

# The Digital Platform Assessment Matrix: Developing a Framework for Evaluating Digital Platforms and Systems for Children and Young People's Mental Health Support

## Abstract

**Purpose:** Digital platforms and systems (DPS) are increasingly used as effective resources to help address the mental health needs of children and young people (CYP). However, appropriate assessment tools to evaluate the quality of DPS remain limited. This study aimed to develop a comprehensive evaluation framework for DPS that provide access to mental health support for CYP, with the goal of identifying their strengths and weaknesses, and promoting best practices.

**Methodology:** We employed a four-step multi-method approach comprising: (1) an extensive literature review and content analysis of existing guidelines; (2) the identification of essential qualities and characteristics of effective DPS; (3) consultation with over 50 stakeholders to ensure the applicability of the evaluation framework; (4) pilot testing on 53 DPS to refine its structure and functionality.

**Findings:** The resulting evaluation framework, referred to as the Digital Platform Assessment Matrix (DPAM), comprises 65 criteria for assessing the functional, technical and social features of DPS. We propose both a comprehensive version of the DPAM and a shortened version, allowing for flexible use across different contexts and stakeholder groups.

**Originality:** The DPAM offers a comprehensive framework for evaluating DPS that facilitates access to mental health services and resources for CYP. Its multiple criteria ensure that digital platforms can best serve their users, be compatible with existing health systems, and sustainable over time. The DPAM also underpins the development of the new digital platform, which aims to provide CYP with streamlined access to place-based arts initiatives that support their mental health.

**Keywords:** digital platforms and systems; evaluation framework; assessment tool; mental health; children and young people

## Introduction

In the UK, children and young people (CYP) are experiencing a mental health crisis. Recent data indicate that about one in five individuals aged 8 to 25 had a probable

mental disorder in 2023, with only around a third receiving treatment (NHS Digital, 2023; Mind, 2024). In response, numerous digital interventions, systems, resources and tools have been developed to provide information, facilitate access to therapeutic services, support symptom management, and streamline referrals within the national healthcare system (NICE, 2023; Health Innovation Network, 2025). Examples include Joy, the Hub of Hope, Lumi Nova (BfB labs), Online Social anxiety Cognitive therapy for Adolescents (OSCA), Online Support and Intervention for child anxiety (OSI) and Space from low mood and anxiety for teens (Silvercloud) (National Institute for Health and Care Excellence (NICE, 2023).

This paper focuses on digital platforms or systems (DPS), which provide complex services and data exchange, rather than tools or directories that serve a single purpose or a certain group of users (World Health Organisation, 2023). DPS are technological infrastructures that enable the delivery of services and the exchange of data between users, applications, or organisations in broader digital ecosystems (European Commission, 2020; World Economic Forum, 2020). By foregrounding this definition, we aim to critically examine the multi-functional, integrative nature of such platforms in supporting mental health provision for CYP.

As part of a wider project titled [...], that aims to support CYP's mental health and wellbeing through enhanced access to place-based arts initiatives in the UK, the project team intended to develop a framework of criteria as an assessment tool to enable the team and stakeholders to evaluate existing mental health-related DPS, identifying their strengths and weaknesses, and promoting best practices.

### ***Overall aim and research questions***

In this paper, we therefore wanted to answer the following main research question:

1. How can digital platforms and systems (DPS) related to CYP's mental health and wellbeing be evaluated comprehensively?

We also had the following sub-questions:

- What are the key features and characteristics of a successful digital platform or system?
- How can our evaluation of these platforms and systems help to develop a new digital platform to tackle the mental health crisis of CYP?

The aim of this study was to establish an evaluation framework to assess the qualities of DPS in the field of CYP's mental health and inform future development of such DPS.

## **Methodology**

This multi-method study included four steps:

- (1) an extensive literature review and content analysis of ten existing guidelines and recent developments in digital health technologies used globally;
- (2) the development of a comprehensive evaluation framework, including the identification of essential qualities and characteristics of effective DPS and the presentation of its key components;
- (3) consultation with stakeholders involved in the [...] project to ensure the relevance and applicability of the evaluation framework;
- (4) pilot testing of the framework on 53 existing DPS identified by the project team and wider partners, to refine its structure and functionality.

### ***Ethical considerations***

All stakeholders were aware of the aims and objectives of the study and permissions were granted for notes to be taken. For this consultation exercise, participation was voluntary, and no identifiable or sensitive data was collected, reducing the ethical risks typically associated with other research activities. Nonetheless, ethical principles such as transparency, respect, and safeguarding were followed to ensure stakeholders felt safe and valued (British Educational Research Association, 2018).

