Beyond Efficacy: A Multi-Stakeholder Study of Deployment Constraints in Immersive Digital Therapeutics for Adolescents with ADHD*

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Abstract

Immersive digital therapeutics, including virtual reality and augmented reality platforms, show strong clinical promise for adolescents with attention deficit hyperactivity disorder. Yet a significant gap persists between what these tools achieve in controlled settings and what occurs when they are introduced into real schools, clinics, and family homes. This study examines how key stakeholders experience the governance, infrastructure, and institutional conditions shaping the real-world deployment of these systems. We conducted qualitative interviews with 17 participants from four stakeholder groups (designers, therapists, parents, and teachers) in Finland, India, the Netherlands, and the USA. Structured inductive analysis revealed convergent patterns across contexts. Three aggregated dimensions were identified: ethics, safety, and governance; infrastructure, access, and system readiness; and institutional and human capacity constraints. Building on these dimensions, the study develops the Multi-Layered Deployment Constraint Model, which positions deployment readiness as a system-level property shaped by the interaction of regulatory, infrastructural, and institutional conditions rather than a function of platform design. The findings provide a deployment-level perspective to health informatics and information systems research and offer concrete guidance for policymakers, developers, and healthcare institutions seeking to move immersive ADHD therapeutics from research settings into sustainable clinical use.

Keywords

Immersive digital therapeutics, Adolescents with ADHD, Deployment constraints, Socio-technical systems, Digital health governance

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1. Introduction

Immersive digital tools ranging from Virtual Reality (VR) and Augmented Reality (AR) to metaverse spaces are increasingly used in the treatment of Attention Deficit Hyperactivity Disorder (ADHD), particularly among adolescents. Evidence shows that these platforms can improve attention, reduce symptom severity, and sustain engagement better than traditional interventions [1, 2, 3]. The Food and Drug Administration (FDA) authorized the game EndeavorRx, and several VR cognitive training programs demonstrated that digital tools can meet clinical standards [4, 5].

Despite this promise, translating clinically validated VR systems into real-world settings such as schools, clinics, and homes remains deeply challenging. These platforms face fragmented regulation, unreliable infrastructure, undertrained workforces, and slow-moving institutions [6, 7, 8]. Adolescents with ADHD are a particularly important group in this regard: they are developmentally at a stage where consistent, sustained therapeutic access matters most. Yet they are the most underserved by systems that require stable infrastructure and institutional coordination to function. It is these deployment conditions, not software quality, that ultimately determine whether immersive therapeutics reach the young people who need them. Yet the research community has invested heavily in demonstrating efficacy under controlled conditions while paying comparatively little attention to the structural prerequisites for

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real-world use. A technology that works in a laboratory but cannot be sustained in a school, clinic, or home is not, in any practical sense, a working therapeutic tool.

The existing literature leaves four gaps. First, while studies note cross-national variation in digital health law and AI safety standards [6, 9], we know little about how stakeholders actually navigate this regulatory complexity in practice. Second, infrastructure barriers including hardware cost, connectivity, and the absence of universal standards are typically treated as secondary concerns rather than primary obstacles to access [7, 8]. Third, institutional readiness factors such as digital literacy, workforce capacity, and cross-sector collaboration remain underexplored as structural constraints [3, 10]. Fourth, the field has largely treated immersive ADHD tools as products to be improved rather than components of a wider socio-technical system [7].

Taken together, these gaps point to a need for research that centres the deployment environment rather than the platform itself. Understanding deployment barriers requires hearing directly from the people who operate within them: clinicians navigating regulatory constraints, designers confronting infrastructure limitations, teachers managing institutional pressures, and parents attempting to sustain treatment at home. This study therefore examines these conditions through a qualitative, multi-stakeholder lens, guided by the following research question: How do key stakeholders experience the governance, infrastructural, and institutional conditions that shape the real-world deployment of immersive digital therapeutics for adolescents with ADHD? We examine this question via three lenses: (1) stakeholder views on regulatory/ethical risks; (2) infrastructural barriers to access; and (3) institutional capacities for integration.

The study makes contributions to health informatics, information systems, and digital therapeutics research. It reframes the focus from how these systems should be designed to whether and how they can be deployed in practice. It reconceptualizes immersive ADHD therapy as a socio-technical system which is shaped by governance structures, infrastructure conditions, and institutional capacity. And it develops an empirically grounded deployment constraint model that provides researchers, policymakers, developers, and healthcare institutions with a concrete foundation for action.

