Digital Transformation Where it Matters: A Four-Pillar Maturity Model for Diverse Assessment Practices in Higher Education

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Abstract: Digital transformation in higher education has been widely conceptualised through institutional frameworks such as those developed by EDUCAUSE and Jisc. While these offer robust lenses for analysing organisation-wide change, assessment transformation within disciplines is an ongoing process that requires continuous measurement and validation at a meso level. Assessment, as a core pedagogical and regulatory function, is closely linked to institutional structures but enacted primarily at the course and teacher levels. Consequently, nuanced transformations in assessment practices may not be fully captured by high-level organisational frameworks. This study addresses the gap by introducing the Digital Assessment Maturity Index (DAMI), a framework for analysing assessment transformation within higher education. The model was developed through an iterative abductive process that combined institutional digital transformation frameworks, contemporary assessment literature, and a contextual analysis of assessment practices at a technical university in Sweden. Rather than adopting organisation-wide dimensions, the study selectively synthesised concepts relevant to the local enactment of digital assessment at course and programme levels. This process identified four interrelated constructs: (1) Adoption & Coverage; (2) Efficiency & Throughput; (3) Authenticity & Learning Alignment; and (4) Trust & Reliability. Institution-wide dimensions such as governance, finance, and policy alignment aspects were excluded because they operate beyond the assessment enactment. The resulting four-pillar DAMI model was operationalised using an institution-wide survey of teachers at the bachelor's and master's levels, enabling an initial empirical mapping of the university's digital assessment maturity. The findings from 314 responses from faculty demonstrate that digital assessment at the university in 2024 is characterised by substantial adoption and efficiency gains, alongside persistent trust and reliability concerns and uneven pedagogical transformation. The model also demonstrates sensitivity to both barriers and enablers of assessment transformation, offering actionable insights to inform programme-level improvements. These outcomes reveal that the DAMI model can isolate assessment as a distinct unit of analysis and derive its dimensions through cross-framework conceptual reduction rather than institutional abstraction. As a next step, DAMI will be evaluated longitudinally through repeated institution-wide surveys.

Keywords: Digital Assessment Maturity, Higher Education, Education Transformation, Assessment Practices

1. Introduction

Higher Education institutions increasingly prioritise Digital transformation (DT) in response to evolving demands from education stakeholders for more innovative and improved education, in accordance with Sustainable Development Goal 4 (Singun, 2025). In first principles, "*Digital transformation is a series of deep and coordinated culture, workforce, and technology shifts that enable new educational and operating models and transform an institution's business model, strategic directions, and value proposition*" (Brown et al., 2020, p. 1). Within higher education, digital transformation extends beyond the adoption of new technologies and involves fundamental changes in how teaching, learning, assessment, and administration are designed and enacted (Rodríguez-Abitia & Bribiesca-Correa, 2021).

The complexity of DT, however, also demands systematic approaches for understanding, implementing, and evaluating institutional change across technological, pedagogical, organisational, and cultural dimensions (Brown et al., 2020; Rodríguez-Abitia & Bribiesca-Correa, 2021). Contemporary DT has been widely conceptualised through comprehensive institutional frameworks, such as the EDUCAUSE Dx Framework (EDUCAUSE, n.d.) and the Jisc Framework (Ahuja, 2025; Newman et al., 2025). These frameworks support universities in assessing digital maturity, identifying strategic priorities, coordinating transformation initiatives, and aligning technological development with institutional goals and educational practices (Alfirević et al., 2025; Brooks & McCormack, 2020; Newman et al., 2025). While providing robust lenses for analysing organisation-wide transformation, these frameworks primarily address institutional strategy, governance, infrastructure, and organisational capability at a macro level.