### ***Step 1: Literature review and content analysis of relevant guidelines***

The rapid development of DPS has transformed healthcare delivery across all stages of a patient journey, creating both opportunities and challenges for healthcare systems worldwide (Borycki et al., 2024; Shapiro et al., 2023; Ricciardi et al., 2019). Digital mental health technologies have also shown promise, especially for CYP, who increasingly seek online support, perceiving web-based services as accessible, anonymous, welcoming, less stigmatising, and trustworthy (Ganga et al., 2024; Smith et al., 2023). These technologies facilitate self-assessment, triage, and provide streamlined access to resources, particularly valuable for CYP's engagement with sensitive topics where internet-based screening may be preferable to face-to-face interactions (Ganga et al., 2024; Camacho et al., 2022; Lagan et al., 2020).

Despite their potential benefits, these technologies often operate in isolation, creating digital fragmentation that hinders effective information exchange between healthcare organisations, leading to potential errors in information transmission (Borycki et al., 2024; Flott et al., 2016; Zanaboni et al., 2018). In addition, despite widespread development, the implementation of DPS faces significant barriers, including users' limited internet access, poor technical literacy, privacy concerns, inadequate interoperability, and insufficient integration with clinical workflows (Catania et al., 2024; Welzel et al., 2023; Smith et al., 2023). Many current platforms

typically focus on individual services in isolation. They appear fragmented, often lack integration, standardisation, and scalability across healthcare services (Shapiro et al., 2023; Welzel et al., 2023; Greenhalgh et al., 2017).

Although various guidelines exist for digital technologies in the healthcare context, there are limited evaluation frameworks and assessment tools to test the qualities of DPS (Catania et al., 2024; Brittingham et al., 2024; Camacho et al., 2022). It is noted that evaluation frameworks are needed to align services with health system goals, identify gaps, balance benefits and risks, ensure cost-effectiveness, track the rapid technological changes and guide decision-making (Flott et al., 2016; Ricciardi, 2019; Klein et al., 2021) emphasise that inadequate evaluation of mental health platforms may perpetuate barriers to care. Fadahunsi et al. (2021) and Sedhorn et al. (2021) suggest that poor information quality in DPS can directly impact patient safety. Accuracy and comprehensiveness of information are crucial for informed decision-making (Brittingham et al., 2024; Lagan et al., 2020; Camacho et al., 2022).

Our analysis of existing literature reveals a few useful evaluation frameworks, mostly in the North American context. However, we also note that terminology and categorisation differ in various frameworks (Sedhorn et al., 2021; Camacho et al., 2022; Reddy & Andrade, 2010). For example, the Clinical Information Quality (CLIQ) synthesises 13 dimensions across three categories: availability (accessibility, portability, security, timeliness), informativeness (accuracy, completeness, interpretability, plausibility, provenance, relevance), and usability (conformance, consistency, maintainability) (Fadahunsi et al., 2021). Furthermore, the American Psychiatric Association (APA) Mental Health App Evaluation framework consists of five themes: engagement style, background and accessibility, privacy and security, therapeutic goal, and clinic foundation (Catania et al., 2024). Another noteworthy framework is Sedhorn et al. (2021)'s digital health scorecard framework, which evaluates mobile health apps across five main domains: technical, clinical, usability, cost, and end-user requirements. Intended to be used globally, ORCHA's Baseline Review (OBR) is designed as an introductory assessment, covering 350+ review points, 70% of global industry standards, and requires payment for their assessment services (ORCHA, 2025). Nevertheless, they do not cover aspects specifically related to the mental health of CYP and their journey in the UK healthcare system due to the specific purposes for which they were developed, e.g. the US context.

The literature suggests that frameworks emphasise human-centred design, integration with clinical workflows, content management capabilities, and effective communication mechanisms as essential functional criteria (Shapiro et al., 2023; Catania et al., 2024; Kechagias et al., 2024). Content quality represents a crucial functional aspect requiring structured evaluation. Frameworks for assessing content quality have been developed across some health domains, including family planning (Brittingham et al., 2024), mental health (Lagan et al., 2020; Camacho et al., 2022), and general clinical information (Fadahunsi et al., 2021). These frameworks

consistently emphasise accuracy, comprehensiveness, relevance, and clarity as essential quality indicators, though specific criteria may vary by clinical domains.