2. Background

The deployment of immersive digital therapeutics for ADHD sits at the intersection of clinical innovation, regulatory complexity, and socio-technical infrastructure. To understand these dimensions, it is important to explore the therapeutic potential of these tools, the governance landscape they operate within, and the theoretical frameworks used to understand why technically capable systems often fail in practice.

2.1. Immersive Digital Therapeutics in ADHD

ADHD is one of the most prevalent neurodevelopmental conditions in childhood and adolescence, affecting approximately 5% to 7% of young people globally, with 60% to 70% of cases persisting into adulthood [11, 12]. Traditional interventions, including pharmacological and behavioral approaches, carry well-documented limitations: medication side effects, inconsistent long-term outcomes, and poor engagement among adolescents who are native to digital environments [13]. The neurodiversity perspective reframes ADHD not as a deficit to be corrected but as a variation in cognitive profile that interventions should accommodate rather than suppress. This framing has grown in influence within both clinical and design communities [14].

Immersive technologies, including VR cognitive training, AR behavioral support, and metaverse-based therapy environments, have emerged as a meaningful complement to conventional care. A major meta-analysis found that VR-based interventions produced significant gains in working memory and sustained attention in children with ADHD [2]. The FDA's authorization of EndeavorRx demonstrated that game-based digital tools can meet strict clinical and regulatory standards. These platforms are especially effective for teenagers because they align with adolescents' existing digital engagement patterns and keep them motivated in ways that traditional therapy often cannot [4, 3]. More recent

work has explored metaverse platforms as spaces for multi-modal therapy, combining virtual social environments, structured clinical goals, and adaptive difficulty scaling within a single environment [15, 10].

Pilot deployments have begun appearing in hospitals, schools, and telehealth programmes across Asia, North America, and Europe. However, nearly all existing evidence comes from controlled laboratory settings. [1] demonstrate VR effectiveness for ADHD under stable, well-resourced conditions, and [16] confirm cognitive gains through computerized training in randomized controlled trials, yet neither study was designed to capture what happens when these systems are introduced into the regulatory, institutional, and infrastructural complexity of real-world clinical and educational environments. This gap between controlled efficacy and real-world feasibility is precisely what this study addresses.

2.2. Governance and Regulatory Landscape in Immersive Digital Therapeutics

Immersive ADHD therapeutics are not purely software products. They collect and process sensitive biometric and behavioral data from a legally and developmentally vulnerable population, placing them within some of the most complex areas of digital health governance. The European Union's General Data Protection Regulation (GDPR) imposes strict conditions on the collection and processing of minors' data [17], while the EU AI Act adds oversight and transparency obligations specifically for high-risk health systems, requiring human oversight mechanisms and clear accountability chains before deployment. In the United States, the FDA through the Digital Health Center of Excellence regulates many digital therapeutic and clinical software products under device software and Software as a Medical Device (SaMD) frameworks, with distinct pre- and post-market review requirements that differ substantially from the European approach. Insurance reimbursement structures add a further layer of adoption pressure that varies considerably across healthcare systems. For developers working across these jurisdictions, navigating overlapping and sometimes conflicting compliance demands presents a major practical barrier [6], and the resulting regulatory fragmentation has been identified as one of the primary obstacles to immersive healthcare adoption globally [9].

Child safety within multi-user immersive environments adds further regulatory complexity. When therapy takes place in shared or metaverse-style spaces, risks including algorithmic manipulation, predatory behavior, and age-inappropriate content require safeguards that extend well beyond standard data protection law. Existing child protection and digital platform regulations impose additional obligations on platforms accessible to minors, while [18] document a broader set of psychological and social risks arising from immersive digital environments that current regulatory frameworks are ill-equipped to address. Developers and clinicians must therefore navigate data law, AI regulation, medical device standards, and children's rights frameworks simultaneously and without a unified compliance pathway, a structural condition that shapes deployment feasibility before a single clinical session can take place.

2.3. Socio-Technical Systems and Theoretical Framework

A persistent observation in digital health research is that technologies which perform well in controlled trials routinely fail when transferred to real-world settings. Socio-technical systems theory offers a principled explanation for this pattern. Originating in organizational studies and widely adopted in Information Systems (IS) research, the theory holds that technology cannot be understood or deployed in isolation from the people, institutions, and governance structures that surround it [19]. Effective deployment requires the technical and social dimensions to develop and adjust together; evaluations that focus solely on platform efficacy miss this interdependence entirely.