The digital assessment practices, however, operate as a continuous and locally enacted pedagogical process that evolves incrementally through course design, teacher practices, disciplinary requirements, and student interactions (Valdivia-Salazar et al., 2025). Although the assessment process is structurally shaped by institutional leadership, policies, and technological infrastructure, its enactment occurs primarily at programme, course, and teacher levels, where assessment types, design, pedagogical alignment, and perceptions of digital trust and authenticity are negotiated in practice (Sahni et al., 2024). Assessment transformation may involve course-level pedagogical redesign, changes in feedback processes, the adoption of authentic and technology-enhanced assessment formats, evolving trust between teachers and students in digital systems, and greater alignment of assessment methods with intended learning outcomes. These changes are often incremental, uneven, and highly contextual across disciplines and teaching practices. As Ahuja (2025, p. 156) notes, existing institutional DT frameworks, including Jisc, face "*challenges of contextualisation, lack of operational granularity, and limited evaluation evidence*" when applied to specific educational practices. This creates a need and space for a domain-specific, development-oriented framework capable of capturing nuanced changes in assessment practices, identifying barriers and enablers to transformation, and supporting longitudinal evaluation of digital assessment maturity.

This study systematically develops a Digital Assessment Maturity Index, a domain-specific framework grounded in the state-of-the-art DT frameworks and operationalised through a case study from a technical university in Sweden, guided by the following research questions: 1. which dimensions of DT are most relevant to the enactment of assessment practices in higher education, and 2. what patterns, tensions, and areas of uneven development emerge when applying the domain-specific framework to digital assessment practices within a technical university?

2. Background - Digital Transformation Maturity Frameworks

Evidence of the challenges higher education institutions (HEIs) encounter during DT is abundant. A recent systematic literature review (Singun, 2025) identified more than 80 transformation barriers across the areas of (i) Digital Vision, Strategy, and Policies; (ii) Digital Leadership and Management; (iii) Digital Organisation; (iv) Digital Resources; (v) Digital Competence; (vi) Digital Stakeholder Management; (vii) Digital Culture; (viii) Digital Academic; and (ix) Digital Ethics (Singun, 2025, p. 1). The article argues, based on these research outcomes, that many HEIs may feel inadequately prepared to adapt DT due to barriers to implementation (ibid). Inevitably, the ongoing DT within HEIs requires a collaborative and inclusive change process, reviewed and updated regularly (Rodríguez-Abitia & Bribiesca-Correa, 2021). When a systematic and regular approach (Roadmap) is required for any complex process, a strategic framework becomes necessary (Brown et al., 2020). Consequently, contemporary research provides evidence-based frameworks for measuring, monitoring, validating, evaluating, and conceptualising DT in HEIs, such as Jisc (Ahuja, 2025; McGill, 2023).

2.1 EDUCAUSE Framework

EDUCAUSE defines digital transformation (Dx) as "a series of deep and coordinated culture, workforce, and technology shifts that enable new educational and operating models" (Brooks & McCormack, 2020). This means Dx is not just a technological approach driven by the integration of tools, but a holistic institutional change in values, strategy, staffing, and capabilities. The framework provides a strategic, institution-wide lens, focusing on leadership, governance, data, technology, and cross-campus coordination, and offers guidance for the senior leadership on why Dx matters and what shifts must occur. However, because the framework operates at such a macro-organisational level, it offers limited insight into how digital transformation is enacted within specific pedagogical domains such as assessment, where transformation occurs through course-level practices, teacher decisions, and student experiences.

2.2 Jisc Framework for Digital Transformation

The Jisc DT Framework for Higher Education, predominantly verified with HEIs in the United Kingdom, is organised around six interconnected dimensions of Leadership and Governance, Culture, People, Technology, Practice and Processes (McGill, 2023). To this end, the framework provides a more practice-oriented perspective on digital transformation than EDUCAUSE, offering insights into the pedagogical, cultural, and operational factors that shape the effective use of digital technologies across the institution. Importantly, Jisc explicitly acknowledges that its conceptualisation of digital transformation is derived from the EDUCAUSE definition of Dx and adapted to the context of UK higher education (Newman et al., 2025). The two frameworks should therefore

be viewed as complementary rather than competing perspectives. While EDUCAUSE provides a strategic and organisational lens focused on leadership, governance, and institutional change, Jisc extends this perspective into the operational and pedagogical domains where digital transformation is experienced by staff and students. Together, they provide a comprehensive understanding of digital transformation, spanning both institutional strategy and educational practice.

3. Digital Transformation Maturity Model Synthesis

Existing digital transformation frameworks primarily address institutional change, offering limited support for analysing assessment transformation at programme and course levels. This study therefore developed a simpler framework to capture localised and incremental digital assessment change.