The reviewed literature emphasises the technical dimension of DPS as well. Researchers identified standardised technical criteria based on established ISO frameworks and other frameworks, including error protection, privacy and security, and operability (Camacho et al., 2022; Maqbool and Herold, 2023; Welzel et al., 2023; Buchan et al., 2024). These technical components are crucial for enabling systematic assessment of digital health technologies in their actual use contexts. In addition, interoperability - the ability of systems to exchange and use information - emerges as a particularly critical technical consideration. Multiple studies highlight the challenges of digital fragmentation and emphasise the need for standardised approaches to data sharing and integration across healthcare ecosystems (Borycki et al., 2024; Welzel et al., 2023; Flott et al., 2016). As healthcare systems increasingly rely on multiple digital tools, evaluation frameworks must assess how effectively these tools communicate with each other and with existing electronic health record systems. This aspect is emphasised in our proposed framework.

The social dimension also stood out in the literature reviewed: it considers how digital tools impact users, communities, and healthcare systems - an aspect increasingly recognised as crucial for long-term adoption and effectiveness. For example, Godage et al.'s (2023) study examines sources of motivation, control mechanisms, knowledge foundations, and legitimation factors to ensure comprehensive stakeholder representation in digital health implementation. This aligns with findings from Smith et al. (2023) and Bhawra et al. (2022), which emphasises the importance of co-design approaches, particularly when developing systems for vulnerable or marginalized communities. Sustainability also emerges as a key social consideration across multiple studies. Godage et al. (2023) identified eight sustainability domains through thematic analysis: environmental support, funding stability, partnership, organisational capacity, system evaluation, system adaptation, communication, and strategic planning. These studies revealed major sustainability challenges including clinical champion support, dedicated funding, technological obsolescence, and stakeholder involvement in the development processes of digital health platforms (Buchan et al., 2024). Researchers also note gaps regarding business models, medical claims, and data ownership considerations.

For mental health applications specifically, several studies highlight social factors that influence quality, spread and adoption. Human interaction remains essential for sustained engagement with digital interventions, which work best as additions to enrich care rather than replacements (Smith et al., 2023; Schlieter et al., 2024). Digital literacy gaps among both clinicians and patients represent significant barriers to adoption, as do concerns about privacy, data management, and potential harms from digital interventions, particularly for vulnerable populations like CYP (Smith et

al., 2023; Catania et al., 2024; Lagan et al., 2020). Therefore, many researchers call for tailored evaluation methods for the social dimension with regards to specific user groups, such as elderly populations, those with cognitive impairments, and so forth (Maqbool and Herold, 2023; Smith et al., 2023; Brittingham et al., 2024). There are arguments that these specialised frameworks must address unique considerations regarding data privacy, age-appropriate design, and caregiver involvement.

The literature highlights the need for a comprehensive evaluation framework that systematically assesses DPS across functional, technical, and social dimensions. To inform the development of such a framework, we synthesised both UK-specific and international guidance and policy documents related to digital health (see Table 1). The NHS Digital Technology Assessment Criteria for Health and Social Care (DTAC, Version 1.0, 22 February 2021) was used as a foundational reference for formulating the criteria included in the framework.

**Table 1.** The Guidelines and Standards for development of the evaluation framework

Title	Year	Country	Organisation	Purpose
NHS Digital Technology Assessment Criteria for Health and Social Care (DTAC)	2021	UK	NHS	Provides criteria for assessing digital health technologies for use in health and social care, ensuring safety, effectiveness, and compliance.
NICE Evidence Standards Framework for Digital Health Technologies	2022	UK	NICE	Sets evidence standards for the effectiveness and economic impact of digital health technologies.
NICE Early Value Assessment Interim Statement	2022	UK	NICE	Offers interim guidance for evaluating the potential value of early-stage digital health technologies.
Online Safety Act	2023	UK	UK Government	Legislation aimed at protecting users online, especially children, from harmful content and ensuring digital safety.

Social Prescribing Information Standard	2023	UK	NHS England	Defines the data standards for recording and sharing social prescribing information across systems.
ISO Health Informatics - Framework for Healthcare and Related Data Reporting	2023	International	ISO	Establishes a standardized framework for reporting healthcare data to enhance interoperability and accuracy.
WHO Digital Transformation Handbook for Health Supply Chain Architecture	2024	International	WHO	Guides countries on digital transformation in health supply chains, improving efficiency and resilience.
WHO Guideline Recommendations on Digital Interventions for Health System Strengthening	2019	International	WHO	Provides evidence-based recommendations on digital health interventions to strengthen health systems.
GDPR Compliance Checklist	2023	EU	EU Commission	Outlines essential steps for organisations to ensure compliance with the General Data Protection Regulation.
National Safety and Quality Digital Mental Health Standards	2020	Australia	Australian Commission on Safety and Quality in Health Care	Sets standards to ensure quality and safety in digital mental health services.

