Manifesto from Dagstuhl Perspectives Workshop 25102

The Future of Games in Society

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Abstract

Over four billion people play games, generating a trillion hours of play annually and fuelling a $230+ billion industry. Games now function as platforms for education, health intervention, scientific research, social connection, and cultural expression. Yet their potential to serve society remains largely unrealized, constrained by fragmented research, limited data access, insufficient funding, and weak links between academia, industry, and public policy. This manifesto, produced by 26 games researchers at Dagstuhl Perspectives Workshop 25102, addresses two audiences: the games research community, which needs coordinated infrastructure and shared standards to mature as a field; and public policymakers, who require evidence-based guidance to regulate, fund, and leverage games for societal benefit. We present nine thematic working group reports (in appendices) covering human flourishing, education, harm prevention, behavioural research platforms, research infrastructure, industry-academia collaboration, assessment rigour, global funding, and research impact. From these, we derive cross-cutting findings and six policy priority areas with concrete recommendations naming the actors who must act and the actions they must take.

This Dagstuhl Manifesto is a collection of the thoughts and writings of all participants, and further inspired by countless others who work every day to continue realizing the potential of games as a positive factor in society.

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Executive Summary

Digital games engage over four billion people worldwide [203, 202], fuel a $230+ billion industry, and drive innovation in artificial intelligence, data science, and human-computer interaction. Games already serve as educational tools, health interventions, citizen science platforms, and social infrastructure. However, this manifesto identifies a persistent gap between what games could contribute to society and what they currently offer. Despite many examples of positive impact from games, addiction and monetization harms, toxicity, fragmented research, lack of educational games takeup in education, and limited data access, form persistent examples that undermine the medium's positive potential. Industry self-regulation has proven insufficient for challenges of this scale [202, 57, 46], and the structure of academia and academic funding is not well-positioned to deliver positive benefits at scale.

This manifesto synthesizes the work of 26 researchers across nine thematic working groups at *Dagstuhl Perspectives Workshop 25102*. It is addressed to two primary audiences: **games researchers**, who need shared infrastructure, standards, and coordination to build a cumulative science of games; and **public policymakers**, who need evidence-based frameworks to regulate, fund, and harness games for the public good.

Our analysis yields five general calls to action, each paired with the gains we expect for the actors addressed:

1. **National research councils and the European Commission** should establish dedicated, long-term funding programmes for games research, comparable in structure

to existing programmes for health or climate science, including support for replication studies, longitudinal panels, and open-science infrastructure.
Expected gains: an independent evidence base for policy on a medium that reaches billions of citizens, reducing reliance on industry-funded studies, and a pipeline toward validated health and education interventions of the kind demonstrated by projects such as *Re-Mission* and *SnowWorld* [149, 140].

2. **Game platform holders and publishers** should enable ethical research data access by partnering with neutral intermediaries, such as the UK Smart Data Donation Service [165], to provide anonymized behavioural data under layered access protocols, breaking the current industry monopoly on large-scale telemetry.
Expected gains: independent analyses of questions companies share an interest in, such as what reduces toxicity or sustains long-term player engagement and well-being; a demonstration of good faith as transparency expectations grow under frameworks such as the EU Digital Services Act [32]; and a reduced likelihood of blunter regulation. Where voluntary access does not materialize, regulation will be needed, which is a far slower route for all parties.
3. **Education ministries and school authorities** should integrate evidence-based game-based learning into curriculum standards, fund teacher training in game-based pedagogy, and invest in the digital infrastructure needed for equitable access [196, 191, 58].
Expected gains: higher student engagement and knowledge retention [196, 191] at low marginal cost per learner, building on existing precedents such as *Scratch*, used by millions of children to learn programming [154], and *DragonBox*, adopted in Norwegian elementary schools (see Working Group Report A9).
4. **Regulators and standards bodies** should mandate transparency in monetization design (loot boxes, reward systems), require annual community-health reporting from major platforms, and develop toxicity-prevention standards that shift accountability from individual players to platform design.
Expected gains: regular transparency reporting gives regulators continuous data without costly case-by-case investigations; evidence-based rules are more defensible and durable; and common standards create a level playing field that rewards studios already investing in responsible design.
5. **The games research community**, starting with the participants of this workshop, should form special interest groups and working groups within global professional organisations (e.g., ACM, IEEE, DiGRA) and use them to build shared research platforms with standardized data collection protocols, common APIs, and open-source tools; establish cross-disciplinary mentorship networks; and advocate for evaluation criteria that recognize societal impact alongside traditional academic metrics. When possible, every research proposal should budget a contribution to this shared infrastructure.
Expected gains: shared platforms lower the cost of each individual project, give early-career researchers access to infrastructure they could not build alone, and generate the demonstrator evidence needed to make the case for national research councils and the industry.

These actions should not be understood as aspirational generalities: Each is grounded in specific findings from the nine working groups, detailed in the sections and working group reports that follow. The window for action is narrow: games are evolving rapidly, AI is transforming both game development and player experience, and policy frameworks are being written now. At a time when AI dominates research agendas and funding debates, games are not a competing priority but a proving ground: game environments have long

served as benchmarks for AI research [192], and synthetic playtesting, language-model-driven characters, and player modelling make games a natural testbed for studying how AI systems interact with people at scale. This manifesto points to the evidence based and strategic framework needed to ensure that those frameworks serve the public interest.

Through this Dagstuhl Manifesto, we commit to ensuring that gaming fulfills its promise as a force for positive change in an increasingly digital world.

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1 Introduction

1.1 The role of games in society

Games are deeply embedded in modern society. An estimated four billion or more billion people play them [203, 202], making games one of the most widely distributed forms of human cultural activity. They are cultural artifacts that reflect and shape societal values, facilitate social connections, and drive technological innovation. Games serve as educational tools, platforms for social interaction, catalysts for technological advancement, and vehicles for social change [118, 92, 198, 203, 46]. The principles of engagement through games is widely embedded in products across society (e.g., [106]). Their economic significance is substantial: the global games industry exceeds $230 billion annually (at the time of writing), creating jobs and generating revenue across multiple sectors. Games are increasingly used in healthcare for rehabilitation and therapy, in education for engaging learning experiences, and in scientific research as instruments of inquiry.

Games possess distinct affordances for positive societal impact. As interactive media, they can foster empathy, critical thinking, and problem-solving through experiential engagement. They create controlled environments for experimentation and learning that no other medium replicates. Applications extend to environmental awareness, where interactive simulations help players understand ecological systems, and to social justice, where immersive storytelling builds empathy across perspectives. These are not speculative possibilities: citizen science games like *Foldit*, therapeutic games like *Re-Mission*, and VR pain management tools like *SnowWorld* demonstrate feasibility. The challenge is scaling such successes from isolated projects to systemic integration.

1.2 What is games research?

Games research is the systematic study of games, their design, development, impact, and societal implications, as well as the use of games as vehicles for research across disciplines. The field draws on computer science, psychology, sociology, design, the natural sciences, economics, law, health, education, and the humanities. It encompasses both the study of existing games and the creation of new games and technologies. In the context of this manifesto, games research seeks to understand how games can address societal challenges, foster positive change, and contribute to a more sustainable and equitable world, while also investigating and mitigating the harms that games can cause.

1.3 The case for games research

The scale of game engagement across demographics and cultures [14, 27, 166, 173, 99] makes understanding games a societal imperative. Three arguments ground this claim:

1. **Games generate uniquely rich behavioural data:** When players engage with games, they produce large-scale behavioural datasets within controlled, interactive environments [52]. This makes games unprecedented laboratories for studying human decision-making, social interaction, and learning [182]. Research-purpose games allow precise environmental control; commercial games offer unparalleled scale and ecological validity [129, 184, 100, 93, 7].

2. **Games drive technological innovation:** The technical demands of modern games, from AI and computational efficiency to interface design, have repeatedly pushed computing boundaries. Innovations originating in games have transferred to education, business, cultural heritage, and social impact [193, 73, 8, 97]. Games uniquely combine technical complexity with human-centred design requirements, producing broadly applicable solutions.
3. **Games have substantial societal effects - both positive and negative - that require independent research:** Games have demonstrated benefits in education, health, and social connection: therapeutic games reduce pain and improve treatment adherence [149, 140], citizen-science games have contributed to biomedical research [125], and game-based learning tools are adopted in school curricula worldwide [154]. At the same time, addiction, toxic behaviour, gambling-like mechanics, and exploitative monetization practices are significant and growing concerns [202, 57, 24, 98, 203, 46]. Maximizing the former while mitigating the latter requires rigorous, independent research. Claims that industry self-regulation alone suffices are contradicted by the scale and complexity of these challenges.

This manifesto provides a shared framework for advancing games research. By foregrounding ethics, inclusion, and collaboration across academia, industry, and policy, it underscores the urgency of coordinated action. Games are not only cultural artefacts but infrastructures of learning, health, research, and civic life. Shaping their impact is essential to ensuring they serve the flourishing of individuals and societies.

2 The Nine Manifesto Themes: A Synthesis

The Dagstuhl seminar organized its work around nine themes, each developed by a dedicated working group. The full reports appear in the Appendix section of this document. This section synthesizes the themes analytically, identifying what is distinctive about each and how they interconnect.

2.1 Methodology

The methodology underlying this report combined interdisciplinary expert collaboration, thematic working group analysis, and iterative synthesis. The basis of this manifesto was developed during and after the Dagstuhl Perspectives Workshop 25102, which brought together 26 international researchers from fields including computer science, psychology, education, game studies, HCI, design, health, and the social sciences. Participants first identified key societal opportunities and challenges related to games through structured brainstorming sessions organized on-site but also already asynchronously before the event. Based on the outcomes, the participants were organized into nine thematic working groups. Each group conducted focused analyses based on a template including questions on current research, societal barriers, infrastructural needs, and policy implications within its domain. Findings were iteratively refined through collaborative discussion, cross-group review, and synthesis into shared cross-cutting themes and policy recommendations. The resulting report reflects a consensus-driven expert perspective grounded in existing literature, professional experience, and interdisciplinary dialogue.

2.2 Themes

A1: Games for Human Flourishing: This theme reframes games' contribution to well-being beyond enjoyment toward flourishing: psychological growth, social connection, and critical reflection. It proposes a five-step roadmap from defining prerequisites (inclusive governance, freedom of expression) through participatory metrics to embedding games in education, community programmes, and policy. The central insight is that flourishing requires systemic change across industry, policy, and community practice, not merely better game design.

A2: Educational Games and the Transformation of Education: Game-based learning can personalize education, boost engagement [196], and develop 21st-century skills [58], but integration into formal curricula remains sporadic. Key barriers include poor-quality educational games, teacher unpreparedness, inflexible curricula, and infrastructure gaps in under-resourced schools. The theme emphasizes that scaling requires curriculum-level policy change, sustained teacher training, and public-private partnerships for content development.

A3: Harms of Games - From Mitigation to Prevention: Current approaches to toxicity, deceptive monetization, problematic play, and accessibility failures are predominantly reactive. This theme argues for a paradigm shift toward prevention through design: predictive modelling, proactive community management, and engine-level accessibility standards. It identifies four priority harms and proposes customizable, cross-platform intervention systems that preserve player agency.

A4: Games as Large-Scale Behavioural Research Platforms: Games generate high-resolution behavioural data capturing decision-making, social interaction, and learning at global scale. The theme proposes four technical strategies - automatic data instrumentation, universal modding, procedural content generation, and robust evaluation frameworks - as a mutually reinforcing system for turning commercial and research games into controlled experimental platforms.

A5: Sustainable and Scalable Research Infrastructure: As a young field, games research lacks the shared infrastructure that mature disciplines take for granted. This theme proposes curated knowledge repositories with visualization tools, shared research platforms with secure data storage and analytics, and international mentorship networks for early-career researchers. The underlying argument is that without infrastructure, the field cannot build cumulatively.

A6: Bridging Industry and Academia: Game-sector collaboration is constrained by telemetry access, proprietary analytics pipelines, IP complexity, monetization ethics, and a speed mismatch between live-service production cycles and academic publication cycles. This theme proposes a global consortium that connects IGDA, DiGRA, CHI PLAY, national industry associations, policymakers, and researchers to translate evidence on player well-being into usable production tools, ethical monetization guidance, and policy mediation.