Using directed content analysis, with assessment practice as the analytical focus, the two frameworks were examined iteratively to identify and refine relevant dimensions. Hence, the process employed an abductive synthesis integrating DT frameworks and assessment transformation literature, and empirical evidence from teachers' assessment practices. As a process of sensemaking, abductive synthesis is particularly well-suited to addressing complex problems, providing a rigorous approach for integrating theoretical and empirical insights (Kolko, 2010, p. 17). Accordingly, the synthesis focused on the semantic meaning and functional role of framework components within assessment practice in contrast to their original component categorisation. Framework components were therefore reinterpreted through an assessment enactment lens and iteratively grouped according to the aspects of assessment transformation they represented.

3.1 The Synthesis Outcomes – the Four-Pillar DAMI Maturity Model

3.1.1 Adoption and Coverage

This dimension concerns the extent to which digital assessment practices are implemented and embedded across an institution. Within the EDUCAUSE Dx framework, widespread adoption is a requirement for digital transformation to enable shifts in educational and operational models. From this perspective, adoption reflects an institution's progression along the transformation journey, from isolated experimentation to routine, embedded practice. Measuring adoption, therefore, indicates how far an institution has progressed in its assessment-related transformation. Within the Jisc framework, adoption is closely associated with digital maturity and institutional benchmarking. Jisc emphasises the consistent integration of digital practices across departments, programmes, and professional roles. Consequently, adoption and coverage reflect the degree to which digital assessment has become a normalised component of everyday teaching and assessment practice.

3.1.2 Efficiency and Throughput

This reflects the extent to which digital assessment improves operational effectiveness through streamlined processes, reduced administrative burden, faster feedback cycles, and scalable assessment workflows. Within the EDUCAUSE framework, digital transformation involves developing workforce capabilities and redesigning organisational processes to improve efficiency and data-informed decision-making. From this perspective, efficiency serves as an indicator of whether digital transformation is delivering tangible improvements to assessment operations. Similarly, the Jisc framework emphasises process improvement, the reduction of organisational complexity, and the development of sustainable digital workflows. Efficient and evidence-informed practices are considered key indicators of digital maturity. Accordingly, this dimension captures the extent to which digital assessment processes are both operationally effective and sustainable in practice.

3.1.3 Authenticity and Learning Alignment

This dimension captures the extent to which digital assessment supports meaningful, practice-oriented assessment tasks and strengthens alignment between assessment design and intended learning processes. This dimension reflects both the authenticity of assessment tasks (i.e., the degree to which they resemble real-world or professional applications) and the extent to which assessment practices support iterative learning through feedback and structured engagement with course content. Within the EDUCAUSE framework, institutional change in higher education is closely linked to the redesign of teaching and assessment practices, particularly where digital technologies enable more flexible, student-centred, and outcomes-oriented learning environments. Similarly, the Jisc framework emphasises enhancement of teaching, learning, and assessment through digital technologies, with particular attention to assessment design, feedback processes, and alignment

between learning outcomes and evaluation methods. Accordingly, authenticity and learning alignment are treated as complementary indicators of pedagogical transformation, reflecting how digital assessment practices contribute to both real-world relevance and structured learning progression.

3.1.4 Trust and Reliability

This dimension captures teachers' and students' confidence in digital assessment technologies, processes, and assessment conditions. Within the EDUCAUSE framework, successful digital transformation depends upon secure, reliable, and future-ready technological infrastructure supported by effective data governance. Trust is therefore closely linked to institutional readiness, technological robustness, and organisational confidence in digital systems. Similarly, Jisc identifies reliable infrastructure, staff capability, institutional support, and a positive digital culture as foundational conditions for sustainable transformation. Its maturity model explicitly considers user confidence, support provision, and the reliability of digital systems. In the context of digital assessment, trust and reliability reflect the extent to which stakeholders feel confident using these technologies in authentic educational settings.

3.2 The Operational and Pedagogical Alignment of DAMI

The four dimensions of DAMI represent complementary perspectives on digital assessment transformation. Together, they provide a multidimensional view of assessment maturity spanning implementation, operational performance, pedagogical quality, and institutional confidence.

Adoption and Coverage capture the extent to which digital assessment practices are implemented and embedded across courses and programmes. It reflects the institutional reach of digital assessment and indicates how far transformation has progressed beyond isolated or experimental use.