**Step 2: Identification of assessment criteria**

An evaluation framework, titled the **Digital Platform Assessment Matrix (DPAM)**, was systematically developed to consolidate and structure the assessment criteria. It comprised three principal dimensions - functional, technical, and social features - organised into 8 evaluation criteria and further detailed through 65 specific items. Table 2 presents the full DPAM, along with references from the literature and the aforementioned guidelines and policies.

Definitions for each criterion were carefully adapted to ensure relevance to digital mental health contexts with CYP in the UK. An iterative refinement process was followed, eliminating redundancies and ensuring alignment with user-centred design principles. A four-point rating matrix (“Works Well,” “Minor Concerns,” “Serious Concerns,” “Not Applicable”) was developed to assist possible automation and highlight strengths and weaknesses.

**Table 2.** The initial full DPAM

	<b>Criteria</b>	<b>Description</b>	<b>Items</b>	<b>References</b>
<b>Functional Features</b>				
1.	Usability	Assesses the simplicity, intuitiveness, and ease of use of digital tools for diverse CYP user groups. It focuses on efficient navigation and functionality that reduces cognitive load.	<ol style="list-style-type: none"> <li>1. Ease of Use</li> <li>2. Efficiency</li> <li>3. Safety and Trust</li> <li>4. Interactive Engagement</li> <li>5. Clear and Understandable</li> <li>6. Accurate Content Provision</li> <li>7. Integration and Adoption</li> </ol>	D1.3 Make the Service Simple to Use, DTAC
2.	Accessibility	Evaluates compliance with standards such as WCAG 2.1 Level AA, ensuring that digital platforms are inclusive for users with disabilities and different literacy levels.	<ol style="list-style-type: none"> <li>8. Inclusive and Equity</li> <li>9. Engagement for Specific/Vulnerable Groups</li> <li>10. User Empowerment</li> <li>11. Cultural and Linguistic Adaptability</li> <li>12. Infrastructure Adaptability</li> </ol>	D1.4 Make sure everyone can use the service, DTAC
<b>Technical Features</b>				
3.	Data Privacy/ Security	Assesses compliance with GDPR and NHS Digital guidance on privacy, encryption (TLS/AES-256), secure storage and handling of patient-sensitive information.	<ol style="list-style-type: none"> <li>13. GDPR Compliance</li> <li>14. Encryption</li> <li>15. Data Privacy and Security</li> <li>16. Data Transparency</li> <li>17. Access Control</li> <li>18. Audit and Monitoring</li> <li>19. Data Integrity</li> <li>20. Protection of Vulnerable Population</li> <li>21. Data Minimisation</li> <li>22. Emergency Data Handling</li> </ol>	C2 Data Protection , DTAC

			23. Data Retention and Disposal	
4.	Scalability and Performances	Derived from cloud-based principles (e.g., AWS scaling, microservices) to ensure the platform performs optimally under high user volumes with load testing and horizontal scaling.	24. Performance Under Load 25. Monitoring Tools 26. Disaster Recovery 27. Global Scalability 28. Operational Resilience 29. Auto-Scaling Features 30. Feedback Loops 31. Safety and Quality 32. Infrastructure Readiness 33. Engagement Retention 34. Integration with Healthcare Systems	C3.6 Load Testing, DTAC
5.	Implementation, API Integrations and Interoperability	Assess alignment with NHS Internet First and Cloud First policies for secure, scalable, and cloud-based deployment. Ensure seamless integration into NHS workflows and broader systems using RESTful APIs or other integration methods to enable communication with platforms and other systems (e.g., NHS EHRs, geolocation services, video consultation tools).	35. System Architecture 36. API Integrations 37. Compliance with Policies 38. User Testing 39. Documentation 40. Change Management 41. Interoperability Standards 42. Early-Stage Testing 43. Open Referral Compliance	D1.9, DTAC; C4, DTAC
6.	Clinical Safety/Risk Management	Assess compliance with DCB0129 Clinical Safety Standards, including risk management, safety case reports, and hazard logs and risk management to minimize harm.	44. Compliance with Standards 45. Hazard Identification 46. Safe Decision-Making 47. Safety Case Reports 48. Real Time Error Detection 49. Training and Awareness 50. Continuous Monitoring	C1, DTAC