Frameworks such as the Technology Acceptance Model (TAM) have been widely applied to digital health adoption, but they center individual attitudes and behavioral intentions while largely ignoring structural and institutional constraints [20, 21]. Moving from individual-level to system-level analysis, implementation science frameworks, particularly the Consolidated Framework for Implementation Research (CFIR), provide a stronger fit for the challenges facing VR-based therapy, attending to the

inner organizational context, the outer policy environment, and the practical steps required to embed a new practice within an existing system [22]. The Metaverse Equitable Rehabilitation Therapy(MERTH) framework, developed specifically for immersive rehabilitation contexts, similarly positions institutional integration and cross-sector collaboration as foundational requirements rather than desirable additions [7].

Two further dimensions of deployment readiness are frequently overlooked in research on therapeutic technology: infrastructure and interoperability. Immersive systems depend on fast and stable connectivity, consistent hardware performance across devices, and shared technical standards that allow data and functionality to transfer reliably between clinical, educational, and home environments. [8] identify interoperability as a systemic challenge specific to metaverse health platforms, and [7] frame infrastructure inequity as a direct threat to equitable access in virtual rehabilitation. These conditions cannot be assumed in many healthcare or educational settings, and the deficit is especially severe in under-resourced or rural contexts. This study draws on these frameworks to examine how governance structures, infrastructure conditions, and institutional capacity collectively shape the deployment environment for immersive ADHD therapeutics, treating deployment readiness as a system-level property rather than a matter of individual user willingness.

3. Methodology

This study employs a qualitative, multi-stakeholder interview design to examine how governance, infrastructure, and institutional constraints shape the real-world deployment of immersive digital therapeutics for adolescents with ADHD. A qualitative approach was chosen because the research aims to understand how stakeholders experience and interpret deployment challenges within complex, context-dependent healthcare environments. Rather than evaluating a specific platform, the study focuses on deployment feasibility as a systemic phenomenon: how regulatory, infrastructural, and institutional conditions interact to shape whether and how these tools can be adopted. This orientation is consistent with Healthcare IS research, which attends to the interplay between technology, human behavior, and governance structures in digital health ecosystems.

Participant recruitment combined purposive and snowball sampling, drawing on professional networks including LinkedIn. The sampling strategy was designed to achieve both domain relevance and diversity across the therapeutic ecosystem. Prospective participants were included if they satisfied at least one of the following conditions:

1. Sustained professional engagement with ADHD adolescents, defined as a minimum of three years working directly with this population in a clinical, educational, or caregiving capacity.
2. Practical experience in the development or deployment of digital or immersive therapeutic systems, including involvement in design, implementation, or technical evaluation.

Seventeen participants were selected across four stakeholder groups: designers, therapists, parents, and teachers. Table 1 provides a full overview of participant distribution by group, country, and contribution to the study. Designers contributed technical and platform deployment perspectives; therapists offered clinical governance and practice insights; parents provided a caregiver access and safety view; and teachers offered an institutional integration perspective. The Netherlands-based participant appeared exclusively in the designer group, as a freelance designer, with contributions principally reflected in infrastructure and governance themes. This multi-perspective strategy supports theoretical triangulation by capturing interpretations of deployment challenges across different roles within the therapeutic ecosystem.

Data was collected through semi-structured interviews, which allowed participants to reflect freely on their experiences while keeping discussion anchored to three core areas: perceptions of regulatory and ethical challenges, experiences with infrastructure and access constraints; and institutional and organizational factors affecting adoption. Interviews were conducted online, recorded with participant consent, and subsequently transcribed. This format enabled participants from Finland, India, the

Netherlands, and the United States to provide detailed, context-rich accounts of real-world deployment conditions across varied national and institutional settings.