Efficiency and Throughput reflect the operational performance of digital assessment, focusing on workflow efficiency, scalability, administrative burden, and feedback timeliness. It captures whether digitalisation translates into tangible improvements in assessment processes.

Authenticity and Learning Alignment represents the pedagogical quality of digital assessment, capturing the extent to which assessment designs support meaningful learning, align with learning outcomes, and enable authentic demonstrations of knowledge and skills. It reflects whether digital assessment contributes to educational improvement rather than procedural digitisation.

Trust and Reliability capture stakeholder confidence in digital assessment systems, including perceptions of technical reliability, system robustness, institutional support, and fairness of assessment processes. It reflects the conditions necessary for sustainable adoption and long-term transformation. This structure is simpler and practical yet enables moving beyond simple measures of technology adoption and captures the multifaceted nature of assessment transformation. Consequently, the framework provides a practical basis for monitoring digital assessment maturity, identifying areas of uneven development, and supporting evidence-informed improvement initiatives at programme and course levels.

4. Empirical Research Instruments

This research employed an empirical methodological approach grounded in a case study of a Swedish engineering university to operationalise the digital assessment maturity model. The data collection instrument was a semi-structured questionnaire, developed for multiple research studies on digital education, digital transformation, and technology penetration through teaching and learning in the engineering discipline. The survey items were designed as five (or seven)-level Likert-scale constructs for DAMI (cf. section 3.2), with digital assessment maturity treated as a multidimensional construct reflected in observable assessment practices, perceived benefits, pedagogical alignment, and trust in digital assessment environments. The questionnaire was administered to the faculty (teachers in bachelor's and master’s courses) at the HEI in the selected case study. The data were analysed descriptively using the R statistical analysis tool. The empirical analysis focused on identifying levels of digital assessment adoption, perceived operational and pedagogical impacts, barriers and enablers of transformation, and tensions between institutional digitalisation and local assessment enactment. The analysis captured unevenness across dimensions, including differences between operational digital maturity and pedagogical assessment transformation.

The standard ethical aspects of research data collection and analysis were followed in this study. The respondents were informed of the explicit use of data for research outputs, and a formal written consent for participation was obtained. However, no sensitive or personal data were collected in this study. The research process was designed following the ethical guidelines of the HEI where the data is collected.

5. Findings and Discussion

The resulting four-pillar DAMI model was embedded in the institution-wide survey of teachers at the bachelor's and master's levels, enabling an initial empirical mapping of the university's digital assessment maturity. Of the 314 respondents, 68 % were male, 27 % female. The median age was between 50 and 54 years, and 46 % of respondents were either professors or associate professors.

Descriptive and interpretive analyses on the survey data were intended to examine how the four DAMI dimensions manifested within teachers' perceptions of digital assessment practices. The analysis aimed to provide an initial empirical mapping of digital assessment transformation within the university context. The analytical focus was therefore placed on identifying patterns of transformation, examining tensions and contradictions across dimensions and exploring areas of uneven development in digital assessment practices.

5.1 Digital Assessment Adoption Across the HEI

Digital assessment adoption was measured through variables regarding teachers' use of digital platforms, proportion of course activities conducted digitally, whether teachers had created digital assessments last year, and use of digital quizzes and examination tools. Overall, 53.5% (n = 168) of respondents reported having created at least one digital assessment during 2024, while 46.5% (n = 146) reported no use of digital assessment. This suggests that digital assessment has achieved moderate institutional penetration but has not yet become a dominant assessment practice. From a digital maturity perspective, the findings indicate a transitional stage in which adoption has progressed beyond early uptake but remains uneven across the teaching population. \