			51. Risk Mitigation Strategies 52. Incident Response 53. Compliance Documentation	
<b>Social Features</b>				
7.	Stakeholder Input	Assesses active engagement of CYP, clinicians, policymakers, and technical experts in the design, testing, and evaluation of digital tools.	54. Diverse Stakeholders 55. Collaborative and Participatory Design 56. Contextual Relevance 57. Feedback Integration 58. Barriers Identification 59. Evaluation Collaboration 60. Organisational Alignment 61. Outcome Improvement	D1.1 User Engagement, DTAC
8.	Cost	Evaluates affordability and cost-effectiveness, particularly in the context of public sector healthcare spending constraints.	62. Affordability 63. Cost-Effectiveness and Budget Alignment 64. Economic Feasibility 65. Sustainability	B Value Proposition, DTAC

**Step 3: Stakeholder Consultation to Validate the Relevance and Applicability of the DPAM**

Stakeholder engagement is essential to ensure that evaluation frameworks reflect real-world implementation needs (e.g., Godage et al., 2023; Shapiro et al., 2023). Accordingly, DPAM was developed iteratively with project co-investigators and delivery partners during regular consortium meetings, where the evolving criteria and scoring anchors were a standing agenda item and were presented, discussed, and minuted at each cycle. The stakeholder sampling frame comprised more than 50 co-investigators and partner organisations, including Integrated Care Boards, NHS foundation trusts, a children’s hospital, CAMHS clinicians, commissioners, digital product developers, community-based arts providers, schools’ associations, and CYP-focused charities. In addition, we conducted targeted one-to-one consultations with subject-matter experts. Moreover, the Young [...] Panel, a PPIE group established at project inception, was engaged from the outset to ensure DPAM’s relevance and accessibility for CYP. The panel comprises CYP co-researchers from diverse backgrounds, recruited through partner networks at project start and retained throughout the study.

#### **Step 4: Pilot Testing the DPAM on Existing DPS**

To refine the initially proposed DPAM (Table 2), we applied the draft framework to 53 DPS. Candidates were identified through a Mapping Recording Exercise that invited co-investigators and partner organisations to submit resources used to map arts-based interventions (collected via Microsoft Forms). No a priori inclusion/exclusion criteria were applied; the aim was to stress-test DPAM's usability and coverage across real-world solutions familiar to stakeholders, rather than to generate a market-representative sample. Prior to assessment we conducted two feasibility checks: (i) removal of exact duplicates and (ii) confirmation that a public webpage or documentation was reachable at the time of desk review. Most of the platforms are publicly accessible online without needing to pay membership fees. Where key evidence was not publicly available, relevant items were recorded as not available (NA). This stakeholder-nominated, pragmatic sample was used solely to examine whether DPAM captures meaningful strengths and limitations; it should not be interpreted as exhaustive, comparative, or endorsing specific products. The full list of DPS is provided in Appendix X.

Platform evaluation was conducted by two raters with complementary expertise: one assessed functional and social dimensions, while the second evaluated technical aspect. The evaluation results were recorded across four categories: Works Well, Minor Concerns, Major Concerns, and Not Applicable. These categories are designed to support a nuanced, formative assessment of each DPS, enabling a clear understanding of their strengths and areas for development.

- **Works Well:** This indicates that the platform meets the specific criterion effectively and demonstrates good practice, either fully or very close to full compliance. No significant improvements are necessary.
- **Minor Concerns:** This denotes that the platform partially meets the criterion but shows some room for improvement. While these issues may not compromise overall functionality or safety, addressing them would enhance the quality and impact of the tool.
- **Major Concerns:** This suggests that the platform fails to meet the criterion in a significant way, potentially raising questions about its quality against the relevant criterion. Such findings warrant attention and, where applicable, remedial action.
- **Not Applicable:** This is used when a specific criterion does not pertain to the platform or system under evaluation. For example, certain criteria may only be relevant to clinical platforms that involve capturing user data. It is important to note that in many cases of our test run, this category was used when the required information was **not available by the team**. In such cases,

rather than assuming non-compliance, the team marked the criterion as not applicable to avoid inaccurate or unfair evaluation. In the future, we recommend **contacting platform developers directly** to request the relevant information, ensuring a more complete and transparent assessment. Alternatively, such a criterion may be reviewed by stakeholders who have relevant information.