Table 1
Participant Overview, presenting stakeholder group, participant count, country of participation, and primary contribution to the study

Stakeholder Group	Participant Count	Country	Contribution to Study
Designers	5	Finland, India, Netherlands and USA	Technical and platform deployment perspective
Therapists	5	Finland, India and USA	Clinical governance and practice perspective
Parents	4	Finland, India and USA	Caregiver access and safety perspective
Teachers	3	Finland and India	Institutional integration perspective

Analysis followed the Gioia methodology [23], a structured inductive approach that builds conceptual categories directly from participant language rather than application of pre-existing categories. The process unfolded in three stages. First, interview transcripts were reviewed to identify first-order concepts closely reflecting how participants described their experiences, capturing recurring themes around governance, access, and institutional readiness. Second, these concepts were grouped into second-order themes representing broader theoretical patterns, moving from descriptive to interpretive levels. Third, the second-order themes were consolidated into three aggregated dimensions: Ethics, Safety and Governance; Infrastructure, Access and System Readiness; and Institutional and Human Capacity Constraints. Two researchers coded independently; disagreements were resolved through structured discussion, with unresolved codes referred to a third reviewer. NVivo 12 supported data organization and traceability. Given the exploratory design, the study aims for conceptual sufficiency rather than statistical generalization, capturing convergent patterns across stakeholder groups without claiming to represent all possible perspectives exhaustively.

4. Findings

The thematic analysis produced three aggregated dimensions: Ethics, Safety and Governance; Infrastructure, Access and System Readiness; and Institutional and Human Capacity Constraints. Each captures a distinct layer of the structural conditions shaping deployment feasibility. Figure 1 presents the full Gioia structure, tracing first-order concepts through second-order themes to each aggregated dimension.

4.1. Ethics, Safety, and Governance

All participants acknowledged the therapeutic potential of immersive technology while identifying ethical and governance conditions as prerequisites for safe clinical use. Concerns clustered around three issues: data control and algorithmic transparency, child protection in shared digital environments, and regulatory fragmentation across national contexts.

On data governance, participants understood the necessity of data collection for adaptive intervention but were concerned about the absence of transparent oversight. One noted that ”if we do not control the machines, they can answer something really upsetting for the person, and we do not know the consequences of those answers” (Int. 10). Most agreed that rules governing data access, model training, and AI behavior must be established before clinical deployment can proceed responsibly.

Child safety in open-platform and multi-user environments was a persistent concern. Participants raised scenarios involving manipulative content, unsupervised mixed-age interaction, and predatory behavior. One designer articulated a view shared by a minority of parents and therapists: "They think VR is fundamentally inappropriate for kids because these are individuals who have yet to form full conceptions of reality... And you're now putting a thing in there where some company like Facebook or whatever can manipulate that" (Int. 3). Parents described compensating by educating their children about online safety themselves, highlighting the perceived absence of adequate platform-level safeguards.