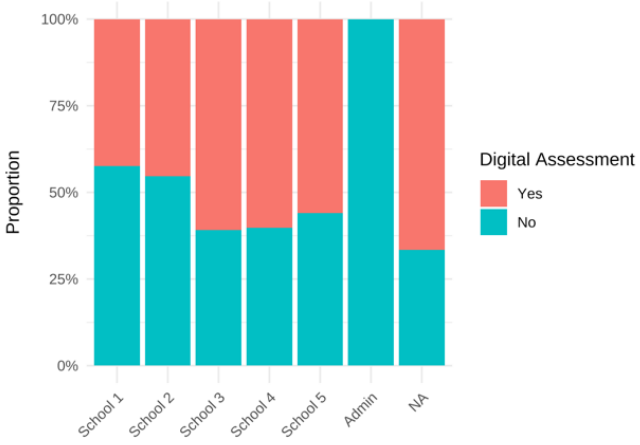


Figure 1: Digital Assessment Adoption by School

As Figure 1 shows, the differences in adoption proportion among schools are insignificant. But teachers' engagement with digital tools in the course activities and the number of activities they conducted digitally during 2024 were unevenly distributed, as shown in Figure 2 (Left). The median of digital course activities 25%, and Mean = 35%, SD = 28%, which indicates that while some teachers conduct a large proportion of their activities digitally, most report relatively modest levels of digital integration. Hence, digital adoption remains uneven across teaching contexts and has not yet become a uniformly embedded aspect of educational practice. As Figure 2 (right) shows, digital tool adoption is very high (Canvas ~97%, Zoom ~90%).

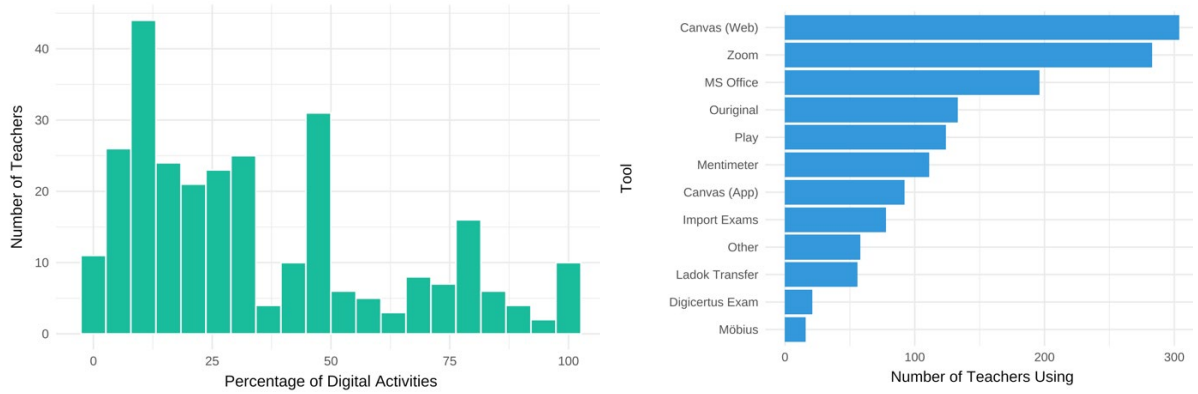


Figure 2: Percentage of digital activites (Left) and, Digital tools adoption (Right)

Considering that 53.5% created at least one digital assessment and the median digital activity level is 25%, it can be concluded that the adoption of digital assessment does not necessarily imply digitalisation of teaching activities. Many teachers just use digital assessment occasionally, not as a part of a broader digital pedagogical approach. Digital quizzes are a popular assessment method among teachers who conducted digital assessments, with 144 out of 168 conducted digital assessments showing that 86.7% of teachers who engage in digital assessment use digital quizzes. This indicates that once teachers adopt digital assessment, quiz-based assessment becomes highly prevalent.

The assessment technology ecosystem was dominated by Canvas, which was used by 96.8% of respondents. Adoption of specialised assessment technologies was considerably lower, including Ouriginal (42.4%), Import Exams (24.8%), Transfer to Ladok (17.8%), Digicertus (6.7%), and Möbius (5.1%). These findings suggest that while digital assessment infrastructure has achieved broad institutional coverage through a common platform, more advanced and specialised assessment technologies remain confined to relatively small groups of teachers. Consequently, assessment maturity appears to be characterised by widespread access and baseline adoption rather than diversified use of digital assessment tools.

The outcomes collectively indicate moderate digital assessment operationalisation concerning adoption and coverage. While over half of respondents reported creating at least one digital assessment, adoption has not yet become universal. Teachers reported relatively modest levels of digital activity overall (median = 25%), and assessment practices were concentrated around a small number of institutional platforms, particularly Canvas. The median teacher used only two assessment-related tools, suggesting that digital assessment is established but not yet characterised by extensive diversification or driven by the opportunities of deep technological integration.