This matrix serves as a formative assessment tool, designed to highlight the relative strengths and weaknesses of each DPS when evaluated against a comprehensive and multi-dimensional set of criteria. As not all criteria within the DPAM are universally applicable, marking genuinely irrelevant or unavailable items as “Not Applicable” helps ensure the evaluation remains precise, fair, and contextually appropriate.

In addition to the categorical assessment using the ‘Works Well’ / ‘Minor Concerns’ / ‘Major Concerns’ / ‘Not Applicable’ rating scales, the DPAM incorporates qualitative comments by evaluators against each criterion. These comments capture nuanced functionalities or features that categorical ratings alone cannot adequately represent. This allows the assessment to go beyond simple checkbox evaluation and to document specific implementation details, unique features, and contextual limitations (Figure 1). For example, when marking ‘Minor Concerns’ about interactive engagement, the comments could specify the interactive features and suggest potential improvements to enhance its interactivity. This qualitative evaluation process provides contextual information that supports in-depth analysis of each platform's strengths and weaknesses. These detailed observations not only justify the assigned ratings but also provide valuable insights for potential users seeking specific information about the DPS concerned, developers identifying improvement opportunities, and researchers analysing trends across platforms.

Criteria	Description	Items	Works Well Indicate what good in particular	Minor Concerns Indicate the concerns	Serious Concerns Indicate the concerns	N/A
<b>FUNCTIONAL FEATURES</b>						
Usability	DPD is intuitive, simple, and user-friendly for CYP (aligns with D1.3 Make the Service Simple to Use, DTAC)	Ease of Use	Generally easy to navigate and use, no complicated features involved. It is relatively easy to explore the information without complicated features involved.			
		Efficiency				
		Safety and Trust		Personal information required for membership login. The web contains video content. However, not much other interactive features apart from that.		
		Interactive Engagement				
		Clear and Understandable	Relatively straight forward and intuitive interfaces and navigation.			
		Accurate Content Provision	Provides news and useful information for its target group.			
		Integration and Adoption		It serves as a website for info dissemination, providing options to allow direct email contact, but no further information for the membership login page.		
Accessibility	Compliance with WCAG 2.1 Level AA standards to ensure accessibility for all users (aligns with D1.4 Make sure everyone can use the service, DTAC)	Inclusive and Equity		Free to use and join the membership. App also provided. Could however, provide larger text option provided. Slight issues with screen reader and ATT for accessibility check.		
		Engagement for Specific/Vulnerable Groups				
		User Empowerment				Unsure about membership features. From the website, it is not available.
		Cultural and Linguistic Adaptability			No option for different languages.	
		Infrastructure Adaptability	Work across different platforms.			

**Figure 1.** Examples of the assessment for functional features (by the authors).

The purpose of the test run was to validate the relevance of each initially proposed criterion to the existing digital platforms and tools. If a criterion yields useful comments for the majority of the DPSs, it proves to be useful and is included in the **short** version of DPAM. Nevertheless, some criteria, particularly those in the technical category, need additional information beyond what is available from their websites. We kept these criteria as they are essential based on the policies and guidance mentioned before. We are consulting relevant stakeholders to verify their relevance in later stages. Table 3 shows the criteria included in the **short** DPAM and their relevance to the assessed digital platforms.

**Table 3.** The relevant criteria of the DPAM as validated in the testing with DPSs

Criterion	Description	Applicable Rate
1	Ease of Use	52/53 (98.1%)
2	Efficiency	52/53 (98.1%)
3	Safety and Trust	52/53 (98.1%)
4	Interactive Engagement	53/53 (100.0%)
5	Clear and Understandable Interface	52/53 (98.1%)
6	Accurate Content Provision	51/53 (96.2%)
8	Inclusive and Equity	52/53 (98.1%)
9	Engagement for Specific/Vulnerable Groups	50/53 (94.3%)
10	User Empowerment	47/53 (88.7%)
11	Cultural and Linguistic Adaptability	52/53 (98.1%)
12	Infrastructure Adaptability	52/53 (98.1%)
13	GDPR Compliance	34/53 (64.2%)
15	Data Privacy and Security	32/53 (60.4%)
16	Data Transparency	31/53 (58.5%)
19	Data Integrity	28/53 (52.8%)
21	Data Minimisation	31/53 (58.5%)
44	Compliance with Standards	28/53 (52.8%)
54	Diverse Stakeholders	53/53 (100.0%)
55	Collaborative and Participatory Design	48/53 (90.6%)
56	Contextual Relevance	52/53 (98.1%)
57	Feedback Integration	51/53 (96.2%)
60	Organisation Alignment	51/53 (96.2%)
65	Sustainability	53/53 (100.0%)

