first stage, raw scores for each university across the six dimensions were calculated. These scores were then converted into percentage values based on a maximum of 20 points per dimension (10 criteria × 2 points) and a total maximum score of 120 points (60 criteria × 2 points). Descriptive statistical techniques, including frequency (f) and percentage (%) distributions, were employed in the analysis of the data. To comparatively present universities' digital quality performance and visualize differences across institutional profiles, dimension-based radar (spider) charts and comparative bar charts were utilized. The resulting Digital Quality Index scores were interpreted to assess universities' levels of digital transparency and quality assurance maturity at the regional level.

Findings

What becomes visible in this section is not simply whether universities publish digital content, but how digital quality is actually constructed through their institutional websites. Using the DQTM-6 framework, the analysis deliberately moves away from the binary presence/absence logic common in higher education research and focuses instead on qualitative differences in information quality, accessibility, and sustainability. In doing so, digital quality is treated less as a checklist outcome and more as a layered governance practice that reflects institutional priorities and design choices.

Accordingly, universities' digital content was assessed not merely on the basis of whether a particular piece of information or document was available on the website, but also in terms of how quickly it could be accessed by users, the extent to which it was supported by evidence, how regularly it was updated, and how accessible it was for international stakeholders. This perspective conceptualizes digital quality not as a static documentation output, but as a dynamic, continuously updated, and stakeholder-oriented communication process.

Restrictive Digital Filters Applied in Data Analysis

In order to determine universities' levels of digital maturity in a more realistic and comparable manner, all indicators evaluated within the DQTM-6 model were subjected to four core digital filters. These filters ensure that scoring is conducted not only on a quantitative basis, but also with a strong emphasis on functionality and user experience.

(i) Navigational Speed Filter (Labyrinth Filter): The accessibility of a given piece of information or document within a maximum of three clicks from the homepage is regarded as a key indicator of digital transparency and user-friendly design. Accordingly, score reductions were applied to criteria for which the target document could only be reached through more than three clicks. This filter is de-

signed to measure not merely the existence of information, but the cost of access to that information from a user perspective. In this context, complex and multi-layered navigation structures—conceptually resembling a "labyrinth"—increase the cognitive and temporal cost of access, and are therefore evaluated within the scope of the Navigational Speed Filter.

(ii) Content Depth Filter: Content that is purely text-based, descriptive in nature, and lacks supporting evidence—such as data, statistics, visuals, or official reports—was considered insufficient in terms of content depth. Documents that remained at an informational level without producing concrete outputs were therefore not eligible for full scores. This filter evaluates universities' digital quality discourse within the framework of evidence-based transparency.

(iii) Chronological Currency (Fossil Content) Filter: Content published on university websites that did not include data or reports from 2024 onwards was downgraded by one score level, on the grounds that it failed to reflect the current state of institutional quality processes. This filter is intended to assess the continuity of quality assurance practices and the temporal sustainability of digital content.

(iv) International Synchronization (Ghost Page) Filter: Criteria were not scored in cases where English-language webpages were not synchronized with their Turkish counterparts, contained substantial empty sections, or were outdated. This approach conceptualizes internationalization not merely as the presence of an English-language menu, but in terms of equivalent content provision and effective accessibility for global stakeholders.

Taken together, these four filters demonstrate that the scoring system applied in this study is not simply a technical tool for producing numerical scores. Rather, it offers an analytical evaluation framework that reveals how universities represent quality in digital environments, what they choose to make visible, and which stakeholder groups they prioritize.

Institutional Digital Performance Profiles and Differential Analysis

Before presenting institution-specific digital profiles, it is important to acknowledge that several core digital components—such as Bologna information packages, learning management systems (LMS), AVESIS research platforms, and BAP project tracking systems—were consistently observed across all universities included in the sample. This pattern reflects a notable level of digital convergence in academic and operational domains, indicating that foundational digital infrastructures are broadly established across institutions. However, such convergence primarily characterizes the structural availability of digital systems rather than the depth, accessibility, and strategic use of information within these systems.

Building on this shared baseline, the restrictive filters applied within the DQTM-6 model did not merely generate differences in aggregate scores across universities' digital quality scorecards; they also revealed a form of structural differentiation rooted in institutions' digital governance capacities. This differentiation can be interpreted through the quality domains universities choose to make visible in digital environments, the stakeholder groups they prioritize, and the digital architectural logics through which information is presented.

Accordingly, the analysis presented in this section deliberately avoids a simple ranking-based approach and instead adopts a profile-oriented analytical perspective on universities' digital quality communication. In this context, radar (spider) charts visually illustrate the balance–imbalance relationships across the DQTM-6 dimensions for each institution, highlighting filter-induced score reductions and institution-specific digital reflexes.