A7: Rigour in Assessment, Evidence, and Knowledge Mobilization: The credibility of games research depends on methodological rigour: replicable studies, standardized assessment tools, and transparent reporting. This theme proposes meta-assessment criteria for the field's diverse paradigms, evidence maps tailored to different audiences (funders, policymakers, the public), and large-scale data platforms to break industry monopolies on telemetry. The *UK Video Games Research Framework* [41] is identified as a model.

A8: Global Funding Infrastructure: Games research is chronically underfunded relative to its societal footprint. Funding is fragmented across countries, short-term, and lacks dedicated streams. This theme proposes dedicated national and international funding programmes, public-private co-funding models, global research networks, and endowment structures to provide stability across political cycles.

A9: Impact and Responsibility: Despite two decades of maturation, games research has produced few outcomes that have scaled to lasting societal impact. Successful cases (*Foldit*, *Re-Mission*, *WEAVR*) remain exceptions. Structural barriers include misaligned academic incentives, lack of scaling support, and insufficient recognition of societal impact in evaluation metrics. The theme proposes cross-sector working groups, aligned incentive structures, and embedding game-based solutions into public systems such as schools and hospitals.

Interconnections: The themes from the nine working groups are deeply interdependent. Rigorous assessment (A7) enables credible policy recommendations (all themes). Shared infrastructure (A5) and data access (A4) are prerequisites for the large-scale evidence base that funding bodies (A8) and policymakers require. Industry-academia collaboration (A6) is the mechanism through which research on flourishing (A1), education (A2), and harm prevention (A3) reaches players. Impact and responsibility (A9) provides the accountability framework without which none of the other visions can be sustained.

No single theme can succeed in isolation; the nine working group reports need to be treated as a single system.

3 Cross-Cutting Analysis

Across the nine themes, five cross-cutting findings emerge that define the structural challenges and opportunities for games research and policy.

3.1 The data access problem is the single greatest bottleneck

Games generate behavioural data of extraordinary richness - capturing decision-making, social interaction, learning, and emotional response at global scale [52, 198]. Yet researchers overwhelmingly cannot access it. Industry holds near-total monopoly on large-scale telemetry, not primarily from a profit motive, but from a combination of low data maturity, legal uncertainty around data sharing, and misaligned timescales between fast-paced commercial development and long-horizon research [44]. This bottleneck affects every theme: without data, researchers cannot study flourishing (A1) or harms (A3) at scale, cannot validate

educational interventions (A2), cannot build behavioural research platforms (A4), and cannot produce the rigorous evidence (A7) that policymakers and funders require. *The UK Smart Data Donation Service* [165] demonstrates a viable model: neutral intermediaries providing layered access under strict ethical protocols, but no equivalent exists at international scale.

3.2 Fragmentation prevents cumulative science

Games research spans computer science, psychology, design, education, health, and the humanities. This breadth is a strength, but it has produced fragmentation: incompatible methodologies, inconsistent terminology, duplicated efforts, and siloed publication venues. The field lacks the shared platforms, common data standards, and curated repositories that would allow researchers to build on each other's work systematically. Several themes (A5, A7) identify this as a root cause of slow progress and propose concrete remedies - standardized data collection protocols, meta-assessment criteria across paradigms, and open knowledge repositories. Without these, the field risks remaining a collection of disconnected sub-communities rather than a cumulative scientific enterprise.

3.3 The gap between research and real-world impact is structural, not incidental

Multiple themes (A6, A9) document a persistent pattern: promising research prototypes that fail to scale beyond the project that produced them. The causes are structural. Academic incentive systems reward publications over societal impact. Funding cycles are too short for the iterative development needed to move from prototype to deployed system. Industry collaboration is ad hoc rather than institutionalized. Scaling educational games (A2) into curricula, therapeutic games (A1) into healthcare systems, or harm-prevention tools (A3) into commercial platforms requires sustained partnerships, dedicated scaling support, and evaluation criteria that recognize real-world deployment. The cases that have succeeded - *Foldit*, *Re-Mission* - did so through exceptional rather than systematic conditions.

3.4 Ethical responsibility must be embedded in infrastructure, not added as afterthought

Every theme engages with ethical concerns: player privacy, manipulative design, data governance, equitable access, and representation. Across these topics, the treatments converge on a single insight: ethics cannot be addressed through guidelines alone. Effective ethical governance requires infrastructure: ethics review processes designed for the pace of games research, data architectures with privacy built in, engine-level accessibility standards (A3), transparent monetization frameworks (A3, A9), and evaluation criteria that weight ethical practice (A7). The current approach, treating ethics as a compliance checkbox, is inadequate for a medium that shapes the behaviour, identity, and well-being of billions.

3.5 Public perception shapes and distorts the policy landscape

Games research operates under a persistent public perception problem. Media narratives oscillate between moral panic (games cause violence, addiction) and uncritical celebration (gamification will solve everything). Neither serves the field. Several themes (A7, A8) identify this as a barrier to funding, institutional support, and policy engagement. The consequence is that policy debates about games are often driven by low-quality evidence or anecdote rather than rigorous research [41]. Countering this requires not better public relations but better science communication: evidence maps tailored to policymaker needs, synthesis documents that translate findings into actionable guidance, and sustained engagement with media and public institutions.

4 Policy Recommendations

The following high-level recommendations are organized by policy priority area, drawing on the evidence and analysis of all nine themes. Each recommendation names the responsible actors and specifies actionable steps. Recommendations are grounded in workshop findings and, where available, existing evidence. These should be viewed as a starting point, a list of initial, high-level suggestions to encourage debate, rather an a complete or finally settled list.

4.1 Research infrastructure and data access

Problem: Games research lacks the shared infrastructure that mature fields rely on - common data standards, secure repositories, shared platforms, and sustained technical support. The industry monopoly on large-scale behavioural data prevents independent research at the scale needed to inform policy.

Actors and actions:

1. **National and international funding bodies** (e.g., ERC, NSF, UKRI) should establish dedicated games research infrastructure programmes, funding shared platforms for data storage, analytics, participant recruitment, and collaborative experimentation. These should follow open-science principles and be designed for long-term sustainability.
2. **Game publishers and platform holders** should partner with neutral data intermediaries to enable ethical research access to anonymized behavioural data. The UK Smart Data Donation Service [165] provides a working model: secure storage, layered access protocols, and strict ethical oversight. Policymakers should incentivize participation through tax benefits or regulatory recognition.
3. **Governments** should fund the development and maintenance of open-source research tools - standardized data collection APIs, universal modding frameworks, and replicable analytics pipelines - reducing duplication and lowering barriers to entry for researchers worldwide.
4. **Research institutions** should invest in human infrastructure: training programmes for specialized skills (game user research, large-scale data analysis) and dedicated technical support staff to maintain shared platforms.

4.2 Education and game-based learning

Problem: Game-based learning has demonstrated efficacy in boosting engagement [196], improving retention [191], and developing critical thinking [58], but integration into formal education remains sporadic. Barriers include poor-quality educational games, unprepared teachers, inflexible curricula, and infrastructure gaps in under-resourced schools.

Actors and actions:

1. **Education ministries** should incorporate validated game-based learning tools into official curriculum standards and approved resource lists, establishing games as legitimate pedagogical approaches rather than supplementary activities.
2. **Education authorities and teacher training institutions** should implement professional development programmes that train teachers to integrate games into lesson plans, manage classroom gameplay, and align game outcomes with learning objectives. This requires funded workshops, certifications, and ongoing pedagogical coaching.
3. **Governments** should invest in digital infrastructure - devices, connectivity, and software licences - with targeted grants for under-resourced schools. A publicly maintained repository of vetted, age-appropriate educational games would give educators reliable access to quality resources.
4. **Funding bodies** should support collaborative development partnerships between educational experts, game developers, and researchers, with pilot programmes in schools to build an evidence base for efficacy. Collaboration between school boards and researchers should address context-specific barriers to adoption, which vary by district, region, and country.

4.3 Player well-being and harm prevention

Problem: Toxicity, deceptive monetization (loot boxes, exploitative reward systems), problematic play, and accessibility failures cause significant harm. Current approaches are predominantly reactive: moderation after the fact, screen-time restrictions, poorly enforced regulations. A paradigm shift from mitigation to prevention is needed.

Actors and actions:

1. **Regulators** should work with the games industry to establish enforceable community health standards. These should require proactive design measures: pre-game behavioural prompts, AI-assisted detection of escalating harm, reputation systems that reward positive conduct, and engine-level accessibility from the outset. Games meeting high standards could receive public certification.
2. **Legislators** should mandate monetization transparency - requiring disclosure of loot box odds, spending caps for minors, and clear labelling of gambling-like mechanics. Annual transparency reports from major platforms on user behaviour, moderation actions, and prevention measures should be required.
3. **Governments** should fund research and development of toxicity-prevention systems through grants, tax incentives, and academic partnerships. Investment should target predictive modelling, real-time harm detection, and customizable intervention tools that preserve player agency.
4. **Education systems** should integrate digital citizenship curricula that specifically address gaming environments, teaching online etiquette, empathy, and critical awareness of manipulative design. Awareness campaigns should target the broader gaming public.

5. **Industry** should participate in cross-company collaboration, sharing anonymized data on harmful behaviour and jointly developing best practices. Shared open-source moderation tools would particularly benefit smaller studios that lack resources for proprietary solutions.

4.4 Industry-academia collaboration and knowledge exchange

Problem: Despite shared talent pools, academia and industry operate with misaligned incentives, timescales, and IP norms [44]. Research prototypes rarely scale to deployment. Knowledge exchange is ad hoc rather than institutionalized.

Actors and actions:

1. **Governments** should create joint research funding programmes that require co-development between universities and game companies, aligning research topics with both societal needs and industry application.
2. **Universities and industry bodies** should adopt formal knowledge exchange frameworks - for example modelled on the *UK Knowledge Exchange Concordat* - that provide standardized templates for data sharing, IP management, publication rights, and confidentiality. This reduces the legal and administrative friction that currently kills many potential collaborations.
3. **Funding bodies** should support structured exchange programmes: developer fellowships in academia, researcher placements in studios, and industry-informed curriculum development. Tax incentives or subsidies should be offered to companies that host academic collaborators or publicly release research findings.
4. **Governments and professional associations** should sponsor regular cross-sector forums, e.g., an annual *Games and Society* summit, where academics, developers, and policymakers present findings, identify shared challenges, and jointly develop solutions.

4.5 Global funding and institutional support

Problem: Games research is chronically underfunded relative to its societal footprint. Funding is fragmented, short-term, and lacks dedicated streams. The field competes with established disciplines for general research funds and rarely secures the multi-year commitments needed for infrastructure and longitudinal research.

Actors and actions:

1. **National science foundations** should establish dedicated Games and Interactive Media funding tracks with annual allocations for fundamental research, comparable to existing programmes for health or environmental science. International bodies (EU, UNESCO) should create multinational consortium funding for global research challenges.
2. **Governments** should implement public-private co-funding models: matching funds for industry contributions to independent research, and R&D tax credits that specifically cover collaborative university-industry games research.

3. **Policy bodies** should support international research networks - including funded exchange programmes, open-access publication platforms, and annual coordination summits - to prevent duplication and enable cumulative progress across countries.
4. **Philanthropic organizations and governments** should explore endowment or trust fund models dedicated to games and interactive media research, providing stable funding insulated from political cycles, with international administration to ensure equitable global distribution.
5. **Funders** should explicitly fund replication studies, longitudinal panels, and open-science infrastructure - currently under-resourced categories that are essential for building a credible evidence base.

4.6 Regulatory frameworks and accountability

Problem: The pace of games evolution - new technologies, business models, and player practices - outstrips current regulatory capacity. Industry self-regulation has not adequately addressed monetization harms, data privacy, or platform accountability. Regulatory frameworks must balance innovation with public protection.

Actors and actions:

1. **Regulators** should introduce accountability mechanisms for monetization practices, player data use, and platform safety that complement (rather than replace) industry self-regulation. These should be evidence-based, drawing on independent research rather than industry-funded studies alone.
2. **Governments** should require that policy decisions about games - on topics such as loot boxes, screen time, or age ratings - be informed by research meeting explicit quality criteria. The UK Video Games Research Framework [41], with its principles of inclusivity, openness, transparency, and independence, provides a model. An independent advisory body could rate the robustness of studies used in policy arguments.
3. **Regulators** should mandate that major game platforms publish annual transparency reports on community health metrics, moderation actions, monetization practices, and data handling. Public accountability creates market pressure for responsible design.
4. **Governments** should require or incentivize the development of open research guidelines for games - covering methodology, reporting standards, and ethical protocols - as conditions of public research funding. Pre-registration, data sharing, and open peer review should be standard expectations.
5. **Policy frameworks** must be designed for adaptability. Given the pace of technological change (particularly AI integration), regulatory mechanisms should include scheduled review cycles and sunset clauses, avoiding rigid mandates that quickly become obsolete.