Indeed, the test run flagged some criteria which yield little insight into a particular DPS's qualities at this stage. For example, in the technical dimension, T2 Encryption, T5 Access Control, T6 Audit and Monitoring, T8 Protection of vulnerable people etc were difficult to assess by the team due to limited information. In the social dimension, S5 Barriers Identification, S6 Evaluation Collaboration, S8 Outcome

Improvement, S9 Affordability S10 Cost-Effectiveness and Budget Alignment, S11 Economic Feasibility, although important for long-term adoption of the DPS, also required additional information. These criteria would be included in the full DPAM and removed from the short DPAM, which will be discussed below.

## Discussion

The DPAM aligns closely with current digital health evaluation priorities in mental healthcare for CYP. Catania et al. (2024) stress the critical role of usability, accessibility, and therapeutic alignment - all incorporated within the DPAM's Functional and Social Features. Similarly, Liverpool et al. (2020) highlight the need for CYP-specific design considerations, emphasised throughout the DPAM's focus on User Barriers and Stakeholder Input criteria. The framework also reflects insights from Ganga et al. (2024), who highlight the importance of reducing barriers to self-referral and engagement. By addressing these themes explicitly, DPAM supports a more inclusive approach to mental health technology deployment.

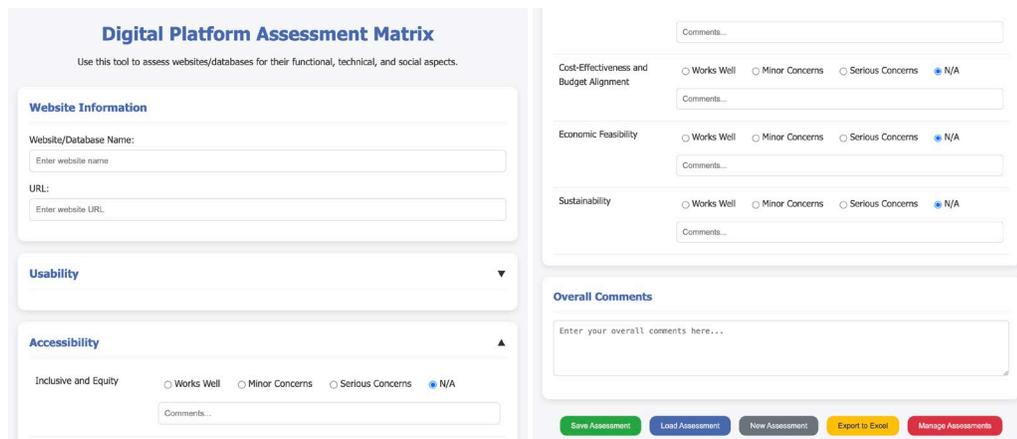
Literature also suggests that evaluation frameworks must balance innovation with careful consideration of potential harms, particularly for vulnerable populations. Multiple studies emphasise the need to establish the effectiveness of digital lifestyle interventions in real-world contexts, determine optimal "dose" and duration parameters, and create clear pathways for clinical implementation (Smith et al., 2023; Zanaboni et al., 2018; Buchan et al., 2024). These approaches recognise that technological excellence alone does not guarantee successful implementation or positive health outcomes. Indeed, DPAM's structured approach enables a balanced evaluation between technical soundness and social engagement, which is essential for the longevity of digital platforms. Furthermore, it emphasises interoperability with the existing health system and smooth information exchange. The DPAM emphasises the Open Referral Standard of data, which is widely used in the UK healthcare system ([Introducing Open Referral UK.](#)).

We have kept both the initial **full** DPAM and **short** DPAM as they may be used in different scenarios. We propose to involve all stakeholders in the assessment process of a concerned DPS, as such testing is the most reliable way to provide validations (De Angelis et al. 2024; Papadopoulos et al. 2024). For example, the users who comprise CYP, parents and carers, schools, primary care professionals, CAMHS, community groups, etc, would be most interested in the functional dimension. Their comments on usability, accessibility and user barriers would be the most valuable. The technical and social aspects are more relevant to service providers, developers, local authorities, researchers, commissioners and the like, who consider the long-term use and sustainability of DPS. The assessment results from these stakeholders can then be aggregated and inform further improvement of existing systems and future development of new ones. This fulfils the advocacy made

by Smith et al. (2023), Bhawra et al. (2022) and Shapiro et al. (2023), who emphasise the importance of co-design or stakeholder-driven approaches, particularly when developing systems for vulnerable or marginalised communities.