5.2 Change to Practice: Efficiency and Throughput

The second DAMI dimension shifts the analytical focus from the extent of digital assessment adoption to the operational changes associated with its use. This dimension captures the degree to which digital assessment is perceived to support more efficient assessment processes through mechanisms such as timely feedback, resource savings, workflow optimisation, monitoring of student progress, and scalable assessment practices. The resulting distribution was strongly right-skewed (Min = 0, Q1 = 0, Median = 1, Mean = 1.77, Q3 = 3, Max = 9). This means more than one quarter of respondents reported no efficiency-related drivers for adopting digital assessment, while a smaller subset reported multiple efficiency-related benefits. The findings indicate that efficiency-oriented transformation is present within the institution but remains unevenly distributed across assessment practices. Most teachers reported only a limited number of efficiency-related characteristics, suggesting that digital assessment adoption is frequently associated with specific operational benefits rather than a comprehensive transformation of assessment workflows. Consequently, the Efficiency & Throughput dimension reflects a heterogeneous maturity profile in which operational gains are realised selectively rather than systematically across the teaching population.

5.3 Authenticity and Learning Alignment

In DAMI, "authenticity and learning alignment" is operationalised not as curriculum-level constructive alignment, but as the extent to which assessment practices are perceived to support authentic disciplinary tasks and learning-oriented processes such as feedback and iteration. Accordingly, the construct for this dimension is defined by the variables of teachers' perceived assessment accuracy/value, digital quizzes as a formative learning integration, and digital quizzes as an iterative learning (multiple attempts) process.

The most prevalent pattern of assessment and learning alignment is the use of digital quizzes enabling multiple attempts (39.2%), suggesting an emerging orientation toward iterative and mastery-based learning designs, where students are given repeated opportunities to improve performance. 32.9% of teachers reported use of quizzes as preparation or follow-up of laboratory or applied learning activities, indicating that digital assessment is increasingly embedded in discipline-specific learning workflows, particularly in practice-oriented teaching contexts. This reflects a partial integration of digital assessment into course structures rather than isolated use. However, only 16.9% of teachers perceive that digital assessment more accurately evaluates student performance compared to traditional paper-based methods. This weak perception suggests that digital assessment has not yet achieved strong epistemic legitimacy among most teachers.

Overall, the distribution of responses shows that assessment–learning alignment in digital assessment is uneven and selectively adopted rather than systemically embedded. While formative and applied uses of digital assessment are present, particularly through iterative quiz design and lab integration, these practices have not yet translated into a broader shift in perceived assessment validity or unified pedagogical transformation. These findings position Pillar 3 as reflecting an emergent but fragmented form of learning-oriented assessment transformation, where digital tools are primarily used to support learning processes rather than to fundamentally redefine assessment quality or standards.

5.4 Trust and Reliability

The trust risk perception reflects teachers' confidence in the functional stability, pedagogical safety, and integrity of digital assessment systems. It captures both trust in the institutional technology ecosystem and perceived risks related to technical failures, cheating opportunities, and system unreliability.

5.4.1 Distribution of Trust in Digital Assessment Tools

Trust was operationalised using the Likert-scale item *"My overall impression of the currently available digital tools for examinations at the university is positive"*, capturing general evaluative attitude toward institutional digital assessment tools (1 = strongly disagree, 7 = strongly agree, 0 = no opinion). The distribution of normalised trust in digital assessment (0–1 scale) indicates a generally positive but heterogeneous perception of digital assessment tools among teachers. The density plot reveals a concentration of responses in the upper-mid to high trust range, with prominent peaks around 0.70–0.85. A secondary cluster is observed around moderate trust levels (approximately 0.50–0.60), while very low trust values are comparatively low, suggesting that trust in digital assessment tools is not uniformly distributed but instead exhibits a right-skewed clustering structure, as shown in Figure 3.