5 Toward Implementation

5.1 Strategies for realizing the manifesto's vision

Realizing the goals of this manifesto requires strategies that operate at system level. Five principles should guide implementation.

Interdisciplinarity as operating principle: Games research spans computer science, psychology, design, sociology, education, law, and the humanities. Progress depends on breaking disciplinary silos, not through general calls for collaboration, but through concrete mechanisms: shared platforms with common data standards, joint funding calls that require multi-disciplinary teams, and evaluation criteria that recognize cross-disciplinary contributions.

Infrastructure before projects: The field's core limitation is not a shortage of good research questions but a shortage of shared infrastructure. Investments in platforms for data access, archiving, collaborative experimentation, and knowledge synthesis will yield returns across all nine themes. These must be designed for openness, equity, and long-term maintenance.

Ethics as infrastructure: Responsible innovation must be built into systems: data architectures, platform design, evaluation criteria, rather than bolted on as compliance. This includes capacity to study and mitigate harms (toxicity, exploitative monetization, addiction) alongside advancing positive applications.

Global inclusivity: Games are a global medium. Strategies must avoid privileging Euro-American contexts alone. Policies, platforms, and funding models should enable participation from diverse cultural and geographical perspectives, ensuring benefits and responsibilities are distributed equitably.

Policy alignment: National and international policymakers can accelerate progress by funding research, mandating accountability, and incentivizing socially beneficial applications. Coordination between research agendas and policy frameworks is essential for lasting impact. The recommendations in Section 4 provide the specific entry points.

5.2 Timeline and priorities

Implementation should proceed in three phases:

Immediate (1-2 years): Form cross-sector working groups to develop data sharing standards and ethical protocols. Establish pilot partnerships between publishers and research data intermediaries. Launch advocacy campaigns targeting national funding bodies. Begin teacher training pilot programmes for game-based learning.

Medium-term (2-5 years): Build shared research platforms with standardized APIs and open-source tools. Establish dedicated funding tracks at national and international level. Implement regulatory requirements for monetization transparency and community health reporting. Scale educational game integration from pilots to curriculum standards.

Long-term (5-10 years): Institutionalize global research networks with stable funding. Embed game-based interventions in public systems (schools, hospitals, civic programmes). Establish and maintain independent advisory bodies for evidence-based games policy. Create endowment structures for research funding resilient to political cycles.

5.3 The workshop process

This manifesto emerged from Dagstuhl Perspectives Seminar 25102, which brought together 26 experts from diverse disciplines and countries. The workshop began with open brainstorming to identify key challenges at the intersection of gaming and society, then organized into nine thematic working groups. Through structured discussions and collaborative analysis, participants developed visions, identified barriers, and proposed strategies. The process continued iteratively before, during, and after the event, with working groups refining analyses through collective review. The result is a synthesis that reflects shared commitment to maximizing gaming's positive societal impact, grounded in the collective expertise of the participants.

5.4 Use of AI in this document

For the joint components of this manifesto (not including the Working Group Reports), Claude Code with Opus 4.8 set to Extra High Effort and Codex with GPT 5.5 at Extra High were used to assist with the revisions of the manuscript, mainly finding supporting argumentation, editing, and intellectual pushback based on the feedback received. The authors reviewed, edited, and verified all AI-assisted text and take full responsibility for the content and interpretations presented in this manuscript. No AI tools were used to generate, alter, or fabricate research data or results.

Acknowledgements

We sincerely appreciate the exceptional administrative and logistical support provided by the Dagstuhl staff in organizing and facilitating the seminar. Our heartfelt thanks also go to all seminar participants onsite, remote or helping out after the seminar: your effort, hard work during and after the workshop, and focus were essential in shaping this manifest.

A Working Group Reports

The following appendices contain the full reports produced by each of the nine thematic working groups. These reports provide the detailed analysis, evidence, and roadmaps that underpin the synthesis and recommendations in the main body of this manifesto. Each report includes the working group's vision statement, analysis of the current state, identification of roadblocks and enablers, and a phased implementation strategy. Readers seeking the evidence base for specific recommendations in Section 4 above should consult the corresponding appendix.

A.1 Games for human flourishing

Theme Authors: Catherine Flick (University of Staffordshire) (team leader), Julian Frommel (Utrecht University), Linda Hirsch (University of California Santa Cruz), Simone Kriglstein (Masaryk University), Sebastian Deterding (Imperial College London) Rachel Kowert (Discord) Kathrin Gerling (Karlsruhe Institute of Technology) Regan Mandryk (University of Victoria)

> Our vision is a future where games support us to thrive before, during, and after play, with benefits that manifest in our daily lives both individually and within wider society.

A.1.1 Abstract

Our vision is for games to support humans to thrive before, during, and after play, with benefits that manifest in our daily lives both individually and within wider society. By "thrive" we mean that games should facilitate well-being, but also go further in enabling us to flourish.

This requires a holistic understanding of the place of games within our society, and how we experience them before, during, and after play. Benefits should manifest not only for players during play (e.g., satisfaction of psychological and other needs through play), but in pre- and post-play mental processes and behaviors.

We already have a lot of knowledge about how to design games for human well-being, e.g., how to design for positive player experiences, how to combat toxicity, how to build games that are inclusive of disabled players, that facilitate skill acquisition in specific areas, increase accessibility for more vulnerable user groups, etc., including mental, emotional and physical well-being on an individual level. What we need more knowledge on is transferring those strategies and ideas into the industry and (in particular) AAA games, developing and testing those games under the dependencies of the ecosystem, and dealing with value trade-offs. There is also less work on a societal well-being level, long-term evaluation of design interventions, and broader challenges around whose values are represented and, with that, who has the power to influence design. Additionally, prior work has shown that a majority of technological interventions suffer from maladaptation when released into real-world contexts [42, 159], clearly indicating a significant gap between lab testing and real-world applicability and acceptance. Meanwhile, we also operate in an increasingly hostile and

capitalism-focused world. Barriers exist at the levels of industry, government, community, and academia. In order to overcome these challenges, we suggest a 5-stage process that sets out prerequisites for this process to work; sets out ways to build a set of shared concepts, develops heuristics for measuring thriving in both individuals and societies, and supports individual and societal flourishing. Our plan offers a more holistic perspective reflecting the complexity and dependencies to achieve games for flourishing individuals and societies.

A.1.2 Vision

We envision games to support us to holistically thrive before, during, and after play, with benefits on an individual level and within wider society. Thriving means that games promote well-being and enable us to flourish. This requires a holistic understanding of the place of games within our society, and how we experience them before, during, and after play. Benefits should manifest not only for players during play (e.g., satisfaction of psychological and other needs through play), but in pre- and post-play mental processes and behaviors.

Human flourishing requires both individual and societal components. Flourishing as an individual involves growing as a self-determining, knowledgeable human being who can understand and critically reflect on interdependencies and connections for their own microcosm as well as their macrocosm. Societal flourishing involves developing a resilient, well-connected, supportive, and inclusive society from within with shared, realizable values.

Games provide a powerful ability to enable both individual and societal flourishing by allowing us to explore possibilities healthily, develop social, cognitive, physical, and critical reflection skills, and understand and experience other people's perspectives.

To facilitate this, the games industry needs to prioritize human flourishing over profit and should be responsible for facilitating positive and mitigating or minimizing negative impacts, with consequences should they not do so. Games research needs to support and advocate for human flourishing in games by providing industry and community with accessible, cutting-edge scientific knowledge and evidence-informed policy advice for regulators.

A.1.3 State-of-the-art

Human flourishing as a concept comes from eudaimonia, which aims to capture the capacity for someone to live well [136]. This is commonly referred to as well-being in modern health [155] and games literature [20], but we wish to avoid the pre-existing conceptions that arise with the term and look more holistically at the entire ecosystem of games and their interactions with society. This more holistic view of games is not new in itself [185] but has, more recently, been somewhat drowned out by the focus on well-being. This does not mean that well-being literature is not useful for this project but that it is not sufficient to move this field forward and more broadly, connect games, players, and communities. Measures that traditionally focus on psychological well-being, for example, are common within the literature but are only part of an understanding of how people experience games before, during, and after play. That said, there is much research that demonstrates that games contribute to well-being and that there are many benefits to playing as leisure [113].

Traditionally, in technology development, designing to support eudaimonia relies on the development of a shared set of values with which the technology strives to align within a

cultural milieu [60]. In games, compared with other technological artefacts, players have agency while immersed in alternative environments that give them: *"a chance to enact [their] most basic relationship to the world"* [126]. This separates games from more passive entertainment and technologies, making it the responsibility of game designers to understand the potential impacts their games might have on players. Within this environment, values embedded in games are reflections of values we develop as individuals and communities, and developers make specific choices about when designing games. Understanding these values and their embodiment within games is also complex from both a design and a player perception perspective [56].

An increasing body of research focuses on the negative aspects of games, such as toxicity, problematic play, and deceptive design practices. These are common harms in games and can impede well-being and flourishing (e.g., a very toxic game community is unlikely to facilitate social connectedness of positive quality). While this side of research is extremely important to supporting the goals of human flourishing, this part of the manifesto aims to concentrate on further developing games as a positive contributor. Approaches such as positive design approaches [56, 86], moderation, establishing community guidelines [105], and regulation (for example, PEGI, ESRB) have attempted to distill these values into effective and measurable actions to ensure player well-being. However, these largely focus on combating harms rather than enabling flourishing, exposing the gap between the status quo and our aims. Existing efforts also frequently involve managing conflicts between different values [56], frequently leading to trade-offs [86].

We already have a lot of knowledge about how to design games for human well-being, e.g., how to design for positive player experiences, how to combat toxicity, how to build games that are inclusive of disabled players, that facilitate skill acquisition in specific areas, increase accessibility for more vulnerable user groups, etc., including mental, emotional and physical well-being on an individual level.

What we need more knowledge on is transferring those strategies and ideas into the industry and (in particular) AAA games (major commercial games), developing and testing those games under the dependencies of the ecosystem, and dealing with value trade-offs.

There is also less work on a societal well-being level, long-term evaluation of design interventions, and broader challenges around whose values are represented and, with that, who has the power to influence design.

A.1.4 Key challenges and barriers

Key challenges and barriers exist at four different levels: industry, government, players/communities, and academia.

In industry, we need to establish better design practices alongside implementing best practices. Many barriers are financial: game companies are under pressure to return, so they are more likely to look at implementing predatory practices, there is a lack of motivation and room for AAA game companies to consider players' well-being/thriving, and it is generally hard to get industry buy-in if it conflicts with the profit margin. Some practices are increasingly accepted in gaming (e.g., toxicity), which hinders effective moderation and shapes norms. There is very little large-scale, generalizable research in this domain, and limited useful practical

knowledge, such as frameworks that utilize game mechanics for positive interactions.

The barriers in government primarily concern maintaining and improving existing approaches to regulation and moderation, while also being mindful of community practices. This is difficult in an era where the government is pulling out of the protection of vulnerable groups, and where the tech industry is less interested in moderation/regulation. Right now, there is no consistency in practice/requirements around moderation, the industry is generally secretive about moderation practices, and outsourcing to artificial agents is desirable - but can be a double-edged sword and further entrench existing harms rather than helping to mitigate them.

When it comes to the community, there are current challenges in supporting the emancipation of players and facilitating community action. These include the lack of literacy about games among relevant stakeholders (e.g., children, parents, but can also include players more widely), the lack of transparency within games about potentially harmful practices (and what we have already comes out of the film/TV industry around passive content consumption, not active, involved media), and lack of awareness about good and bad design patterns in games and what their impacts might be.

The key issues within academia are that the games research field is highly interdisciplinary and largely disconnected. This causes challenges in terms of establishing consensus.

A.1.5 Key enablers needed

There is already significant buy-in from the gaming community, especially community leadership like community managers and moderators. Other key enablers tend to be the high-level decision-makers within a company (e.g., CEOs, other C-suite members). Without buy-in from this group, any interventions risk being sidelined or having minimal impact on decision-making.