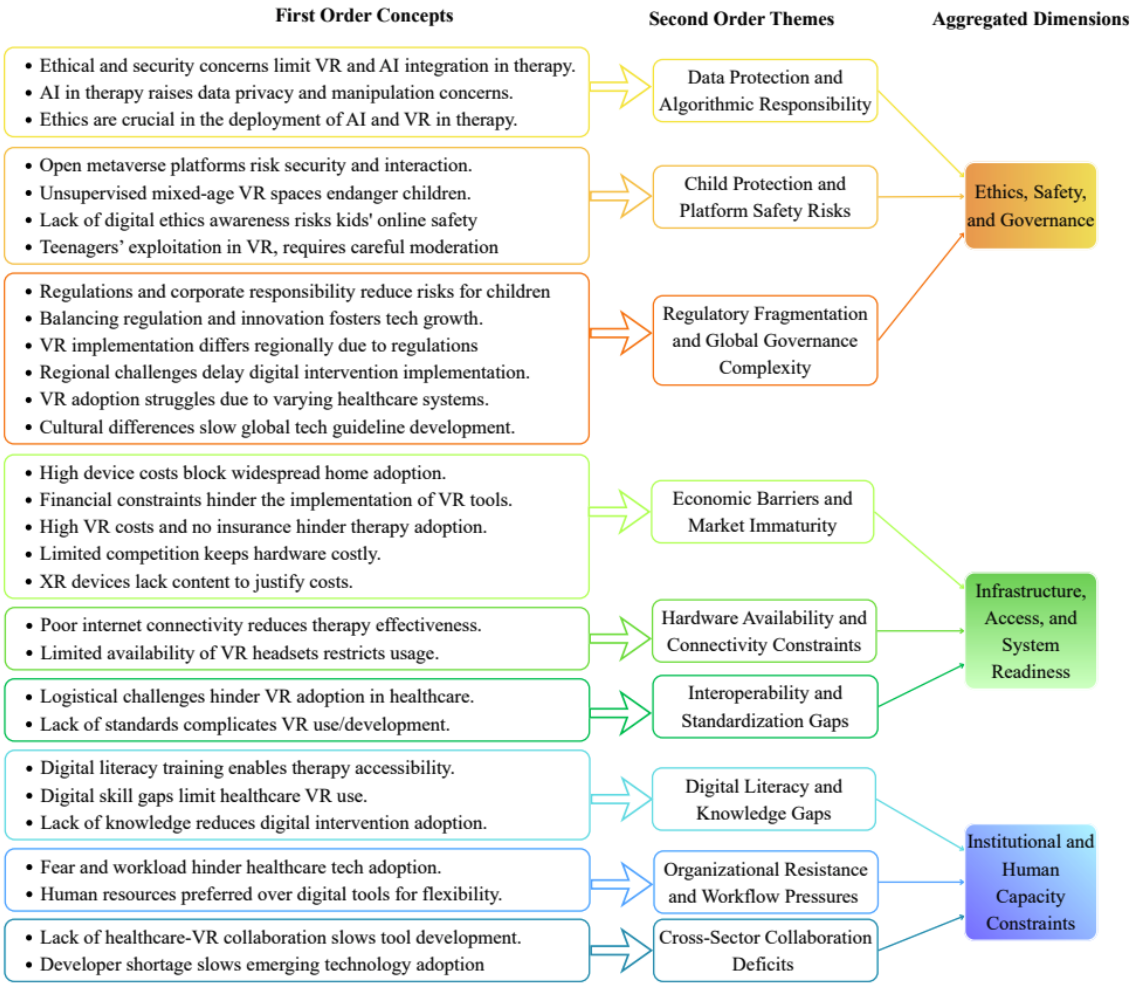


Figure 1: Gioia analytical structure illustrating the progression from first-order concepts to aggregated dimensions

National regulatory variation added further complexity. Participants from Finland, the United States, the Netherlands, and India described substantially different data protection regimes, AI governance frameworks, and children's digital rights. One European stakeholder noted: "In Europe, because of the GDPR rules, it's very difficult to implement things" (Int. 10). A participant from India contrasted this with stigma-driven and infrastructure-driven barriers in their context and noted structural differences in how insurance-led versus publicly funded healthcare systems shape adoption. Participants also flagged the risk of over-regulation, warning that overly restrictive frameworks could slow access for the children who stand to benefit most.

4.2. Infrastructure, Access, and System Readiness

Participants across all groups described hardware cost, connectivity unreliability, and institutional unpreparedness as primary rather than secondary obstacles to therapeutic continuity.

Hardware cost was the most frequently cited access barrier. VR therapy was widely regarded as clinically appropriate but financially inaccessible for many families. One designer stated: ”These technologies... raise the price by 200 bucks... they should not be available only to the ultra-rich” (Int. 3). Continuity was an equally serious concern: one participant described a school programme where children engaged strongly while headsets were available, only to disengage once the devices were removed and unavailable at home. Participants expected prices to fall over time but acknowledged this offers no relief for families with urgent therapeutic needs.

Network reliability and institutional IT governance created additional friction. A therapist described the disruption of clinical VR sessions: ”Is my signal good? Is it connected to the right network? Is the app up to date? We need to eliminate all these things and just have the therapist and client connect” (Int. 8). The same participant described a university IT department repeatedly shutting down a VR research programme over unapproved network traffic. Per-deployment approval requirements compounded these barriers: ”You have to get approval from every single parent of every single student in every single classroom. And it’s not a simple thing” (Int. 16). Participants agreed that resolving standardization across institutional settings would require sustained cross-sector effort.

4.3. Institutional and Human Capacity Constraints

Even where infrastructure exists, institutions must be organizationally prepared to integrate these tools. This dimension captures constraints related to knowledge gaps, workforce strain, and the structural disconnect between clinical and technology development communities.

Digital literacy gaps were reported across all stakeholder groups. Clinicians needed clinical evidence, implementation guidance, and practical onboarding support; parents needed accessible training to sustain treatment at home. One designer noted: ”Lack of knowledge is another problem. People are not getting much information about these technologies, and maybe they are getting, but that’s not the correct information” (Int. 2). Workforce pressure compounded these gaps, with healthcare staff under strain experiencing new technology adoption as an additional burden: ”Some people are just so tired with the work, they do not have the attitude to gain new knowledge or try new things” (Int. 10).