- **U-A: A Profile of Regional Transparency and Stakeholder-Oriented Digital Agility**

Among the institutions examined, U-A exhibits the most integrated institutional profile in linking digital quality with societal contribution, stakeholder engagement, and public accountability. As illustrated in Figure 2, the institution demonstrates a relatively balanced distribution across all six dimensions, with particularly strong performance in Stakeholder and Alumni Relations (D4) and Research and Development and Sustainability (D6).

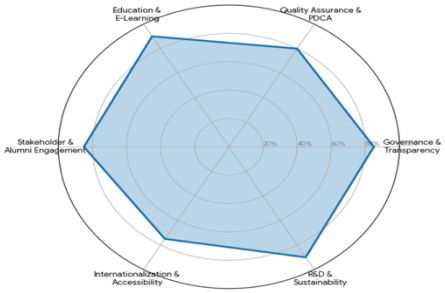

Figure 1. U-A DQTM-6 Digital Quality Index

Dimensional analysis further shows that Teaching and Learning (D3) and R&D/Sustainability (D6) approach the 90% level, while Governance and Transparency (D1) and Stakeholder Engagement (D4) remain consistently high (around 85%). This pattern reflects not only the visibility of core institutional functions in the digital space, but also their coherent and structured representation.

A distinguishing feature of U-A lies in its ability to support regionally oriented activities with concrete datasets and measurable outputs, particularly in projects related to livestock development and collaboration with local producers. This evidence-based approach enables the institution to avoid score reductions under the Content Depth Filter and positions its digital presence closer to an evidence-based governance model rather than a symbolic "digital showcase." By contrast, the Internationalization and Digital Accessibility (D5) dimension remains comparatively limited (approximately 75%). This is primarily associated with technical and structural constraints, including incomplete synchronization between Turkish and English content and limited direct access to up-to-date English catalogues. These issues resulted in score reductions under the International Synchronization and Navigational Speed Filters, indicating that global digital visibility remains underdeveloped despite strong domestic content quality.

The primary constraint affecting U-A's overall digital performance is navigational depth. Key documents such as strategic plans, quality reports, and evaluation materials require more than three clicks to access, leading to score reductions under the Navigational Speed Filter. This suggests that while content quality is high, critical information has not been sufficiently positioned within a user-centered digital architecture.

Overall, the observed imbalances do not indicate a structural weakness but rather a need for digital architectural optimization. Simplifying access pathways through homepage-level positioning of key elements—such as transparency panels or quality dashboards—would significantly enhance accessibility with minimal structural intervention, particularly in D1, D2, and D5.

- **U-B: A Digital Profile Oriented Toward Institutional Governance and Quality Standards**

U-B displays a digital profile in which quality is primarily structured around institutional governance, regulatory transparency, and compliance with quality assurance standards. As illustrated in Figure 3, the institution demonstrates relatively high and balanced performance in Governance and Transparency (D1), Quality Assurance and PDCA (D2), and Teaching and Learning (D3), while exhibiting a clear contraction in the Stakeholder and Alumni Relations (D4) dimension.

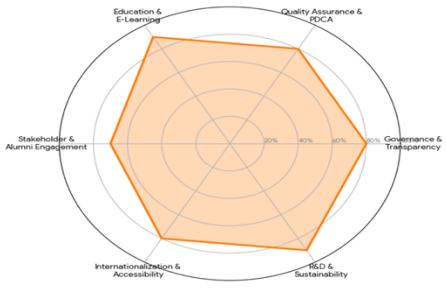

Figure 2. U-B DQTM-6 Digital Quality Index

Dimensional analysis shows that Teaching and Learning (D3) and R&D/Sustainability (D6) approach the 90% level, while D1 and D2 remain consistently strong at around 80%. This pattern reflects a digital architecture oriented toward regulatory compliance, structured reporting, and institutional accountability. The visibility of up-to-date self-evaluation reports (KİDR), accreditation records, and quality governance structures further supports this compliance-driven orientation.

The most pronounced limitation emerges in Stakeholder and Alumni Relations (D4), where performance remains at approximately 70%. This is not due to the absence of mechanisms, but to the limited availability of evidence-based, outcome-oriented data, such as alumni employment tracking, sectoral distribution, and measurable impact of stakeholder feedback. As a result, score reductions occur under the Content Depth Filter, indicating that stakeholder engagement remains insufficiently translated into analyzable digital outputs. A similar structural limitation is observed in the Internationalization and Digital Accessibility (D5) dimension (around 80%), where outdated English-language content and partial synchronization constrain global visibility, resulting in score reductions under the Chronological Currency and Navigational Speed Filters.