A.1.6 Roadmap to realizing societal impact

This roadmap aims to be flexible in its implementation to take into account the particular aspect of human flourishing within games that a community might be interested in encouraging. It is by nature somewhat abstract but suggests methods and approaches supporting these processes instead of dictating values as being "good" or "bad". The key goal of the roadmap is to guide the development of games that enable individuals to thrive on both an individual and societal level and, in doing so, contribute positively to society's well-being. We use the previously defined terms of thriving at both an individual and societal level to frame this goal. We also provide examples, but only for help with understanding the process and inspiring further work.

Step 1: Prerequisites defining the work relationships and code of conduct include:

- Freedom of expression must be ensured to protect work group members from potential oppression or other misuse.
- Availability of stakeholders ensures that the work group represents an inclusive and diverse group of communities and individuals who are supported and enabled to participate in the activities, e.g., 20% of their working hours may be allocated for the project.

- The power to make change requires all parties to support and push for realizing initiatives beyond the work group. This point further concerns the required funding for equipment, travel, etc., relevant to realizing initiatives.
- Transparency of process by providing regular updates of past, ongoing, and planned activities toward the overarching goal
- A steering committee willing and able to do the work

Step 2: Shared concept building within the steering committee, which requires:

- Building appropriate stakeholder networks by bringing representatives together from:
  - Games Industry
  - Players
  - Policymakers
  - Academics
  - Wider community (including civil society organisations)
- Taking the time to build consensus and shared terminology and understanding before going into co-creation processes and participative methods. This includes defining shared values subject to a shared technological understanding and an understanding of available equipment/ resources for different geographical communities and societies (for example, the multi-nation policy review and stakeholder consultation on augmented social play with young people) [188].

Step 3: Development of measurements through participative methods.

As flourishing means different things for different individuals and communities, we suggest inclusive approaches of community members and more vulnerable groups of society through, e.g. arts-based methods [171, 108] and community-driven design [88, 187] to define measurements for games for social good and human flourishing. For this, we need to align on both the development of heuristics that include qualities and measurable metrics for thriving, and the approach and definition of impact assessment for individuals and societies. Yet, we suggest focusing on individual flourishing first (Step 4) as flourishing individuals are a non-exclusive prerequisite for a flourishing society (Step 5).

Step 4: Iterative feedback loop.

Supporting individual flourishing, concurrent and forming an iterative feedback loop with Step 5, merging from self-centered (individual) flourishing to others-centered (societal) flourishing:

- Identifying and implementing current best game design and practices
- Research on better practice (examples of current cutting edge research areas: wind down/mood management [157], belonging [5], positive escapism [104], resilience against bullying, self determination theory [achievement, social connection, agency, autonomy] [158], post work recovery [205], fun [23])
- Supporting individual development of thriving values [90, 81] regarding:
  - Self-determination
  - Access to, engagement with, and understanding of knowledge
  - Critical reflection
  - Understanding both the individual and societal nature and impact of these values

- Supporting others-centered development through empathy, compassion [146], communication and collaboration. (prior work, e.g., done through storytelling or prompting in real-time situations [107].)

Step 5: Supporting societal flourishing while forming an iterative feedback loop with Step 4, because individual and societal flourishing are interdependent and complementary. For this, we see these relevant steps:

- Developing and establishing shared spaces where games can fit in (example: School curricula, community groups, extracurricular education, leisure-based gaming clubs (e.g., *Fortnite, Minecraft*))
- Continuing to develop emergent shared values around games - particularly cultural, social, and community expectations.
- Supportive infrastructure - advocacy, cutting-edge scientific knowledge.
- Lobby/policy groups for regulation
- Development of incentives and consequences for companies (incentives example: investment, leadership, awards, resources to make it easy to implement) (Consequences example: regulation)
- Support systems for individuals making mistakes (example: recasting failure within games to allow for learning opportunities and self-reflection)
- Community involvement of both gaming and non-gaming communities (example: digital literacy of parents and carers, early childhood settings, teachers, etc.)

In the steps presented, game researchers and practitioners contribute only one stakeholder group. Our plan offers a more holistic perspective reflecting the complexity and dependencies to achieve games for flourishing individuals and societies. However, game researchers and practitioners contribute with approaches such as situated play [16], playful interventions towards a more inclusive and compassionate community [107] and measurements to evaluate and steer the process [127], essentially shaping future society.

A.1.7 Ethics and risk management

It is not for this manifesto to dictate what is "good" or "bad", or "right" or "wrong". These concepts need to be co-created as part of this process. We face an uphill battle against a capitalistic society not willing to change; this will prove to be a significant challenge to any attempt at improving the ethical aspects of games. This process has the potential to misidentify relevant collaboration partners and/or leaders, which could lead to bias and skewing of the process. Checks and balances need to be established to ensure a broad representation of diverse aspects of society. It is also possible that this process could overlook long-term impacts or other ripple effects due to a lack of evaluation; therefore, monitoring the process and its long-term impacts should be part of the initial requirements set out for the process.

A.2 Realizing the potential of educational games to transform traditional education

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> Our vision is a future where collaboration between educators, game designers, and global communities unlocks the full potential of games to create personalized and adaptive learning experiences that transform education worldwide.

A.2.1 Abstract

Personalized & adaptive game-based learning empowers the community to create internationally implemented, validated tools through global network works that connect stakeholders and support widespread collaboration between educators, game designers, communities, and school systems to transform traditional education with games. In spite of great strides made with games like The Sumerian Game (1965) [6] and Oregon Trail (1985) [119], effective design, development, implementation, integration, and scale of educational games and simulation have yet to deliver on the promise of video games, game-based education, and gamified learning to transform the experience of education across the globe. This document discusses the current state of the art of many instances of games, gaming, and elements of games used for education and training. The discussion continues to consider the key challenges and barriers to realizing the promise of games to transform education and the enablers needed to manifest the potential of games for education and training.

A.2.2 Vision

We envision a future where educational games are seamlessly integrated into mainstream learning environments, providing learners with experiences that are adaptive, engaging, and contextually meaningful. Rather than being perceived as add-ons or novelties, games will serve as trusted educational technologies that promote deeper understanding, creativity, and collaboration across disciplines.

By leveraging the motivational affordances of play and the analytical power of modern technologies, educational games can move beyond rote instruction toward fostering critical thinking, problem-solving, and lifelong curiosity. Our vision is that such games become not only tools for transmitting knowledge but also spaces for exploration and transformation, bridging gaps between formal curricula and the diverse ways in which learners make sense of the world.

A.2.3 State-of-the-art

There are currently instances of the qualities envisioned for the transformative potential of games in education. Personalized and adaptive games are already part of the landscape of games used for education and training [145]. Similarly, learning analytics are already available in many games (see the *Open Game Data* initiative at *https://opengamedata.fielddaylab.wisc.edu/* and some even have the capacity for student data to automatically populate teacher's grade books through their learning management systems. AI tools make the integration of learning

analytics more feasible with plugins that can be used to connect student data, while protecting student data and privacy.

There are many examples of games for informal learning to help learners outside of the classroom learn about many different concepts - including geology, geography, history, as well as formal learning, where games are integrated within the classroom to aid in learning a specific concept, such as math. In such cases, these games were developed using core curriculum standards to abide by the student outcomes and standards dictated by states or the government. Examples of these games include: *DragonBox*, which uses algebra-based puzzles to teach mathematical concepts interactively; *Prodigy*: A gamified learning platform that integrates math challenges into an RPG-style environment; *Kerbal Space Program*, a game that teaches physics and engineering through rocket building and space exploration. Games have been shown to improve student outcomes, but there is insufficient data to demonstrate any framework for integration and scale of any game or system of games for education and training between learners, contexts, or learning objectives.

Researchers across disciplines have designed, developed, and tested multiple physical games, digital games, immersive learning experiences to achieve a range of educational and learning objectives (see the many examples published through the conferences *Games for Change* (*https://www.gamesforchange.org/*), *Serious Play* (*https://seriousplayconf.com/*), and *Meaningful Play* (*https://meaningfulplay.msu.edu/*), to mention a few). These learning objectives include implicit learning (unconscious acquisition of knowledge or skills through experience, without conscious awareness or intention to learn) and explicit learning (a structured, conscious process in which learners acquire knowledge or skills through direct instruction, practice, and feedback. Explicit learning in games can be seen in games teaching science, technology, engineering, and math [109, 38], job training such as in flight simulation experiences [156], and games and simulation games teaching history [117] to name a few.

Inversely, implicit learning includes interpersonal communication skills [76], language learning [80, 64], cultural heritage , empathy, and Meta cognitive or Self Regulated Learning [204]. As technology has advanced, many of the tools have advanced to implement emerging technologies from multiuser environments, mobile devices and wearable technologies to immersive technologies like VR, AR, and MR. Likewise, researchers have been studying these impacts across the globe [38]. The analysis of the implementation of games as transformative tools of education would be incomplete without the consideration of tools used to teach game design and integration of games to students and teachers. Some of the examples of these tools include Scratch from Massachusetts Institute of Technology (MIT) [154], the *Game Creator App* that allows children to create games - (e.g., make *Flappy Bird*-like games) with their teachers or families. In addition to the overarching concept of games for education and training, another direction to consider regarding the educational potential of games in society includes tools to support teachers, or gamification tools teachers can use to gamify their teaching. Tools like *quizlet* [169], *Kahoot* [40], *Class Dojo* [112], and *Google classroom* [85] empower teachers to create experiences in their face to face and online classes that engage students using elements of games, such as leaderboards, badges, and points.

A.2.3.1 Theory

The work that has been done in this space has led to multiple studies that can be key in moving from our current space of unique individual products that serve specific populations

to scaled implementations that can deliver on the promise of transforming education. A recent systematic review and analysis of theory in research on gamification, serious games and game-based learning [106] revealed 118 theories used to explore these tools for education. Of the 118 theories, these researchers found self-determination theory, flow theory, experiential learning theory and constructivist learning theory to be most popular and salient. Technology Acceptance Model [111], Problem-based learning , are also frequently used theories to explore games, gamification, and game based learning.

While the field of educational games has applied existing tools to the study of games, we are still developing in terms of its theoretical framework and methods. In contrast to traditional educational research, in which there are established benchmarks for evaluating success (e.g., test results, academic performance), the evaluation of the effectiveness of educational games is more complex.

In the field of game-based education, replicability of studies can be difficult due to variations in game design, the context in which a game is used, and individual differences between participants. For example, a study on the effectiveness of a math game for elementary school students may not yield the same results when repeated at a different school, with a different group of students, or using a different version of the game.

Educational games are often tested in short-term studies, but long-term effects on learning are more difficult to measure. Many games are designed to support engagement or problem solving, and their long-term effects may not be immediately obvious or measured.

Table 1 A Chronology of educational games and tools

Game/Tool	Year	Description
The Sumerian Game	1964	An early text-based strategy video game of land and resource management. It was developed as part of a joint research project between the Board of Cooperative Educational Services.
The Oregon Trail	1971	A pioneering game that teaches history and resource management through a journey simulation.
Reader Rabbit	1984	A literacy game series designed to develop reading skills in young children.
Where in the World is Carmen Sandiego?	1985	A geography-based detective game that helps players learn about world cultures and locations.
Math Blaster!	1987	A math-based arcade-style game that reinforces arithmetic skills.
SimCity	1989	A city-building simulation that teaches urban planning, problem-solving, and resource management.
Typing of the Dead	1999	A typing tutor that gamifies keyboard skills using a zombie survival theme.

Table 1 – *Continued from previous page*

Game/Tool	Year	Description
Brainpop	1999	GameUp, BrainPOP's game portal, is a collection of learning games from more than 40 development partners including BrainQuake, Filament, iCivics, Learning Games Network, and MIT Education Arcade.
Scratch	2003	A visual programming language designed for children to create interactive stories and games.
Education.com Games	2006	Nurtures children's education from pre-K through 8th grade, boasting over 40 million users with 10,000 new members each day.
Kerbal Space Program	2011	A physics-based space simulation game that teaches aerodynamics, engineering, and astrophysics.
Duolingo	2011	A gamified language-learning app that revolutionized interactive language education.
Class Dojo	2011	A classroom behavior management tool that gamifies learning and student engagement.
PBS Learning	2011	Offers more than 100,000 digital resources for PreK-12 educators. The PBS KIDS Games app and website offer 250 to 375 educational games featuring characters from popular shows.
Epic!	2013	A reading app providing access to books, videos, and audiobooks, with features like offline reading, class reports, and COPPA/FERPA compliance.
Field Day Games	2015	A collection of educational games from Field Day Lab that explore science, history, and problem-solving.
Minecraft: Education Edition	2016	An educational adaptation of Minecraft that promotes creativity, coding, and teamwork.
Path Out	2017	A game on Steam that follows a Syrian refugee's journey and includes teacher guidance tools.
The Anne Frank House VR Experience	2018	A VR experience that immerses players in Anne Frank's secret annex, providing an educational and emotional look at history.
Game Creator App	2022	A tool for children and families to create games (e.g., making Flappy Bird-style games).