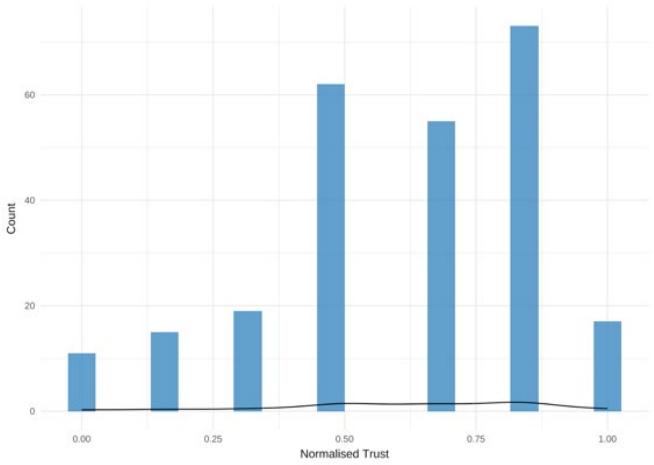


Figure 3: Distribution of trust in digital assessment tools

5.4.2 Distribution of Perceived Risk

Technical risk perception was measured using the binary items *"I'm unsure if digital assessments will function as expected"* and *"I'm worried about technical issues that could arise during the exam"*, capturing concerns related to system reliability and operational stability during digital examinations (0/1 presence of concern) as shown in Figure 4. Accordingly, the risk perception index (0–1 scale) shows a significantly different structure. The distribution is strongly concentrated at the lower end of the scale, with the highest density observed at values close to zero. Smaller secondary concentrations appear around 0.2–0.3 and 0.4–0.5, while high-risk perceptions are rare. This indicates that perceived risks related to digital assessment, such as technical reliability, assessment integrity, and system functionality, are generally weakly expressed across the sample, with a dominant configuration of low perceived risk.

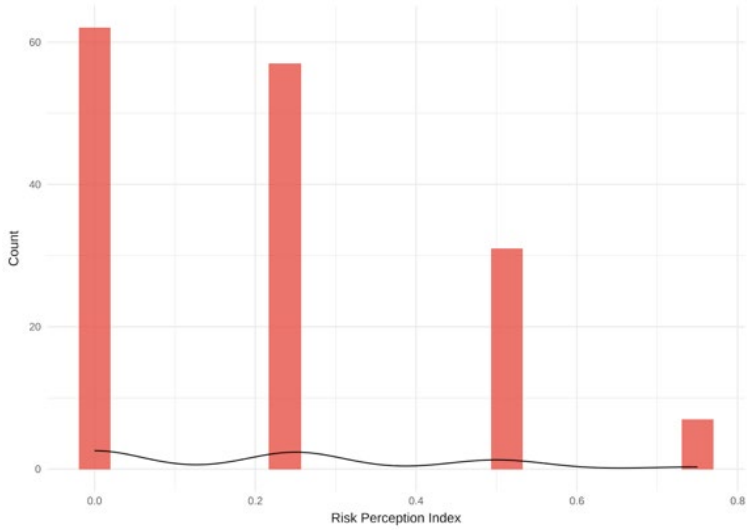


Figure 4: Distribution of Risk Perception Index

5.4.3 Trust vs. Risk

The joint distribution of trust and risk reveals a structured and highly clustered configurational space rather than a linear relationship between the two constructs. As Figure 5 (left) shows, density estimation and two-dimensional bins indicate a dominant concentration of observations in the region characterised by high trust (0.75–0.85) and low-to-moderate risk (0.20–0.30). A broader high-density zone extends across trust values ranging from approximately 0.50 to 0.90, combined with risk values between 0.20 and 0.40. This reveals the presence of an extended "acceptance band" in which trust remains relatively stable while risk perceptions vary moderately. Importantly, the high-density region is not aligned along a diagonal gradient, indicating that trust and risk do not operate as simple inverse variables. Instead, they form a configurational structure with identifiable stable entities. Furthermore, the general distrust was measured using the item "I don't trust digital tools for assessments", capturing explicit scepticism toward digital assessment technologies, alongside the overall trust–risk composite structure derived from the index. The joint distribution of trust and risk (Figure 5 – right) was divided into four quadrants based on median splits of both variables. The results show a dominant concentration of respondents in the high trust / low risk quadrant, with substantially smaller proportions in the other configurations. The high trust / low risk quadrant represents the dominant regime of digital assessment perception. The high trust / high risk quadrant is present but substantially smaller, suggesting conditional acceptance with latent concerns. The low trust / low risk quadrant indicates limited engagement or indifference rather than active resistance. The low trust / high risk quadrant is marginal, indicating that strong scepticism is rare in the dataset. This configuration suggests that digital assessment at the institutional level is largely characterised by technology acceptance, where trust is relatively high, and risk perceptions are contained within.