Overall, U-B's primary constraint lies not in content availability, but in the static nature of its digital representation. While the institution demonstrates a high level of organizational order and standardization, it remains limited in transforming this structure into dynamic, data-driven, and interaction-based digital governance.

From a policy perspective, strengthening U-B's digital profile requires the integration of live data dashboards, graduate employment indicators, and impact-oriented reporting mechanisms that make the feedback–action cycle visible. Such interventions would enable a transition from a compliance-oriented structure toward a more interactive and outcome-driven model of digital quality communication.

- **U-C: A Profile of Applied Education and Thematic Digital Specialization**

U-C exhibits a digital profile structured not around holistic institutional governance, but primarily along the axes of applied education, sectoral integration, and thematic specialization. As illustrated in Figure 4, the institution demonstrates strong expansion in Teaching and Learning (D3) and Research and Development and Sustainability (D6), alongside a pronounced contraction in Internationalization and Digital Accessibility (D5).

Figure 3. U-C DQTM-6 Digital Quality Index

With scores of 18/20 in both D3 and D6, U-C reflects a highly coherent digital architecture in which academic and applied outputs are effectively translated into the digital environment. This pattern indicates that the institution constructs its digital visibility primarily through pedagogical functionality and applied knowledge production, rather than through governance-oriented representation.

However, this strength is not equally extended across all dimensions. Governance and Transparency (D1) and Quality Assurance (D2) remain comparatively moderate (15/20 and 14/20), with limitations primarily related to access depth and content currency, resulting in score reductions under the Navigational Speed and Chronological Currency Filters. This suggests that, although a formal quality infrastructure exists, it is not sufficiently integrated into a user-centered digital architecture. A similar pattern emerges in Stakeholder and Alumni Relations (D4), where relatively strong operational engagement is not fully supported by data-driven monitoring and reporting mechanisms, leading to score reductions under the Content Depth Filter.

The most pronounced structural limitation is observed in the Internationalization and Digital Accessibility (D5) dimension. Outdated or incomplete English-language content, combined with limited accessibility and navigation challenges, results in substantial score losses, indicating that international digital visibility remains secondary to local and national priorities.

Overall, U-C demonstrates a digital quality profile that is strong in content production and thematic specialization, yet limited in terms of integration, institutional memory, and global visibility. This imbalance highlights a structural gap between applied academic strength and governance-oriented digital representation.

From a policy perspective, strengthening U-C's digital profile requires coordinated updating of English-language content, reducing access depth for key documents, and developing data-driven stakeholder and graduate tracking systems. Such interventions would enable the institution to extend its thematic strengths toward a more integrated and internationally visible digital governance model.

- **U-D: A Profile of Institutional Scale, Digital Inertia, and Fragmented Transparency**

U-D displays an institutional profile characterized by strong academic production capacity combined with limited digital agility. As illustrated in Figure 4, the institution demonstrates high performance in Teaching and Learning (D3) and Research and Development (D6), both approaching the 90% level. This indicates that core academic functions are effectively represented in the digital environment.

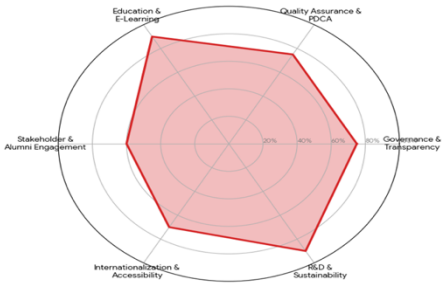

Figure 4. U-D DQTM-6 Digital Quality Index

However, this strength is not equally reflected in governance-related dimensions. Governance and Transparency (D1) and Quality Assurance (D2) remain comparatively moderate (around 75%), primarily due to access-related constraints. Although strategic documents and institutional records are publicly available, their accessibility is limited by deep and complex navigation structures, resulting in score reductions under the Navigational Speed Filter. This pattern suggests that transparency is achieved at the level of content production, but not at the level of user-oriented access.

The most pronounced limitation emerges in Stakeholder and Alumni Relations (D4), where performance remains at approximately 60%. Despite the formal presence of stakeholder mechanisms, the absence of evidence-based and publicly traceable outputs—such as graduate employment data and documented advisory board outcomes—leads to significant score reductions under the Content Depth Filter. This indicates a gap between institutional activity and its digital representation.