A.2.4 Key challenges and barriers

A.2.4.1 Chocolate on broccoli phenomena

The most underestimated problem is how to make "good" games. There are many educational games that fail to be educational because they lack understanding of the learner, the content, the context, and/or effective instructional design techniques. Similarly, many educational games fail to be fun, as the instructional designers often lack a complete understanding of the art of making experiences fun. This can be addressed by effective collaborations between game designers, instructional designers, and subject matter experts (SMEs). This can be

seen in the work of some labs doing applied research with games, such as *Field Day Games, SURGE XR lab*

These interdisciplinary teams are also more effective at addressing some of the barriers to implementing educational games in the curriculum. For example, the game Path out that teaches about the experience of being a Syrian refugee has an interdisciplinary team that has integrated a tool to provide guidance for the teachers. User-centered design and participatory design are both approaches that would help to ensure that the design of games for education would be more effective and also have the buy-in of a broader range of stakeholders. Participatory design and iterative development including teachers could also address many of the concerns with teachers comfort and acceptance of games as an educational tool. Likewise, user centered design would help designers keep the teachers, students, and parents in mind during the design phases in order to ensure they are solving problems for the stakeholders, as opposed to creating problems. Some considerations towards making the educational games useful to the teachers include a design thinking approach in which the designers consider the needs and pain points of the users. Some examples for teacher needs and pain points include time management, classroom management, too many responsibilities, knowledge gap, assessment tools, and grading tools. These considerations can help guide implementation, for instance, teachers are exhausted and overworked - efforts to transform education with games must reduce their workload. For example, any games used to transform education should seamlessly plug into into the Learning Management Systems (LMS) the teacher is already using.

A.2.4.2 Policy challenges

A key barrier to evolving our approaches to education to integrate games, game-based learning, and gamification is the fact that the current societal expectations and regulations are build around the traditional approaches to education. These expectations and regulations often overlook the potential of transforming education. Likewise, there is not a single entity that must change to propagate new global approaches to education, as every country has different needs, expectations, and standards. Similarly, even in the United States, for example, standards for primary and secondary education vary from state to state, while the implementations of each state's standards may be implemented differently in individual district (generally structure geographically around cities or counties).

Attitudes about games and emerging technologies make the measures of efficacy crucial to realizing the transformative power of games on education. While there are currently mixed attitudes and ranging policies on integration of emerging and existing tools in the classroom (e.g. bans of cell phones, very strict firewalls), evidence of the effectiveness can spawn evidence based practice of games for learning. Likewise, solving problems for the stakeholders.

A.2.4.3 Scalability challenges

Issues of scalability are a key challenge to the future world we envision where games have transformed education, but while they are hard problems, they are not impossible problems. While there are very few companies that have identified ways to create global experiences,

it has been shown to be be possible by companies like Google, Dell, Apple, and Amazon. After overcoming the first step of demonstrating the value and potential of games for global educational transformation, the next steps will include building the pipeline for scaling the systems. This pipeline must be created in a way that in "future proofed" in a way that allows for future innovation and unforeseen emerging tools.

A.2.4.4 Localization

Because many educational games are developed in the North America and Europe, their content may not be culturally relevant or effective for students in regions such as Asia, Africa and South America. Localization efforts should take into account not only factors such as language, local standard, and regulations, but also education systems and learning methods. This may lead to a larger mapping of learning outcomes across locations, which has the potential to strengthen all programs, by integrating the most effective approaches across curriculums, regions, countries, and the globe.

A.2.4.5 Funding disparities and associated perceptions

Another key barrier to the goal of realizing the potential of games to transform education is the concern of funding. There is a real problem with some schools having little to no perceived funding, but there is a great deal of funding for schools. There is a bottleneck for this funding. So, where is the bottleneck? The funding for developing learning games often comes from different sources: For example, in the United States, federal funding through the *Department of Education, National Science Foundation* (NSF), or *National Institutes of Health* (NIH), philanthropy or self-funded initiatives, foundations such as the *McArthur Foundation* or companies, such as *Facebook* or *Microsoft*, or publishers. These funding sources often fund the design and development. However, little money is allocated for maintenance, professional development, or community-based work.

A.2.4.6 Technical challenges

Even when games are effective and the cost has been somehow mitigated, there are a number of technical issues that often set back efforts for research, implementation, integration, and scale. Some physical technical barriers include firewalls that prevent students from connecting to necessary servers that hold educational content. Likewise, failure to train teachers on emerging tools has repeatedly been a barrier in technology implementation and integration [79]. This can be seen by the number of idle technologies in classrooms (e.g. ipads, chromebooks, smart boards).

In addition to regulations in individual districts, in which some schools don't even allow teachers to use modern technology /change classroom tools.Evidence of efficacy of games as a pervasive education tool can lead to large-scale reform. This can also impact teacher attitudes and the curriculum of teacher training programs to prepare teachers to integrate games into the curriculum.

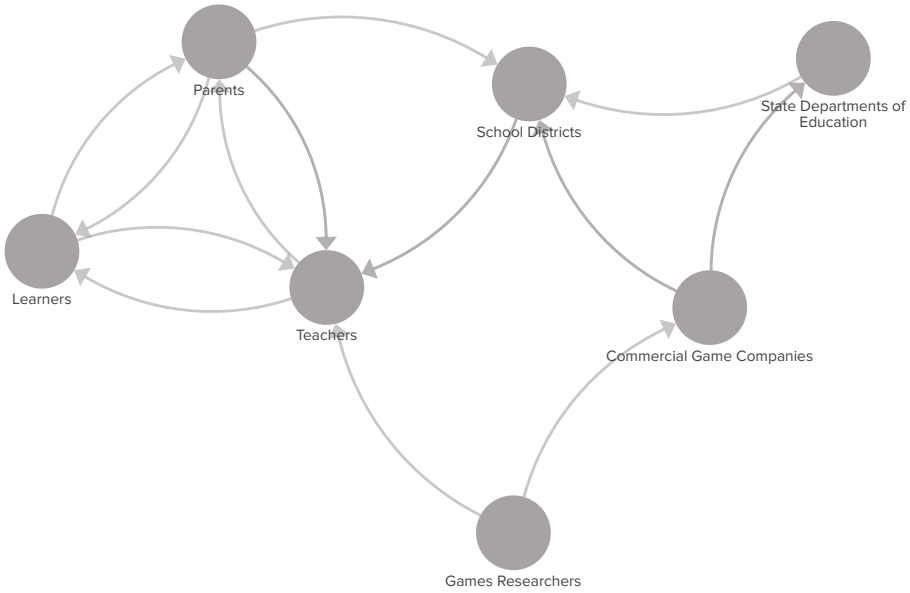


Figure 1 Mindmap of the stakeholders

A.2.4.7 Safety and privacy

A key barrier to widespread integration and scalability of many of the available tools is the perception of safety, considering access to the internet is a key risk to student safety [79].

A.2.5 Key enablers needed

To fully realize the potential of educational games in transforming traditional education, several critical enablers must be strategically implemented across multiple domains. These enablers span policy reform, infrastructure development, stakeholder engagement, and international collaboration to ensure effective implementation and long-term sustainability of game-based educational transformation.

A.2.5.1 Stakeholder buy-in and evidence-based advocacy

Achieving widespread adoption of educational games requires comprehensive buy-in from all stakeholders in the educational ecosystem. This includes politicians, administrators, teachers, parents, and students themselves. The foundation of this buy-in must be grounded in clear, compelling evidence that demonstrates tangible return on investment for educational administrators.

The field must prioritize understanding and addressing the metrics that matter most to decision-makers: *cost savings*, *increased teacher satisfaction and retention*, *measurable improvements in student performance*, and *enhanced student engagement*. To demonstrate these outcomes, we need robust evaluation frameworks that go beyond traditional assessment metrics to capture the holistic benefits of game-based learning environments.

A systematic change management approach is essential for building this buy-in effectively.

Implementation should follow a graduated scaling model, beginning with pilot programs in individual classrooms, expanding to entire grade levels within schools, then progressing to district-wide adoption, state-level integration, and ultimately national implementation. Such a scaling model enables iteration at different scales, evidence collection at each scale, and the cultivation of champions who can advocate for broader adoption.

Leadership engagement at every level is crucial. In the United States context, this means securing support from superintendents, school board members, state education officials, and—ultimately—federal policymakers. Each level of leadership brings unique influence and resources that can accelerate or impede the transformation process.

A.2.5.2 Comprehensive preparation and capacity building

The transition to game-empowered learning environments demands substantial preparation across multiple dimensions. Teacher training programs at universities must evolve to include game-based pedagogical approaches in their core curricula. This preparation cannot be relegated to optional electives but must be integrated as a fundamental component of modern educator preparation.

Professional development providers must develop sophisticated, ongoing training programs that help current educators understand not just how to use educational games, but when and why to integrate them effectively. This includes developing educators' abilities to select appropriate games for specific learning objectives, integrate game-based activities with traditional instructional methods, and assess learning outcomes in game-enhanced environments.

Beyond individual educator preparation, institutional readiness requires investment in technical infrastructure, policy development for game integration, and the creation of support systems that reduce rather than increase teacher workload. Any successful implementation must acknowledge that teachers are already overwhelmed with responsibilities and ensure that game-based tools streamline rather than complicate their instructional processes.

A.2.5.3 International collaboration and knowledge networks

The global nature of educational challenges demands international collaboration to share effective practices, research findings, and technological innovations. Establishing robust networks for international research collaboration can accelerate progress by preventing duplication of efforts and enabling cross-cultural validation of educational game effectiveness.

International collaboration should encompass multiple mechanisms: researcher exchange programs that enable scholars from different regions to work together on game-based learning projects; joint funding initiatives that pool resources from multiple countries or regions to support large-scale research and development; and collaborative platforms that facilitate sharing of educational games, research data, and implementation strategies across borders.

European project funding models, such as those supported by Horizon Europe, provide valuable examples of how international collaboration can be structured and funded. Similarly, initiatives that support Global South participation in educational technology research can

ensure that game-based learning solutions address diverse cultural, linguistic, and socioeconomic contexts rather than merely replicating Western educational models.

A.2.5.4 Sustainable funding and resource models

Realizing the transformative potential of educational games requires addressing fundamental funding challenges that currently limit scalability and sustainability. While initial development funding often comes from federal agencies (*Department of Education, NSF, NIH*), foundations (*MacArthur, Gates*), or industry partners (*Microsoft, Unity, Epic Games*), sustainable implementation requires diversified funding models that support ongoing maintenance, professional development, and community engagement.

Innovative funding approaches should be explored, including public-private partnerships that leverage industry expertise while maintaining educational priorities, outcome-based funding models that tie investment to measurable educational improvements, and international funding consortia that share costs and benefits across multiple educational systems.

The emergence of substantial grant programs from game development companies (such as *Epic MegaGrants* and *Unity for Humanity initiatives*) represents a promising trend that should be expanded and systematized. These industry partnerships can provide not only funding but also technical expertise and platforms that reduce development costs and increase accessibility.

A.2.5.5 Strategic lintegration and transition planning

Successful transformation requires careful consideration of how and when to integrate games into existing educational structures. Rather than wholesale replacement of traditional methods, strategic integration should identify optimal opportunities for game-based approaches while preserving effective traditional practices.

This includes developing frameworks for determining when games are most beneficial (e.g., for complex problem-solving, skill practice, or conceptual exploration) versus when traditional methods remain superior. A promising approach involves replacing existing multimedia educational tools with more engaging, interactive game-based alternatives rather than adding games as supplementary activities.

The transition must also address practical questions of curriculum integration, assessment alignment, and scheduling that enable games to enhance rather than disrupt educational flow. This requires close collaboration between game designers, curriculum specialists, and practising educators to ensure that game-based solutions address real educational needs rather than creating additional complexity.

Success in achieving these enablers will require sustained commitment from the research community, policy makers, educators, and technology developers working in coordinated partnership toward the shared vision of educational transformation through games.