Nevertheless, Fadahunsi et al. (2021) and Sedhorn et al. (2021) suggested that frameworks often lack guidance on the relative importance of different evaluation criteria and optimal measurement approaches, limiting their practical utility. In this respect, the short DPAM is a useful tool for quick assessment using available information.

Literature also suggests that existing evaluation frameworks have limited automation capacity, which means they are laborious and time-consuming (Maqbool and Herold, 2023; Welzel et al., 2023). To address workflow inefficiencies in the assessment process, we digitalised the DPAM documentation by developing a web-based interface to present and collect evaluation results against the 65-criteria (Figure 2). This custom HTML application streamlines the manual assessment process by providing evaluators with a structured environment to efficiently document their ratings and comments. While the actual evaluation still relies on human judgment, the interface eliminates cumbersome paperwork and facilitates organised data collection systematically. Evaluators can quickly assign ratings and document detailed observations in a consistent format. Upon completion, the entire assessment can be exported into an Excel file for further analysis, comparison, and reporting. This digital approach significantly improves the efficiency of the implementation of DPAM, while maintaining the depth and rigour of human-centred evaluation of DPS.



**Figure 2.** Screenshots of the web-based DPAM (by the authors)

The DPAM differentiates itself from existing evaluation frameworks through several key innovations. It incorporates CYP's considerations, directly responding to Ganga et al.'s (2024) findings on digital mental health accessibility for young users. The framework aligns with UK healthcare priorities by integrating NHS Digital Technology

Assessment Criteria (DTAC) standards and Open Referral Data standards, thereby addressing Flott et al. (2016) identified need for system-wide digital maturity assessments. The DPAM addresses the broader ecosystem of DPS rather than focusing on individual health apps and digital health products.

Furthermore, the DPAM provides actionable evaluation parameters with clearly defined rating scales. Its combination of quantitative ratings and qualitative commentary overcomes limitations highlighted by Maqbool and Herold (2023) regarding over-reliance on single-method evaluation approaches.

## **Conclusion**

To answer our research question on the evaluation framework and features of a successful platform, the DPAM is a significant tool, and arguably the first digital assessment tool for CYP mental health, particularly concerning arts-based initiatives in the UK. It emphasises usability, information accuracy and clarity, reducing barriers for vulnerable groups, data security and standardisation that allows interoperability and smooth exchange of information across systems and platforms. It promotes clinical safety, stakeholder input, and cost-effectiveness, which ensures the longevity of a digital system.

It is acknowledged that iterative development processes are beneficial for many successful framework development initiatives (Borycki et al., 2024). Our 4-step process began with a review of literature and culminated in thematic integration of concepts from established models (Borycki et al., 2024). We have proposed the **full** DPAM and the **short** DPAM for different scenarios. As we explore the **full** DPAM with stakeholders, the framework can evolve based on emerging evidence and changing technological landscapes, such as the rapidly developing GAI and AI technologies (Zanaboni et al., 2018; Ricciardi et al., 2019), as well as stakeholder experiences. DPAM leaves room for further refinement.

The limitation of the DPAM lies in its external validity, which needs further involvement of diverse stakeholders as suggested before. It has only been tested on a limited number of DPS. We cannot be certain if the criteria included are exhaustive or all relevant, even though both a short version and a full version of the DPAM are proposed. A further step we could take is to test its interrater reliability, where different raters do the assessment and the degrees of agreement between them are analysed. In addition, we may have missed some relevant literature despite the considerable effort from project team to capture as much of the published literature as possible.

In sum, the integrated approach of establishing the DPAM reflects growing recognition that successful DPS must not only be technically sound but also user-

centred, accessible, and embedded within broader healthcare ecosystems. As DPS continues to transform healthcare delivery, comprehensive evaluation frameworks will prove to be increasingly vital for ensuring these systems fulfil their promise of improving health outcomes while minimising potential harms (Ross et al., 2021). The DPAM will be useful to support decision-making in developing new digital platforms and systems.

## Conflicts of Interest

None declared

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