A similar structural constraint is observed in the Internationalization and Digital Accessibility (D5) dimension (around 70%), where outdated or unsynchronized English-language content limits global visibility. These issues, combined with navigational complexity, result in score reductions under the Chronological Currency and Navigational Speed Filters, suggesting that international digital strategy remains secondary.

Overall, U-D demonstrates a content-rich but access-limited digital profile, in which strong academic output is not fully integrated with governance transparency, stakeholder visibility, and user-centered design. Institutional scale and multi-layered organizational structures appear to generate digital inertia, constraining the institution's ability to translate its capacity into accessible and interactive digital governance.

From a policy perspective, improving U-D's digital performance requires simplifying access pathways, increasing the visibility of decision-making outputs, and developing data-driven stakeholder reporting systems. Such interventions would enable the institution to transform its digital profile

from a fragmented and inward-oriented structure into a more transparent and accessible governance model.

- **U-E: A Profile of Local Career Orientation and Digital Maturation in Progress**

U-E presents a digital profile characterized by strong local engagement and career-oriented functionality, while remaining in a maturing phase in terms of international visibility, stakeholder transparency, and data-driven governance. As illustrated in Figure 5, the institution demonstrates solid performance in Teaching and Learning (D3), reaching approximately 90%, indicating that core academic processes are managed in a stable and standards-compliant manner within digital environments.

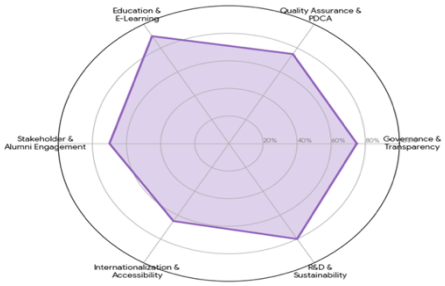

Figure 5. U-E DQTM-6 Digital Quality Index

However, this structural adequacy is not fully reflected in governance-related dimensions. Governance and Transparency (D1) and Quality Assurance (D2) remain moderate (around 75%), with limitations primarily related to accessibility and content presentation. Strategic documents are available, yet their accessibility is constrained by navigational depth, and their format—predominantly static PDF documents—limits their analytical usability, resulting in score reductions under the Navigational Speed and Content Depth Filters.

In the Stakeholder and Alumni Relations (D4) dimension, U-E demonstrates relatively strong operational engagement (around 70%), particularly through career services and regional collaborations. However, this activity is not supported by data-driven monitoring and reporting mechanisms, such as alumni tracking or sectoral employment statistics, leading to score reductions under the Content Depth Filter. This indicates a transition gap between activity generation and analytical visibility.

The most significant limitation emerges in the Internationalization and Digital Accessibility (D5) dimension (around 65%), where outdated and unsynchronized English-language content constrains global visibility. These issues result in score reductions under the Chronological Currency and Navigational Speed Filters, suggesting that international digital strategy remains reactive rather than systematically developed. In the Research and Development and Sustainability (D6) dimension, U-E demonstrates moderate strength (around 80%) in making regional development activities visible. However, the absence of measurable and impact-oriented sustainability indicators limits the analytical depth of this content.

Overall, U-E exhibits a digital quality profile that is functional, locally effective, and structurally sufficient, yet not fully matured in terms of integration, data-driven governance, and global visibility. This pattern reflects a transitional stage in which institutional capacity exists but has not yet been systematically transformed into evidence-based digital representation.

From a policy perspective, advancing U-E's digital maturity requires strengthening data-driven stakeholder systems, synchronized international content, and user-centered access architecture. Such interventions would enable the institution to evolve from a functionally adequate structure toward a more integrated and analytically robust digital governance model.

- **Institutional Digital Profile Typology and Strategic Differentiation**

Figure 6 presents an inter-institutional comparative radar chart visualizing the distribution of DQTM-6 dimensions across the universities included in the sample. Rather than producing a linear ranking, the figure demonstrates that universities' levels of digital quality maturity exhibit distinct

patterns shaped by institutional scale, governance culture, and strategic orientations.

Asymmetries across dimensions—particularly those observed in Stakeholder and Alumni Relations (D4) and Internationalization and Digital Accessibility (D5)—provide empirical support for the institutional digital profile typology presented in Table 3. These findings suggest that digital quality in higher education should not be treated as a singular or homogeneous performance indicator, but rather as a multidimensional, context-sensitive, and institution-specific governance phenomenon.