A.2.6 Opportunities for societal impact

The opportunities for societal impact once we realize the potential of games to transform education are truly endless, starting with more interesting, diverse, and fun learning experiences that ripple outward to touch every aspect of society. This transformation has the power to create a more educated, digitally literate, and inclusive population of individuals who have been shaped by personalized learning experiences that contribute not only to academic achievement, but also to connection, well-being, self-awareness, and empathy.

A.2.6.1 Educational and personal transformation

At the heart of this transformation lies the fundamental shift toward personalized learning experiences that pace education with students' capabilities, interests, and talents. When learning adapts to the learner rather than forcing conformity to rigid systems, students feel empowered and develop a higher sense of autonomy and self-efficacy. These experiences also increase digital literacy — both implicitly and explicitly — among students, parents, and teachers, creating a more technologically capable society.

Because learning experiences can be designed to support children's learning at home beyond their parents' knowledge, educational games level the playing field, offering a more fair chance to succeed even when parents are unable to teach specific content. Students gain opportunities to personalize their learning through customizable avatars and adaptive pathways, while parents find themselves with happier, more successful children who require less homework assistance, freeing up family time and reducing the pressure on parents to manage their children's educational responsibilities.

A.2.6.2 Systemic benefits across stakeholders

The ripple effects extend far beyond individual learners. Teachers benefit from students who are more engaged and less disruptive, with automation handling some traditional responsibilities and providing real-time updates to parents about classroom behavior, thereby minimizing knowledge gaps between home and school. The result is saved time and reduced administrative burden, allowing educators to focus on what they do best—teaching and mentoring.

Employers and industry stand to gain more prepared employees who are actually digitally literate (challenging the myth of "digital natives" who may be tech-savvy but lack true digital literacy). The game industry itself benefits as populations become more literate in game genres and design, creating more sophisticated consumers and potential creators.

Not only will students' learning experiences and outcomes improve, but government processes will be facilitated by these tools. The outcomes of this transformed educational arena will include clear metrics of student success, achievements, and talents, providing unprecedented data for policy-making and resource allocation.

A.2.6.3 Building communities of practice

Perhaps most promising is the potential for connecting games-for-education communities of practice: groups of people who share a concern or passion for something they do and learn how to do it better as they interact regularly. This Communities of Practice (CoP) approach

represents a social learning framework that fosters knowledge sharing, collaboration, and mutual support among practitioners.

This CoP framework could dramatically increase collaboration and synergy among citizens and educators regarding learning objectives that align with standards while also addressing the specific needs of the communities in which learners live. Rather than top-down educational mandates, we could see bottom-up innovation that responds to local contexts while maintaining educational rigor and coherence.

A.2.6.4 Addressing risks and maintaining balance

However, realizing these opportunities requires careful attention to potential risks that could undermine the transformative potential of educational games. The challenge of AI bias demands that we train algorithms to be culturally diverse and rigorously test for bias, ensuring that personalized learning truly serves all students rather than perpetuating existing inequalities.

Screen time concerns must be balanced through thoughtful integration with other educational tools—books, physical activities, and mixed reality experiences that combine digital and physical learning. The goal is not to replace all traditional learning methods but to enhance them strategically.

A critical risk is the potential loss of personal connection in education. We must be careful not to lose the positive experiences students have with teachers by designing systems that reduce human engagement. Educational games should include social engagement as a core design principle, incorporating collaboration rather than competition in game experiences with other students. The concept of "coopertition" (cooperative competition) used in programs like FIRST Robotics provides a model for maintaining social learning while leveraging game mechanics.

A.2.6.5 Equity and access considerations

Accessibility and fairness present ongoing challenges that must be addressed proactively. Questions of control—who will actually play or engage with these educational games (students, parents, siblings, friends)—require thoughtful design that maintains educational integrity while acknowledging the social nature of learning and play.

Perhaps most critically, we must guard against accelerating international differences in access to learning opportunities. The digital divide could be exacerbated if educational games become available only to privileged populations. This requires dedicated funding for underserved communities and robust international networks that ensure equitable access to transformative educational technologies.

The societal impact of educational games extends far beyond improved test scores or engagement metrics. We are talking about reshaping how humans learn, connect, and develop throughout their lives. The stakes are high, but so is the potential for creating a more educated, empathetic, and capable global society. Success requires that we pursue these opportunities while vigilantly addressing the risks that could limit access or diminish the human elements that make education transformative.

A.2.7 Roadmap to realizing societal impact

Step 1: Synthesis of existing models of sustainable educational games at scale.

- Document successful global implementations (*Duolingo, Minecraft: Education Edition*)
- Identify common scalability factors
- Create evidence-based replication frameworks
- Map funding models and sustainability strategies
- Establish baseline metrics for educational game effectiveness

Step 2: Identify stakeholders and build foundational networks (1-3 years).

- Connect educators, game designers, and researchers
- Engage policymakers and education administrators
- Partner with community organizations and parents
- Establish international collaboration networks
- Create communication platforms for ongoing dialogue
- Develop shared vocabulary and goals across disciplines
- Host conferences and working group meetings

Step 3: Create systematic partnerships and validation frameworks (3-5 years).

- Develop partnership protocols between schools and game studios
- Establish research validation standards
- Create funding consortium models
- Build teacher training and certification programs
- Design quality assurance frameworks
- Implement pilot testing protocols

Step 4: Implement scaled pilot programs with iterative feedback loops (5+ years).

- Deploy comprehensive pilot programs
  - Urban, suburban, and rural school implementations
  - Cross-cultural validation in multiple countries
  - Grade-level and subject-specific testing
  - Special needs and accessibility pilots
- Establish continuous improvement mechanisms
  - Real-time data collection systems
  - Regular stakeholder feedback sessions
  - Adaptive design protocols
  - Performance analytics and reporting
- Scale successful models systematically
  - District-wide implementations
  - State and national integration
  - International knowledge transfer
  - Policy integration and reform

Step 5: Address the last mile problem and achieve global transformation (10+ years).

- Universal access solutions
  - Low-bandwidth, offline-capable games
  - Multilingual and culturally adaptive content
  - International equity funding mechanisms
  - Device-agnostic learning platforms

- Institutionalize game-based learning
  - Integrate into teacher preparation programs
  - Establish quality standards and certification
  - Create supportive policy frameworks
  - Develop assessment and accountability systems
- Build self-sustaining ecosystems
  - Educator-led game creation tools
  - Continuous R&D cycles
  - Sustainable economic models
  - Community-driven innovation networks
  - Long-term maintenance and support systems

A.3 Harms of games: shifting the paradigm from mitigation to prevention

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Our vision is a future where evidence-based research, multidisciplinary collaboration, and innovative tools address gaming's harms, creating safe, inclusive, and healthy gaming experiences for all players.

A.3.1 Abstract

Digital gaming, a pervasive global activity engaging nearly 80% of online users, presents a paradox: while offering significant benefits, it simultaneously generates substantial harms. These harms, including toxicity, problematic play, deceptive design, and inequitable access, are inadequately addressed by current reactive mitigation approaches. This document outlines a vision for a multidisciplinary approach to proactively mitigate these issues, transitioning from reactive management to preventative design and intervention. Our vision is for identifying and combating gaming's harms in that future games research, design, and development accounts for human fallibility by proactively preventing negative in-game experiences, and supports scaffolding toward healthy relationships with games for broad player groups through the use of novel tools and innovative technologies that are grounded in evidence-based research.

The core problem lies in the systemic nature of these harms, which are deeply embedded within game design and community practices. Toxicity, ranging from verbal abuse to extremist ideology, remains rampant due to subjective definitions and normalized behaviour. Deceptive design practices, such as loot boxes and exploitative reward systems, manipulate player behaviour and raise ethical concerns. Problematic gaming, while controversially classified as a disorder, undeniably causes harm to some players, necessitating a nuanced understanding that avoids pathologizing healthy coping mechanisms. Furthermore, a lack of accessible interfaces and inclusive design perpetuates inequity and exclusion.

To overcome these challenges, we propose key enablers that will lead to solutions. We must establish a robust evidence base through multidisciplinary research, employing diverse methodologies from epidemiological analysis to in-situ studies. This evidence must be translated into accessible resources for researchers, developers, policymakers, and players. Further, we advocate for a paradigm shift towards preemptive harm prevention, leveraging data-driven predictive modeling and real-time detection systems. Additionally, we call for the development of actionable, cross-platform intervention tools, including algorithms, interfaces, and frameworks, that integrate with diverse player contexts and community practices. Importantly, we aim to empower players and build resilient communities through improved literacy on harmful design practices and transparent communication of game content. Finally, we must foster ethical data-sharing practices between researchers and industry, enabling evidence-based policy development.

This vision will be realized through a phased roadmap. Immediate actions include gathering evidence and identifying multidisciplinary expertise. Short-term goals focus on refining

research agendas, developing player education resources, and prototyping intervention tools. Medium-term goals include establishing predictive models and conducting rigorous efficacy trials. Long-term, we aim for implemented regulations, public-facing resource repositories, and fully automated harm prevention systems.

The societal impact of this work is multifaceted. Culturally, it will reframe gaming as a safe and inclusive space, fostering a positive shift in public perception. Educationally, it will equip stakeholders with the knowledge and skills to prevent and respond to negative in-game experiences. Economically, by fostering healthier player relationships, it will contribute to the continued growth of the gaming industry. By proactively addressing the harms of gaming, we can ensure that its positive potential is fully realized while mitigating its negative consequences, creating a sustainable and equitable future for digital play.

A.3.2 Vision

Billions of people around the world play games. While gaming offers many benefits, it also breeds serious harms, including toxicity, problematic play, exploitation through deceptive design, and a lack of equitable access to games. Current solutions to these harms are failing and we need a multidisciplinary research approach to craft evidence-based and actionable solutions. Games research for identifying and combating gaming's harms should yield 1) scientific evidence of antecedents, mechanisms, and impacts of harms that consider the context in which play takes place; 2) concrete intervention tools—algorithms, interfaces, and frameworks, and 3) public-facing resources for use by players, parents, policymakers, and producers of games.

Our vision for identifying and combating gaming's harms is that future games research, design, and development accounts for human fallibility by proactively preventing negative in-game experiences, and supports scaffolding toward healthy relationships with games for broad player groups through the use of novel tools and innovative technologies that are grounded in evidence-based research.

With harms of gaming effectively addressed, we envision a future in which we effectively manage the harms that are an often unintended byproduct of interactive play: Children's games actively support healthy patterns of engagement, games are accessible for everyone independent of individual abilities, gaming spaces are safe and enriching for all players regardless of their identities, and gamers feel they have control over their play choices and experiences.

A.3.3 State-of-the-Art

Gaming is a global force, engaging nearly 80% of online users [113]. While known for benefits like social connection [113], supporting resilience and recovery [93, 31, 153], and offering cognitive benefits [74], there is increasing concern about the problematic side of games, including: toxicity [103, 61], obsessive play [153], deceptive design and problematic monetization [197, 62, 203, 46], and a lack of equitable representation in and access to games [65, 66] (see below). Current efforts to address these "wicked problems" are woefully inadequate. For example, moderation of toxic behavior is reactive, underused, and misused [186]; screentime restrictions are inadequate [15] and potentially harmful by impeding access to essential social support [36]; policies for problematic or deceptive design are lacking, e.g.,

lootbox regulation not being effectively enforced [189]; and existing approaches to accessibility are often merely band aid solutions applied post-hoc [26, 68]. We need more than just research; we need action that integrates a multidisciplinary approach, combining computer science with human-centered perspectives to design socio-technical solutions. Examples of tangible solutions include, but are not limited to: algorithms to detect and mitigate toxicity, interfaces to promote healthy play, frameworks for ethical game design, tools for moderators and parents/guardians, and evidence-based policy. We must move beyond acknowledging and reactively managing these harms after they already occur to proactively dismantling them. The future of gaming depends on it.