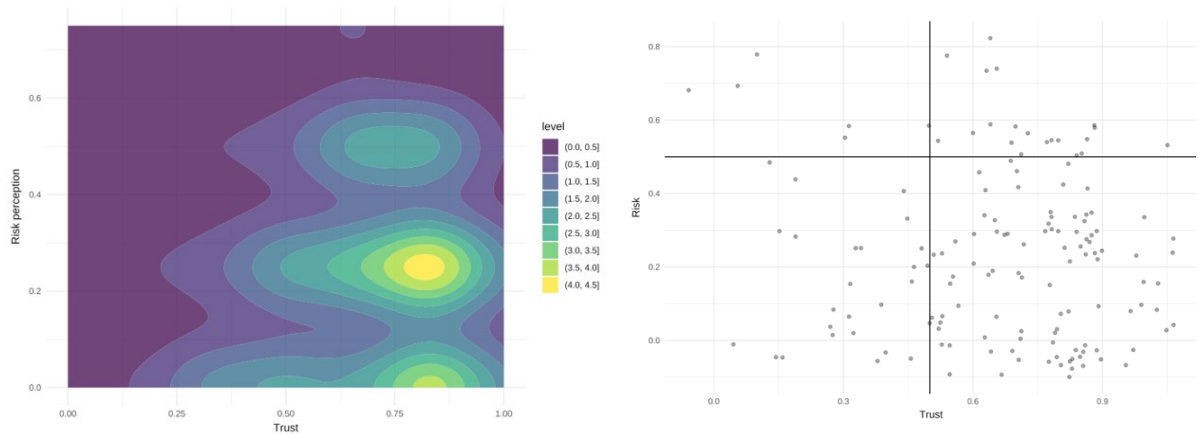


Figure 5: Trust–Risk Joint Density (Left) and Quadrant Distribution of Trust–Risk Configurations

Overall, the digital assessment landscape is characterised by broad adoption of foundational technologies, particularly learning management systems, while the use of more advanced assessment technologies remains selective and uneven. High trust and low perceived risk are associated with this established digital infrastructure, indicating a stabilised foundation for digital assessment. The widespread use of digital quizzes further illustrates that when technologies are perceived as useful, reliable, and pedagogically valuable, their integration into specific assessment practices can become routine and widespread.

6. Concluding Remarks

This study developed and applied the Digital Assessment Maturity Index (DAMI) to examine how digital transformation is enacted through assessment practices in higher education. The study was guided by two research questions: (1) which dimensions of digital transformation are most relevant to the enactment of assessment practices in higher education, and (2) what patterns, tensions, and areas of uneven development emerge when applying a domain-specific framework to digital assessment practices within an engineering university. The findings show that digital assessment transformation can be understood through four interrelated dimensions: Adoption & Coverage, Efficiency & Throughput, Authenticity & Learning Alignment, and Trust & Reliability. Together, these dimensions capture not only the extent of digital implementation, but also how digital assessment is operationalised, how it supports pedagogical practice, and how it is experienced in terms of institutional confidence. The results suggest that transformation cannot be reduced to adoption alone, but instead emerges through the interaction of operational, pedagogical, and perceptual dimensions.

The empirical analysis reveals clear patterns of uneven development across these dimensions. While adoption of digital assessment tools is relatively high, operational efficiency gains are selective and context-dependent rather than systematic. Similarly, authenticity and learning alignment are present but not fully consolidated, indicating an emerging but incomplete pedagogical transformation. Trust in digital assessment tools is generally positive, yet structured by heterogeneous perceptions of risk, particularly relating to technical reliability and academic integrity. Overall, the DAMI framework demonstrates its value as an analytical tool for capturing these multidimensional dynamics. It enables a more granular understanding of digital assessment transformation beyond adoption metrics, highlighting where practices are stabilised, where tensions persist, and where development remains incomplete in the context of engineering education.

Ethics Declaration

No personal data is collected for this research, and therefore, ethical clearance was not required for the research.

AI Declaration

AI tools were used for correcting language and grammar in writing the manuscript.

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