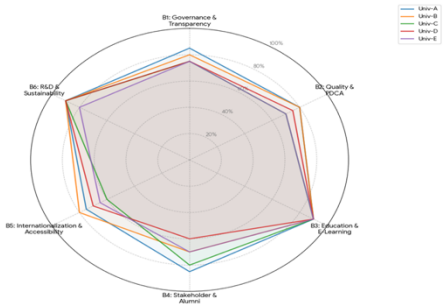

Figure 6. Dimension-Based Institutional Performance Comparison Matrix of the DQTM-6 Digital Quality Index

The results derived from the DQTM-6 model reveal not only quantitative score differences among universities, but also distinct institutional profiles in terms of digital governance approaches, content production logics, and strategic priorities toward stakeholders. The typology summarized in Table 3 offers a holistic analytical framework that simultaneously captures each institution's dominant digital character, the primary digital constraint limiting this character, and the institution's strategic focus.

Table 4. Dimension-Based Comparison of Institutional Digital Performance Profiles

Institution	Dominant Character	Primary Digital Constraint	Strategic Focus
U-A	Agile / Regional	Navigational Depth	Stakeholder Transparency
U-B	Disciplined / Standards-Oriented	Data Staticization	Accountability
U-C	Thematic / Young	Archival Depth	Applied Education
U-D	Established / Inert	Structural Complexity	R&D Capacity
U-E	Local / Maturing	Global Synchronization	Career Services

U-A exhibits an agile and regionally oriented digital structure that places stakeholder transparency at its core. While this configuration is strong in terms of content quality and societal contribution, navigational depth generates accessibility costs for users. In contrast, U-B stands out in the domain of accountability through a disciplined and standards-based approach to digital governance; however, data staticization limits the transformation of this strength into dynamic stakeholder interaction.

U-C's thematic and young profile enables digital specialization in applied education, yet shortcomings in institutional memory and archival depth create structural vulnerabilities for sustainable quality assurance. U-D, as a long-established and large-scale institution, demonstrates strong R&D capacity but also displays pronounced digital inertia due to structural complexity and a multi-layered digital architecture. Finally, U-E, within a local and maturing profile, achieves strong visibility in career services and regional engagement, while exhibiting limited performance in global synchronization and international digital accessibility.

Overall, this typology demonstrates that universities' digital quality performance is shaped not only by technical capabilities, but also by institutional scale, governance culture, and strategic priorities. Consequently, policies and interventions aimed at enhancing digital quality should be designed not as one-size-fits-all solutions, but rather as differentiated strategies that take into account institution-specific digital characteristics and structural constraints.

Conclusion and Discussion

This study developed and operationalized the DQTM-6 model, which conceptualizes universities' digital quality performance not through binary presence/absence indicators, but through a multidimensional lens encompassing accessibility, content depth, currency, and the relationship between information and governance practices. The comparative web analysis conducted across universi-

ties located in Türkiye's Lakes Region demonstrates that digital quality is neither a homogeneous nor a linear performance domain. Rather, it generates distinct institutional digital profiles shaped by institutional scale, governance culture, and strategic priorities.

The findings indicate that differences in digital quality across universities cannot be explained solely by technical infrastructure or content volume. Radar charts and dimension-based analyses reveal that some institutions achieve high overall scores while simultaneously exhibiting structural vulnerabilities in specific dimensions—most notably in Stakeholder and Alumni Relations and Internationalization and Digital Accessibility. Conversely, institutions with relatively lower overall scores may develop strong and coherent digital practices in particular thematic areas, such as applied education or regional engagement. These patterns suggest that digital quality is less a singular "performance score" than a governance choice reflecting what institutions choose to make visible and which stakeholder groups they prioritize.

The institutional digital profile typology proposed in this study transforms digital quality from a static measurement domain into a dynamic and contextual analytical framework. Agile and regionally oriented institutions tend to excel in stakeholder transparency and societal contribution, while institutions with disciplined, standards-based governance structures demonstrate strong digital representations in accountability and quality assurance. Thematic and younger universities are able to develop digital specialization in applied education, yet limitations in archival depth and institutional memory constrain the sustainability of these strengths. In contrast, large and long-established institutions possess high R&D capacity but face risks of digital inertia due to multi-layered digital architectures and structural complexity. Finally, locally oriented and maturing institutions achieve visibility in regional career services while remaining comparatively weak in global synchronization and international digital accessibility.

These findings indicate that one-size-fits-all digital quality improvement policies are likely to have limited impact. Digital transformation strategies should instead be designed through differentiated approaches that account for each institution's dominant digital character, structural constraints, and strategic focus. For example, institutions that are agile but generate high navigational costs should prioritize simplifying information architecture and reducing access depth rather than further content production. Institutions with strong standards-based governance structures should focus on transforming static data into dynamic, traceable, and comparable digital dashboards. Challenges observed in internationalization are, for most institutions, less a matter of content scarcity than of synchronization, currency, and user-experience-related structural issues.