A.3.4 Key Challenges and Barriers

There are four key challenges and barriers that need to be addressed in the context of mitigating the harms of games:

- Toxic behavior, hate, and harassment: Toxicity refers to various types of negative behaviours and communications (including hate speech and harassment) that violate the rules and social norms of the game [103, 61, 15] with behaviors ranging from flaming to the spreading of extremist ideology. It remains a current, widely prevalent, and unsolved problem that causes harm to those who are targeted, e.g., causing anxiety and distress. It remains hard to combat because it is very subjective what is toxic, while toxicity is now already normalized in gaming culture [15], and because current regulation and industry practices do not adequately address the phenomenon.
- Deceptive design and problematic monetization practices: Games commonly employ deceptive design strategies that do not prioritize player interests [197], for example, loot boxes and other chance-based game elements that share characteristics with gambling [199], or exploitative reward systems [62]. These are closely linked with harmful monetization strategies, which - while we acknowledge the necessity to monetize games - can put undue pressure onto players, and are ethically questionable [147].
- Problematic gaming and addiction: Some players struggle to control their engagement; the recent recognition of Gaming Disorder in the ICD-11 and DSM5 (as a condition for further study) has sparked significant debate, with researchers questioning its premature inclusion and potential for misdiagnosis [15]. However, research also makes clear that for many players, an inflexible, persistent, and uncontrollable passion for gaming leads to harm [6,16]. We need to better understand problematic play, so that we avoid pathologizing what is, for many, an adaptive and healthy coping mechanism to manage life's challenges. Our goal is to maintain the immersive and engaging nature of games while minimizing risks of problematic play. This necessitates research into game mechanics that facilitate healthy engagement and, importantly, healthy disengagement.
- Challenges for access and equitable experiences: Unintended exclusion of groups of players can cause harm, for example caused by a lack of accessible player interfaces and interaction paradigms [26], and current practices are overwhelmingly limited to post-hoc improvements rather than bottom-up design that appreciates human diversity. Likewise, protecting diverse groups of players from specific harms caused by non-inclusive design practices remains a challenge, for example, extending to player representation [142] and challenges when ensuring that in-game content is adequate for all members of the intended audience and does not cause psychological harm in unanticipated ways [65].

To overcome these challenges, we need multidisciplinary solutions that accurately account for the interactive characteristics of games and their mechanics, and that interface with

industry regulatory bodies, policy makers and wider society to ensure implementation.

A.3.5 Key Enablers Needed

(1) Scientific evidence that identifies sources and causes of harm, effective intervention mechanisms, and coping tools, which is current and contextual, and made accessible to researchers, but also to stakeholders such as game designers, policy makers, parents, and players:

- Repository summarizing scientific evidence for different audiences
- Scientific communication beyond our own disciplinary boundaries
- Pipeline of research from evaluating initial prototype evaluation through to full-scale RCTs of interventions
- Ecologically-valid studies that investigate causes, interventions, and coping mechanisms in-situ
- Data-based investigation of actual player behaviours using techniques appropriate for rich and messy real-world data (e.g., epidemiological analyses, data mining) that inform our understanding of harm

(2) Shifting the paradigm from a predominantly responsive approach to harm mitigation to preemptive action that proactively prevents harms and implements harm-reducing game designs:

- Data-driven predictive modeling of diverse instances of harm in games
- Real-time detection of developing harms
- Speculative, future-looking research approaches that aim to anticipate future harms (e.g., in relation with new and emerging technologies, novel mechanics, or patterns of play)
- Customizable systems that recognize individual perception of and capacity to mitigate harms, emphasizing player agency and player context

(3) Interventions (actionable and cross-platform approaches, tools, frameworks) for regulation and mitigation that integrate with various player context and community practice:

- Designing games and frameworks in a way that interventions can be plugged in different gaming environments and platforms when needed, flexible design that accepts intervention will happen
- Tools for players to cope with harm from others and inform of new and emergent harms
- Intervention tools that can be swiftly refined and reconfigured to adapt to new and emergent harms
- Interventions that help players avoid perpetuating harm to themselves or others
- Software frameworks that address equitable access to games at the level of engine technologies, ensuring bottom-up implementation of best practice

(4) Empowered players and resilient communities who recognize and support harm reduction in games:

- Improve literacy on harmful design practice/deceptive design in games among relevant groups (e.g., children, parents, players more widely)
- More transparent communication of game content to enable informed choice at point of purchase/engagement
- Pathways for player communities to effectively report, reject harmful design practice

A.3.6 Opportunities for Societal Impact

Through our vision for identifying and combating gaming's harms, we anticipate multiple opportunities for societal impact:

- **Cultural**: By proactively preventing negative in-game experiences, we will bring positive changes to reframe the current gaming culture, which is often seen as notorious and stigmatized by the society. By enabling gaming environments where everyone would feel safe and have equal access to play, we will make a cultural shift to build an inclusive, accessible, and "safe for all" gaming culture.
- **Educational**: By enabling players, parents and guardians, educators, policy-makers, and producers of games to better understand, define, and proactively take actions to prevent and respond to negative in-game experiences, we will not only help various stakeholders develop deeper knowledge of potential harms in gaming but also build necessary skill sets to better protect themselves and others in these spaces. This will also maximize the potential of educational games to help designers and developers create advanced educational games where more efficient and collaborative learning can happen in safe social play.
- **Economic**: Games have been a key economic driver in modern society. In 2024, the global video game market revenue reached $184.3 billion [132]. As the gaming landscape continues to evolve to attract different generations of players, our vision will also contribute to amplifying the importance of gaming to global economic growth by fostering a larger player population with healthier relationships with games.

A.3.7 Five-Step Roadmap to Realizing Societal Impact

Step 1: Immediate actions
- Gather evidence of various harms
- Identify relevant academic expertise from other disciplines
- Identify pathways for industry involvement that invites their expertise but does not compromise integrity of evidence: Look at best practice from other fields, e.g., gambling, tobacco, food

Step 2: Short-term goals (1–3 years)
- Bring together academic stakeholders to refine research agenda on harms of games
- Player education resources
- Multidisciplinary understanding of harms in games based on scientific evidence from different ways of knowing
- Prototypes of tools for harm mitigation and prevention
- Design guidelines that prioritize harm prevention in games
- Initial evidence of efficacy of prediction and intervention

Step 3: Medium-term goals (3–5 years)
- Predictive models for detecting harms and antecedents of harms
- Evidence from RCTs on efficacy of harm-prevention interventions and approaches
- Established ethical data-sharing practices that provide researchers access to player data from game companies.

Step 4: Long-term vision (5+ years)
- Implemented regulations for gaming companies at the government level that prevent problematic play, toxicity and hate, exclusive designs, and deceptive practices
- A repository of public-facing resources for different stakeholders on mitigating harms in games

- Fully automated harm prevention systems that flexibly adapt to players, contributing to games that actively support player wellbeing.

A.4 Games as large-scale behavioural research platforms

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Our vision is a future where games serve as dynamic digital laboratories that capture the full spectrum of human behavior, enabling researchers, policymakers, and society to understand the fundamental algorithms of human cognition, social interaction, and decision-making through unprecedented high-resolution behavioral data that transforms how we study, predict, and enhance the human condition.

A.4.1 Abstract

This project envisions transforming video games into dynamic "petri dishes" for human behavior research, unlocking unprecedented insights into cognition, social interaction, and decision-making. By harnessing the rich, granular data generated within game environments, we propose a paradigm shift in understanding the human condition, moving beyond traditional static observation to capture the fluid, performative essence of human experience.

The core concept revolves around leveraging games as controlled experimental spaces, utilizing advanced data instrumentation, universal modding systems, AI-driven content generation, and sophisticated evaluation tools. This approach addresses limitations of conventional research by offering controlled environments, large-scale data collection, and ethical considerations through simulated scenarios and anonymization. We aim to capture the "performative" rather than "declarative" aspects of human behavior, bypassing the biases inherent in self-reporting.

Our approach draws upon existing academic literature on game-based digital biomarkers, the microcosm of human behavior within games, and the correlation between in-game behavior and psychological traits. However, we seek to transcend current limitations by developing a comprehensive, cross-platform framework that integrates memory-level data capture with qualitative methods.

Key to this vision is a four-step roadmap: firstly, establishing automatic data instrumentation to capture comprehensive player behavior across diverse game environments. Secondly, developing a universal modding system to enable controlled experimental manipulation within any game. Thirdly, utilizing procedural content generation and AI-driven synthetic humans to create adaptive, scalable research environments. Finally, implementing advanced evaluation tools, including AI-assisted dashboards and benchmarking systems, to derive meaningful insights and foster reproducibility.

This project acknowledges the inherent challenges, including ethical considerations surrounding data privacy, the potential for reductionism, the need for robust data interpretation, and the imperative to bridge the gap between academic research and real-world application. We advocate for transparency, interdisciplinary collaboration, and the development of ethical guidelines to mitigate these risks.

The societal impact of this research is profound. It promises to revolutionize policymaking by providing data-driven insights into the effects of potential interventions. It offers advancements in healthcare through early mental health detection and personalized treatment. It enhances education through engaging, personalized learning experiences. Furthermore, it provides tools for improved urban planning and contributes to a deeper understanding of human social dynamics.

Ultimately, this project aims to create a "meta-theory" of human behavior within digital spaces, fostering a deeper understanding of cognition, social interaction, and decision-making. By transforming games into scientific laboratories, we seek to unlock the "angels and beasts" within the human psyche, driving innovation across diverse fields and contributing to a more nuanced understanding of ourselves.

A.4.2 Vision

We envision a future where games serve as living laboratories for understanding human behavior at scale, advancing both scientific knowledge and societal well-being. Through their immersive and interactive nature, games can capture rich, ecologically valid data on cognition, emotion, and social interaction across diverse populations. Our vision is to establish frameworks where such data collection is ethical, transparent, and mutually beneficial for researchers, players, and developers alike.

By responsibly harnessing the scale of contemporary games, researchers can generate insights that inform psychology, sociology, economics, and beyond, while players gain more meaningful and trustworthy experiences. Ultimately, we foresee games becoming integral to a new paradigm of behavioral research, one that is participatory, globally inclusive, and deeply attentive to the responsibilities of working with human data.

A.4.3 State-of-the-Art

The academic study of video games has evolved to position them as powerful platforms for behavioral science. Research increasingly demonstrates that the rich behavioral data generated during gameplay can serve as a proxy for understanding human psychology, cognition, and social dynamics. This work builds on foundational theories from personality psychology, sociology, and emotion theory, contributing new methods and findings back to these fields. The research can be broadly categorized into three key areas: the use of game data as digital biomarkers, the study of games as microcosms of human behavior, and the modeling of individual differences through in-game actions.

A.4.3.1 Game-Based Digital Biomarkers

A promising area of research is the use of "game-based digital biomarkers" to non-intrusively assess and model mental health. Mandryk and Birk argue that data from commercial, off-the-shelf games can provide high-resolution behavioral traces related to a player's cognitive performance, motor skills, social behavior, and affect [114]. By analyzing these patterns, researchers aim to develop scalable methods for population screening and mental health monitoring that supplement traditional clinical assessments.

A.4.3.2 Games as Microcosms of Human Behavior

Virtual worlds also serve as powerful methodological tools and experimental platforms for social science. Immersive virtual environments were identified early on as a valuable method for studying social psychology in controlled, replicable settings [17]. This concept has been extended to Alternate Reality Games (ARGs), which use real-world communication tools within a fictional narrative to study complex team dynamics, adaptability, and other social science phenomena [71, 163]. Social games are also designed as experimental platforms where researchers can manipulate social scenarios to observe player behavior in response to varying personalities and contexts [162].

This approach is exemplified by studies of emergent societies in games like *Minecraft*. Anarchy servers such as *2b2t*, which operate with no rules, have become natural experiments for observing self-organizing social structures. Recognizing this potential, the University of Essex recently opened the world's first "Minecraft psychology lab" to formally research social behavior, creativity, and problem-solving within the game [139]. The frontier of this field involves creating fully interactive simulations of human behavior, as demonstrated by the "Generative Agents" project, where AI-powered simulacra inhabit a virtual town, providing an unprecedented platform for studying emergent social phenomena [141]. Beyond social observation, research has also shown that playing certain video games can directly enhance cognitive control, particularly in older adults [9].

A.4.3.3 Personality and Behavioral Modeling

A significant body of work focuses on the direct link between a player's personality and their in-game behavior. Studies have shown that it is possible to create surprisingly accurate personality profiles based on gameplay data, effectively using games as personality profiling tools [183, 13]. This is achieved by modeling player actions, tactics, and strategies to infer psychological traits. Research has demonstrated that personality facets, such as extraversion or conscientiousness, have significant correlations with specific behaviors like navigation or quest completion, though these links are highly dependent on the in-game context [28]. Advanced techniques like sequential pattern mining are being used to move beyond simple aggregate statistics, allowing for a more nuanced understanding of how individual differences manifest in moment-to-moment gameplay decisions.

This academic work is complemented by insights from the game industry, where companies like *Quantic Foundry* and speakers at the *Game Developers Conference* (GDC) regularly discuss player motivation and experience, bridging the gap between theoretical research and practical game design.