The structural disconnect between technology developers and clinical practitioners was identified as the deepest institutional constraint. Developers lacked clinical input; clinicians lacked tools that fit their workflows. One therapist described what genuine collaboration would need to produce: ”We have to do a good job of representing our interests for them in a way they understand. They can respond and make versions of their devices that are brutally simplified for healthcare, very secure... and only when that happens will the people who make the software be able to actually bridge these gaps” (Int. 8). Bodies such as the International VR and Healthcare Association and the American Medical XR Association were identified as potential bridges, though participants noted that formal sustained collaboration mechanisms remain scarce.

4.4. Summary of Findings

Across all three dimensions, a consistent pattern emerged: the barriers are not located within the platforms themselves but in the surrounding conditions that determine whether those platforms can function in practice. Taken together, these dimensions suggest that deployment feasibility is a systemic property shaped by the interaction of regulatory, infrastructural, and institutional conditions rather than a challenge that can be resolved at the level of platform design.

5. Discussion

The findings reveal that barriers to deployment are not failures of platform design but failures of the surrounding systems: the regulatory frameworks that precede clinical use, the infrastructure that sustains it, and the institutional capacity that determines whether it can be maintained. This points to a

significant shift in how the field should evaluate these technologies, away from whether they work under ideal conditions and toward what conditions must exist for them to work at all.

5.1. A Multi-Layered Deployment Constraint

The findings support a model in which three interdependent layers, namely governance, infrastructure, and institutional capacity, must align before immersive ADHD therapeutics can function reliably in practice. Figure 2 represents this as the Multi-Layered Deployment Constraint Model, illustrating how each layer interacts with the others and how misalignment in any one layer undermines the whole system.

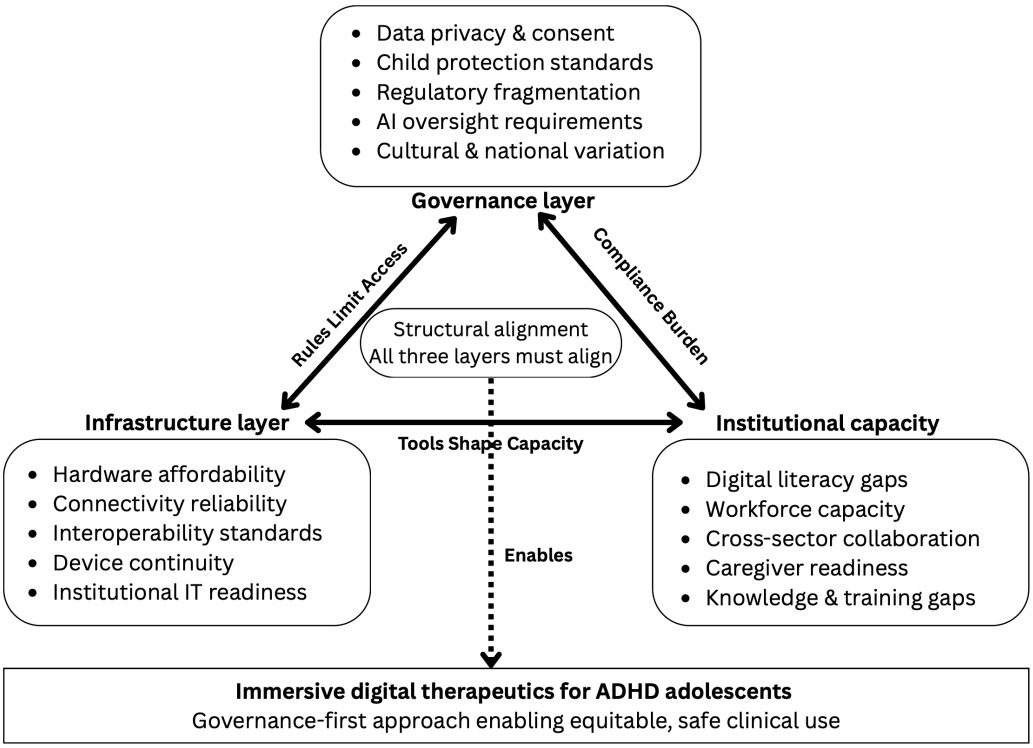


Figure 2: Deployment readiness as a multi-layered deployment constraint Model

The governance layer encompasses data privacy regimes, child protection standards, AI oversight requirements, and fragmented national regulatory frameworks that participants consistently described as prerequisites for deployment. GDPR compliance places a high burden on developers in European contexts[24]; the U.S. follows a reimbursement-centered and SaMD-centred logic[25]; and contexts such as India present a different configuration of barriers centered on stigma and limited formal regulation. These divergences make a single universal compliance pathway currently impossible, leaving developers and clinicians without a clear route before any clinical session begins.