Within this context, the DQTM-6 model is positioned not merely as a performance measurement tool, but as an analytical governance instrument that can support institutional self-evaluation, strategic planning, and policy design in higher education. One of the model's primary contributions lies in linking digital quality to governance capacity rather than technical adequacy alone, thereby enabling structurally grounded and explanatory answers to the question of *why* digital performance varies across institutions. Moreover, the use of restrictive filters makes visible digital content that formally exists but is effectively inaccessible, outdated, or lacking in evidentiary depth, offering a complementary perspective to existing accreditation and quality assurance systems.

In conclusion, this study invites a rethinking of digital quality debates in higher education beyond a narrow focus on technical infrastructure, toward a framework centered on governance, transparency, and strategic priorities. The DQTM-6 model provides researchers and decision-makers with a flexible and context-sensitive analytical ground for understanding, comparing, and improving digital quality. Future research could further test the model across different national contexts, types of universities, and through longitudinal designs, thereby capturing the evolutionary nature of digital quality maturity in higher education.

Declarations

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Conflicts of Interest: The author declares no conflicts of interest related to this study.

***Ethical Approval*:** This study is of a nature that does not require ethics committee approval, and the data used were obtained through a review of the literature and other published sources. It is hereby declared that scientific and ethical 2 principles were observed throughout the preparation of this study and that all works utilized have been indicated in the references.

AI Disclosure: *The scholarly content of this work—including research questions, theoretical framework, methodology, analyses, and results—was entirely generated by the author(s). In the preparation process of this work, artificial intelligence-based tools [Chatgbt and Gemini] were utilized to a limited extent only for the purposes of language editing, improving expression fluency, and formal checks. The generated AI outputs were carefully reviewed and verified by the author(s). AI-based tools were strictly not used in this study for the purposes of data collection or generation, statistical analysis, or citation/reference generation.*

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APPENDIX

This appendix presents the full indicator framework of the DQTM-6 model, consisting of 60 criteria structured across six analytical dimensions. Each indicator is operationalized through a three-level evaluation logic (0–1–2), reflecting absence, limited presence, and complete/updated evidence. This structure enables a standardized and replicable assessment of digital quality communication in higher education institutions.

Dimension	Indicator Code	Indicator	Operational Definition	0 = Not Available	1 = Limited / Outdated	2 = Complete / Up-to-date
1. Institutional Governance & Transparency	1.1	Rector, Vice Rectors and Advisors Information	Structured and updated digital profiles of senior executive leadership including academic background, administrative authority scope, and official institutional contact details.	No executive information publicly accessible.	Only names and titles listed without CV or defined responsibilities.	Full academic/administrative profiles, authority areas and institutional contact details updated within the last academic year.
	1.2	Senate and Executive Board Structure	Transparent presentation of governance bodies including membership, functional roles and governance responsibilities.	No information on governance bodies.	Member list provided without role or mandate description.	Members, roles and governance functions clearly defined and current.
	1.3	Organizational Chart	Digital representation of academic and administrative hierarchy reflecting reporting lines and institutional structure.	No organizational chart available.	Static or outdated visual chart without structural clarity.	Updated, hierarchical and preferably interactive chart linked to relevant units.
	1.4	Strategic Plan	Public accessibility and temporal currency of the institutional strategic plan including measurable objectives and monitoring indicators.	No strategic plan available.	Outdated plan or lacking measurable performance indicators.	Current plan accessible with measurable objectives and monitoring framework.
	1.5	Annual Activity Reports Archive	Systematic publication and archival accessibility of institutional performance and activity reports.	No reports published.	Only latest report accessible or incomplete archive.	Multi-year archive (minimum 3–5 years) systematically accessible.
	1.6	Institutional Regulations and Bylaws	Public accessibility of institutional regulations, directives and governance-related normative documents.	No regulatory documents accessible.	Partial or outdated regulatory documents.	Comprehensive and updated regulatory framework organized and accessible.
	1.7	Data Protection & Privacy Statements	Visibility of data protection policies, privacy notices and legally required disclosure procedures.	No privacy/data protection statement available.	General statement without procedural clarity.	Detailed privacy policy including rights, procedures and application mechanisms.
	1.8	Financial Statements and Budget Reports	Digital transparency of institutional financial resources including budget allocation and performance reporting.	No financial data published.	Only aggregated budget figures without breakdown.	Detailed budget allocation, expenditure breakdown and financial reporting available.
	1.9	Board and Commission Decision Summaries	Regular publication of decision summaries from institutional boards and commissions.	No decision summaries accessible.	Irregular or partial decision summaries.	Systematic publication including dates and reference numbers.
	1.10	Ethics Committee and Ethical Guidelines	Public availability of ethical principles, ethics committee structure and application procedures.	No ethics-related information available.	Committee members listed without procedural guidelines.	Clearly defined ethical principles, committee structure and application procedures accessible.
2. Quality Assurance & Continuous Improvement	2.1	Quality Commission Structure	Digital visibility of institutional quality commission structure, including member roles and unit-level representation.	No quality commission page.	Only member names listed.	Roles, responsibilities and unit representatives clearly defined and current.
	2.2	Unit Internal Evaluation Reports (BIDR)	Public availability of unit-level internal evaluation reports.	No reports accessible.	Reports available for limited units or outdated years.	All units' current reports publicly accessible.
	2.3	Institutional Self-Evaluation Report (KIDR)	Accessibility of the institutional self-evaluation report prepared in national QA format.	No report published.	Outdated report accessible.	Latest report published in official QA format.
	2.4	Accreditation Certificates and Processes	Transparency of program/institutional accreditation documents and validity periods.	No accreditation information.	Logos or general statements only.	Accreditation certificates, scope and validity dates clearly published.
	2.5	PDCA (Plan-Do-Check-Act) Evidence	Digital visibility of continuous improvement actions and documented outcomes.	No improvement evidence.	Generic statements without documentation.	Documented improvement actions with measurable outcomes.
	2.6	Quality Policy & Strategic Alignment	Consistency between quality policy and institutional strategic objectives.	No quality policy published.	Generic policy statement without alignment.	Clearly articulated policy aligned with strategic objectives.
	2.7	Stakeholder Satisfaction Survey Results	Public disclosure of stakeholder satisfaction survey results and analyses.	No results published.	Survey links without results.	Analyzed results with visuals and interpretation published.
	2.8	Process Management & Workflow Diagrams	Digital representation of institutional processes and workflows.	No process diagrams.	Limited or unit-specific diagrams.	Comprehensive process diagrams covering all key functions.

	2.9	External Evaluation & Monitoring Reports	Accessibility of external QA evaluation and monitoring reports.	No external reports published.	Outdated or partial reports available.	Full evaluation and follow-up reports publicly accessible.
	2.10	Quality-Focused News & Announcement Archive	Regular dissemination of quality-related news and announcements.	No quality-related communication.	Irregular or sporadic announcements.	Systematic archive of quality-focused communications.
3. Teaching & Digital Learning Ecosystem	3.1	Bologna Information Package & Qualification Alignment	Transparency of program information aligned with national and European qualification frameworks.	No package available.	Incomplete or inconsistent information.	All programs aligned and fully accessible.
	3.2	Course Syllabi and Learning Outcomes	Digital access to syllabi including learning outcomes and assessment criteria.	No syllabi available.	Course titles only.	Full syllabi with outcomes and assessment criteria.
	3.3	Academic Calendar & Exam Schedules	Accessibility and clarity of academic calendar and assessment schedules.	No calendar available.	Static PDF calendar only.	Interactive, updated digital calendar.
	3.4	Learning Management System (LMS) & Digital Access	Availability of LMS and digital learning materials.	No LMS access.	LMS access without guidance.	LMS with guides, support and digital resources.
	3.5	Library Databases & Digital Resources	Accessibility of digital library resources and databases.	No information provided.	Database names listed only.	Full access guides, remote access and usage instructions.
	3.6	Double Major & Minor Program Information	Transparency of double major and minor program requirements.	No information available.	Regulations only.	Application procedures, quotas and timelines published.
	3.7	Assessment & Evaluation Regulations	Clarity of assessment rules and appeal procedures.	No regulations published.	General exam rules only.	Detailed assessment and appeal procedures accessible.
	3.8	Laboratory & Technical Infrastructure Inventory	Visibility of laboratories and technical infrastructure.	No information available.	Unit or lab names only.	Detailed infrastructure inventory and usage information.
	3.9	Open Course Materials & MOOC Integration	Availability of open educational resources and MOOC integration.	No materials available.	Limited materials provided.	Rich repository of open digital learning materials.
	3.10	Student Mobility Programs (Erasmus/Farabi/Mevlana)	Transparency of national and international mobility opportunities.	No information available.	External links only.	Agreements, quotas and application guides published.
4. Stakeholder Engagement & Alumni Relations	4.1	Alumni Information System	Existence of a functional alumni tracking and service platform.	No system available.	Contact form only.	Active alumni portal with data entry and services.
	4.2	Employer Advisory Board & Industry Cooperation	Transparency of employer involvement and sectoral collaboration.	No information available.	Member list only.	Meeting records and collaboration outcomes published.
	4.3	Student Council Representation	Visibility of student representation mechanisms.	No information available.	Representative names only.	Activities, roles and contact channels published.
	4.4	Digital Request & Complaint Tracking System	Functionality of digital feedback and tracking mechanisms.	No system available.	Email address only.	Traceable digital request/complaint system.
	4.5	Graduate Employment Statistics	Transparency of graduate employment outcomes.	No data published.	General statements only.	Sectoral employment statistics published.
	4.6	Social Responsibility & Community Reports	Disclosure of societal contribution activities.	No reports published.	Sporadic news items only.	Structured reports and documentation available.
	4.7	External Stakeholder Feedback Mechanisms	Mechanisms for collecting external stakeholder input.	No mechanisms available.	Ad hoc feedback only.	Structured and continuous feedback systems.
	4.8	University-Industry Cooperation Portal	Visibility of industry collaboration platforms.	No portal available.	External links only.	Active portal with project tracking.
	4.9	Career Center & Employment Support	Accessibility of career guidance and employment services.	No information available.	External links only.	Comprehensive career services and job listings.
	4.10	Public Communication Channels (CIMER etc.)	Availability of formal communication channels.	Contact info only.	Limited unit-level info.	Comprehensive channels including formal complaint systems.
5. Internationalization & Accessibility	5.1	English Website Synchronization	Consistency between native and English website content.	No English site.	Partial translation.	Fully synchronized content.
	5.2	International Bilateral Agreements	Transparency of international partnerships.	No list available.	Outdated list.	Updated partner list with quotas.
	5.3	International Student Application Guide	Clarity of application and admission procedures.	No guide available.	Application form only.	Comprehensive admission and living guide.
	5.4	International Staff & Student Mobility	Visibility of international mobility opportunities.	No information available.	General info only.	Detailed mobility programs and procedures.
	5.5	Foreign Language Catalogues & Brochures	Availability of program information in foreign languages.	No catalogues.	Limited brochures.	Full program catalogues available.
	5.6	Web Accessibility Tools (WCAG Compliance)	Compliance with accessibility standards.	No tools available.	Basic accessibility features.	Full WCAG-compliant accessibility tools.
	5.7	Mobile Responsiveness	Compatibility with mobile devices.	Not mobile-friendly.	Partial responsiveness.	Fully responsive design.
	5.8	Advanced Site Search & Navigation	Usability of internal search and navigation.	No search function.	Basic search only.	Advanced filtering and site map.