The infrastructure layer encompasses hardware affordability, connectivity reliability, device continuity across settings, and the absence of interoperability standards. These are not background conditions but active barriers: disrupted sessions, excluded families, and ad hoc institutional approval processes are direct consequences of infrastructure misalignment. ADHD symptom presentation varies across home, school, and clinical environments, making cross-context continuity a therapeutic necessity rather than merely a logistical convenience.

The institutional capacity layer covers workforce readiness, caregiver knowledge, and the structural gap between technology developers and clinical practitioners. Even technically capable tools fail when staff are overburdened, parents are unsupported, and developers lack clinical input. The fact

that participants pointed to professional associations as potential bridges while acknowledging that functional collaboration mechanisms remain scarce underscores that this is a structural gap, not a design problem. Consistent with socio-technical systems theory, the model treats deployment readiness as a property of the entire surrounding system; refining the platform cannot resolve governance fragmentation, infrastructure gaps, or workforce strain.

5.2. Theoretical Implications

This study makes three contributions to IS and digital health theory. First, it reframes the field's central question. Prior research has largely focused on whether immersive interventions improve ADHD outcomes [26, 16]. This study redirects attention to deployment feasibility, asking what structural conditions must be present for these tools to be used at all. The barriers identified, including hardware inaccessibility, cross-context discontinuity, caregiver unpreparedness, and workforce pressure, are systemic constraints that efficacy studies are not designed to capture and that clinical promise alone cannot overcome.

Second, the study extends socio-technical IS theory [19, 9] by showing that the three deployment layers are mutually constraining rather than merely additive. Regulatory frameworks determine which adaptive features can be legally operationalized; infrastructure determines whether those features can be delivered consistently across contexts; and institutional capacity determines whether clinicians, parents, and teachers can use them effectively. Each layer shapes and is shaped by the others, and improvement in one does not substitute for failures in another. The CFIR and the MERTH framework anticipate parts of this picture; both describe deployment conditions as separate categories that occur at the same time. However, they do not show how these conditions depend on each other or follow a cause-and-effect sequence in real-world deployment. CFIR treats regulatory and organisational conditions as parallel contextual factors rather than mutually constraining layers [22], while MERTH lacks specialized protocols for pediatric AI governance [7]. The multi-layered deployment constraint model addresses this gap: it proposes that governance compliance must precede and actively shape both infrastructure investment and institutional capacity-building, a sequenced interdependence that existing frameworks do not explicitly model.

Third, the study advances governance research in therapeutic contexts. Participants valued features including personalised difficulty scaling and real-time environmental adaptation while identifying non-technical barriers that technical research does not address: regulatory embeddedness, where GDPR and the EU AI Act classify these as high-risk systems requiring legal compliance before clinical use; cultural calibration, where stakeholders from Finland, India, and the U.S.A held meaningfully different norms around therapy, data, and parental involvement; institutional trust structures, where the competing interests of designers, therapists, and parents are not resolvable through interface design; and the need for clinical transparency, where therapists cannot supervise AI-driven adaptations they cannot interpret. As noted by [6], the line between therapeutic monitoring and behavioral data extraction in immersive environments is ethically and legally indeterminate, a concern grounded throughout in the direct experience of participants.

5.3. Practical Implications

The Multi-Layered Deployment Constraint Model offers practical guidance for each stakeholder group, with Figure 2 serving as an organizing framework for these recommendations.

For policymakers, the cross-national governance divergence identified here confirms that no single framework currently serves all deployment contexts. Priority actions include harmonising data protection standards for digital therapeutics that collect children's health data, developing international coordination mechanisms to resolve cross-border conflicts, and exploring hardware subsidy schemes analogous to Finland's KELA model (the national social insurance scheme that subsidises assistive and rehabilitative technologies for eligible individuals) to address affordability-driven exclusion [27]. The governance layer of the framework functions as a precondition for the other two: without a viable

compliance pathway, infrastructure investment and institutional capacity-building cannot translate into clinical deployment.