	5.9	Social Media Integration & Engagement	Integration of social media channels.	No integration.	Static links only.	Active integration and engagement indicators.
	5.10	W3C Standards & Page Speed Compliance	Compliance with web standards and performance.	No compliance evidence.	Partial compliance.	Fully compliant and optimized.
6. Academic Performance & Sustainability	6.1	Academic CV System (AVESIS etc.)	Availability of digital academic profile system.	No system available.	Outdated profiles.	Live updated profiles with metrics.
	6.2	Publication & Citation Statistics Dashboard	Transparency of research output indicators.	No statistics available.	Aggregate numbers only.	Detailed dashboards by year/unit.
	6.3	Patent & Registered Product Lists	Disclosure of intellectual property outputs.	No information available.	General information only.	Detailed lists with registration numbers.
	6.4	Sustainability & Green Campus Data	Availability of sustainability and environmental performance data.	No data available.	General statements only.	Certified data and sustainability reports.
	6.5	Research Projects (BAP) Information System	Transparency of institutional research funding.	No information available.	Regulations only.	Active project tracking and budget transparency.
	6.6	Technology Transfer Office (TTO) & Technopark Links	Visibility of technology transfer mechanisms.	No information available.	External links only.	Detailed TTO and technopark information.
	6.7	Scientific Events & Conference Calendar	Accessibility of academic event schedules.	No calendar available.	Fragmented announcements.	Centralized and updated event calendar.
	6.8	Corporate Identity Guidelines	Availability of institutional branding guidelines.	No guidelines available.	Logo files only.	Full identity manual accessible.
	6.9	Institutional E-Bulletin & Journal Archive	Continuity of institutional communication publications.	No archive available.	Limited issues available.	Complete and updated archive.
	6.10	YÖK Monitoring & Evaluation Indicators	Transparency of national monitoring and evaluation results.	No indicators published.	Outdated indicators.	Current monitoring reports publicly accessible.