For developers, the model indicates that privacy-by-design must be embedded from the outset rather than added to systems built around engagement and data collection[28]. Adaptive features, however effective, cannot be deployed in regulated clinical contexts without interpretable decision logic that allows therapist oversight[29]. Hardware design priorities should address the specific demands of institutional contexts including lighter devices, simpler network configurations, and cross-setting continuity. The infrastructure layer in the framework shows that tools that work in a lab but fail in a school IT environment or cannot be used at home are not deployment-ready regardless of their clinical performance.

For healthcare institutions, the model's institutional capacity layer points to three immediate priorities. Training programmes must address the full stakeholder chain including clinicians, parents, and teachers, since between-session continuity depends on caregiver capability. Onboarding processes must be simplified, with dedicated technical support roles rather than expecting therapists to manage device setup during sessions. Formal cross-sector collaboration structures between clinical teams and platform developers are needed from the design stage. The institutional capacity depends on and enables the other two layers: a well-trained, well-supported workforce is the mechanism through which governance compliance and infrastructure investment actually reach the adolescent.

5.4. Limitations and Future Directions

Three limitations warrant acknowledgement. First, the direct perspectives of adolescents with ADHD are absent; the study captures adult stakeholder experience but not the end-user view that should ultimately guide deployment decisions. Second, while the multinational sample adds breadth, findings cannot be mapped precisely to any single deployment context, as barriers carry different weights across national systems. Third, qualitative design supports conceptual rather than statistical generalization; the study identifies structural constraints but does not quantify their relative impact on therapeutic outcomes.

Future research should center the adolescent voice through direct interviews with young people with ADHD. The cross-national governance divergence identified here has not been systematically mapped across frameworks such as the EU AI Act, GDPR, HIPAA, and emerging global south regulations; comparative policy analysis could identify where alignment is both feasible and child protective. Longitudinal implementation studies are needed to track how schools and clinics use these tools over time and to identify whether brief training is sufficient or whether sustained support is required. Health economic analysis of hardware subsidy models and insurance reimbursement pathways would provide the evidence base that policymakers currently lack.

6. Conclusion

This study began with a simple but significant observation: the research community has invested much time in demonstrating that immersive digital therapies work for teenagers with ADHD, while paying far less attention to whether the conditions required to deploy them exist. The findings confirm that this gap is not coincidence. Across seventeen interviews with designers, therapists, parents, and teachers, the barriers to deployment were located not within the platforms themselves but in the regulatory, infrastructural, and institutional environments into which those platforms must be introduced.

These conditions do not operate independently. Fragmented governance frameworks leave developers and clinicians without a viable compliance pathway before a single session can take place. Infrastructure limitations, from hardware affordability to connectivity reliability to the absence of shared technical standards, disrupt the cross-context continuity that adolescents with ADHD specifically require. And institutional unpreparedness, spanning workforce strain, caregiver knowledge gaps, and the structural disconnection between clinical and technology development communities, means that capable tools routinely arrive in environments that are not ready to sustain them. The Multi-Layered Deployment

Constraint Model, presented in Figure 2, formalizes this interdependence, arguing that deployment readiness is a property of the whole surrounding system and that misalignment in any one layer undermines the others.

The cross-national dimension of these findings deserves particular emphasis. GDPR obligations in Europe, insurance-driven adoption patterns in the United States, and the combination of social stigma and infrastructure limitations in India each configure the deployment problem differently. A single governance response cannot address this variation, and future policy work must attend to how different national contexts produce different barriers even when the underlying technology is the same.

Meaningful progress requires coordinated action from all parts of the system. Policymakers must harmonize child-protective data frameworks and address hardware accessibility. Developers must embed privacy-by-design and cross-device interoperability from the outset rather than treating them as compliance afterthoughts. Healthcare institutions must invest in workforce training, caregiver support structures, and formal cross-sector collaboration with technology developers. These are not optional improvements to an existing approach. They are the foundational conditions under which immersive ADHD therapeutics can move from controlled research settings into the lives of the adolescents who need them most.

Declaration on Generative AI

During the preparation of this manuscript, Claude was used to correct grammar, refine language, and adjust the academic tone. All AI-generated content was reviewed and edited by the authors (first and second), who take full responsibility for the final version of the manuscript.

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