A.4.3.4 Controlled Digital Laboratories

Games represent a revolutionary departure from traditional research methodologies by offering unprecedented experimental control within naturally engaging environments. Unlike conventional laboratory settings that suffer from artificial constraints and the "white coat effect," games provide researchers with the ability to manipulate variables while maintaining ecological validity. Players immerse themselves willingly in these digital spaces, exhibiting authentic behaviors without the self-consciousness that plagues traditional observation. This controlled environment enables the isolation of specific social phenomena—cooperation,

competition, leadership emergence, moral reasoning—allowing researchers to study these complex processes with surgical precision while minimizing external confounding factors.

A.4.3.5 Longitudinal Behavioral Evolution

The intrinsically motivational nature of games creates an unparalleled opportunity for longitudinal data collection that transcends the limitations of traditional cross-sectional studies. Players return repeatedly over months and years, generating rich temporal datasets that capture the evolution of behavior, learning, and social dynamics. This engagement reveals how internal psychological processes and external environmental pressures drive behavioral change over time. We can observe the development of expertise, the formation and dissolution of social bonds, the adaptation to changing game mechanics, and the emergence of player-driven cultural norms — all within a digitally instrumented environment that captures every nuance of this behavioral evolution.

A.4.3.6 Performative Behavioral Measurement

Games offer a fundamental advantage over declarative research methods by capturing what people actually do rather than what they claim to do. Traditional psychological assessments rely heavily on self-report measures that are susceptible to social desirability bias, memory limitations, and introspective blind spots. In contrast, gameplay data reveals performative expressions of psychological traits—resilience through persistence in challenging scenarios, leadership through emergent coordination behaviors, or narcissism through competitive displays and social positioning. These behavioral signatures emerge naturally from player actions, providing objective measures of psychological constructs that have traditionally been difficult to assess reliably.

A.4.3.7 Synthetic Human Integration

The integration of AI-driven synthetic humans into game environments opens unprecedented possibilities for controlled social experimentation. These digital entities, powered by large language models and behavioral AI, can serve as consistent experimental confederates, standardized social stimuli, or adaptive interaction partners. Unlike human confederates who may introduce variability through fatigue, mood, or inconsistent performance, synthetic humans can maintain precise behavioral parameters while still exhibiting realistic social responses. This technology enables researchers to study social dynamics with levels of control previously impossible - examining how groups respond to specific leadership styles, how individuals adapt to different personality types, or how social networks form around particular behavioral patterns.

A.4.3.8 Scalable Data Ecosystems

The digital nature of games transforms data collection from a resource-intensive bottleneck into a scalable, automated process. Massive multiplayer environments generate terabytes of behavioral data from thousands of simultaneous participants, creating datasets of unprecedented size and richness. This scalability enables researchers to study rare behavioral phenomena, detect subtle statistical patterns, and examine cross-cultural differences across global player populations. The automated instrumentation captures everything from microsecond reaction times to complex social network formations, creating a comprehensive

archive of human behavior that can be analyzed using modern computational methods to reveal insights invisible to traditional research approaches.

A.4.3.9 Ethical Experimentation Through Simulation

Games provide a crucial ethical framework for studying sensitive social phenomena that would be impossible or harmful to replicate in real-world settings. Researchers can simulate economic crises, social conflicts, moral dilemmas, and policy interventions within safe digital spaces where no actual harm can occur. This capability is particularly valuable for studying responses to extreme scenarios — how communities respond to resource scarcity, how individuals make decisions under severe time pressure, how groups handle betrayal or deception. The anonymization inherent in digital avatars and gaming personas further protects participant privacy while enabling the study of behaviors that might otherwise remain hidden from scientific scrutiny.

A.4.3.10 Policy Laboratory and Social Simulation

The potential for games to serve as policy testing grounds represents a paradigm shift in how we approach social and economic interventions. Rather than implementing policies blindly or relying on theoretical models, researchers can simulate the effects of different approaches within game environments that mirror real-world social structures. Economic simulations can test monetary policies, social experiments can explore the effects of different governance structures, and urban planning initiatives can be evaluated through virtual city-building scenarios. This approach provides policymakers with data-driven insights into potential outcomes, reducing the risk of unintended consequences while optimizing intervention strategies before real-world implementation.

A.4.4 Key Challenges and Barriers

A.4.4.1 Ethics, Privacy, and Player Consent

The promise of comprehensive behavioral data collection through games immediately confronts fundamental ethical challenges around consent, privacy, and data ownership. GDPR regulations and evolving privacy frameworks create complex legal landscapes where the line between gameplay analytics and behavioral research becomes increasingly blurred. Players who simply want to enjoy a game may never have explicitly consented to having their decision-making patterns, social interactions, and psychological traits analyzed for research purposes.

Trust emerges as a critical factor. When players discover that their digital behaviors are being scrutinized for insights into their real-world psychology, they may feel deceived or manipulated — particularly if this analysis was conducted without transparent disclosure. The gaming industry's history of data collection primarily for monetization purposes further complicates public trust, as players may reasonably question whether their behavioral data serves scientific advancement or corporate profit maximization.

A.4.4.2 Misaligned Incentives and Data Control

A fundamental structural challenge lies in the disconnect between those who generate behavioral data and those equipped to extract meaningful scientific insights from it. Game companies possess vast troves of player behavior data but typically lack the interdisciplinary

expertise, methodological rigor, or research objectives necessary to transform this information into valid psychological or social science knowledge. Their primary motivation — revenue generation and player engagement optimization — often conflicts with scientific goals of understanding human behavior more broadly.

This creates a problematic dependency where researchers must rely on corporate entities for data access, potentially compromising research independence and introducing selection biases based on what companies are willing to share. The resulting research may inadvertently reflect commercial interests rather than genuine scientific inquiry.

A.4.4.3 Potential for Algorithmic Harm

Perhaps the most concerning challenge involves the dual-use nature of detailed behavioral insights derived from gaming data. Models that can predict psychological traits, decision-making patterns, or social behaviors from gameplay create powerful tools that could be weaponized for discrimination in hiring, insurance, credit decisions, or healthcare access. The same algorithms that might help researchers understand human cooperation could enable companies to identify and exclude "difficult" employees or "risky" insurance applicants.

This risk is amplified by the potentially covert nature of data collection — players engaging in seemingly harmless entertainment activities while unknowingly providing detailed psychological profiles. The question of how to provide meaningful value back to players in exchange for this data remains largely unresolved, raising fundamental questions about fair exchange and informed participation.

A.4.4.4 Technical and Analytical Limitations

The ambition to capture "everything" about human behavior through games confronts harsh technical realities. Comprehensive behavioral instrumentation generates massive, heterogeneous datasets that strain current storage, processing, and analytical capabilities. The sheer volume of data — every click, pause, movement, and interaction across millions of players — creates computational challenges that may outpace our ability to derive meaningful insights.

More fundamentally, the question of what constitutes relevant behavioral data remains open. Should researchers capture physiological responses, eye movement patterns, social media activity during gameplay, or post-game reflection data? The risk of drowning signal in noise increases exponentially with data volume, particularly when analytical frameworks lag behind data collection capabilities.

A.4.4.5 Legitimacy and Ecological Validity Concerns

The research community faces persistent skepticism about games as legitimate scientific instruments. Critics argue that game environments are too artificial, too removed from real-world contexts, to generate insights applicable to actual human behavior. This "just toys" perception undermines efforts to establish games-based research as a serious scientific discipline and may limit funding, publication opportunities, and interdisciplinary collaboration.

The ecological validity challenge runs deeper than mere perception. Games do create artificial environments with unique social norms, reward structures, and behavioral constraints that may not translate to offline contexts. Players may exhibit behaviors in games that differ

significantly from their real-world personalities, raising questions about the generalizability of game-derived insights.

A.4.4.6 Interpretation Challenges and Bias

Data objectivity provides no immunity against interpretive bias. While behavioral traces captured through games may be quantitatively precise, the frameworks researchers use to analyze and interpret this data inevitably reflect their theoretical assumptions, cultural backgrounds, and disciplinary perspectives. The models we build, the patterns we choose to identify, and the significance we attribute to different behaviors all carry embedded biases that can systematically distort conclusions.

Context dependency poses another critical challenge. Behavioral data gathered within specific game environments, with particular player populations, under certain social and economic conditions, may not generalize across different contexts. The abstraction necessary to create broadly applicable models risks losing the contextual richness that gives behavioral data its meaning.

AI-driven analytical tools, while powerful, often function as "black boxes" with poor explainability. Researchers may identify strong predictive relationships between gameplay patterns and psychological traits without understanding the underlying mechanisms, limiting both scientific insight and practical application.

A.4.4.7 Adoption and Impact Barriers

Despite potentially transformative insights, games-based behavioral research faces significant adoption barriers across multiple stakeholder communities. Academic psychologists may resist incorporating game-derived findings due to methodological unfamiliarity or concerns about validity. Game companies, despite generating the data, may lack incentives to support research that does not directly enhance profitability. Policymakers often struggle to translate digital behavioral insights into real-world interventions.

These adoption challenges reflect deeper philosophical differences about research priorities and validity standards. While games researchers may prioritize external validity and real-world applicability, traditional psychology emphasizes internal validity and controlled conditions. Bridging these epistemological divides requires not just better research, but fundamental changes in how different fields evaluate and integrate scientific knowledge.

The risk that this promising research paradigm remains siloed within games studies, failing to achieve its transformative potential, represents perhaps the greatest long-term challenge facing the field.

A.4.5 Key Enablers Needed

A.4.5.1 Research-Oriented Game Design

Realizing the full potential of games as behavioral laboratories requires purpose-built platforms designed with research objectives as primary goals rather than afterthoughts. These games must feature modular architectures that allow researchers to systematically manipulate variables — adjusting cooperation incentives, introducing resource scarcity, or modifying

communication channels—while maintaining player engagement. Data-rich environments become essential, capturing not just obvious metrics like click patterns but subtle indicators such as hesitation duration, communication sentiment, and attention allocation.

The challenge lies in balancing scientific rigor with entertainment value. Research games must remain intrinsically motivating while providing controlled experimental conditions that would satisfy peer review standards.

A.4.5.2 Intelligent Analytics Infrastructure

The massive scale of behavioral data generated by games demands sophisticated analytical tools that extend far beyond traditional statistical approaches. AI-powered analysis systems must identify complex behavioral patterns, predict psychological traits, and extract meaningful insights from heterogeneous datasets spanning millions of players and interactions. Real-time analytics capabilities enable dynamic experimental adjustments, allowing researchers to observe immediate behavioral responses to environmental changes.

Interactive visualization platforms become crucial for communicating complex findings to diverse stakeholders—from academic colleagues to policymakers who may lack technical backgrounds. These tools must translate raw behavioral patterns into comprehensible insights that inform decision-making across multiple domains.

A.4.5.3 Robust Ethical Frameworks

Comprehensive ethical guidelines must address the unique challenges posed by behavioral research through games. Informed consent processes need fundamental redesign to clearly communicate how gameplay data translates into psychological insights, moving beyond generic privacy notices to meaningful disclosure about research implications. Data anonymization techniques must evolve to handle behavioral biometrics that may be inherently identifying, while security measures protect against both external breaches and internal misuse.

Ethical oversight must extend beyond data protection to address potential psychological manipulation, ensuring that research activities do not exploit player engagement mechanisms for purposes beyond scientific inquiry.

A.4.5.4 Interdisciplinary Collaboration Models

Breaking down silos between game development and behavioral research requires new collaboration frameworks that align traditionally divergent objectives. Game developers bring technical expertise and player engagement insights, while social scientists contribute methodological rigor and theoretical frameworks. Computer scientists provide analytical capabilities, and psychologists offer interpretive expertise.

These partnerships must navigate fundamental differences in timelines, success metrics, and publication practices. Shared research goals need careful negotiation to ensure that commercial viability does not compromise scientific validity, while research objectives do not undermine player satisfaction.

A.4.5.5 Public Engagement and Transparency

Building public trust requires moving beyond traditional passive consent models toward active participant engagement in the research process. Educational outreach must help players understand both the potential benefits and risks of behavioral research through games. Citizen science approaches can transform players from data sources into research collaborators, allowing them to contribute to hypothesis generation, data interpretation, and result validation.

Transparency about research objectives, methodologies, and findings helps build the social license necessary for this research paradigm to flourish while addressing public concerns about data misuse and privacy violations.

A.4.6 Opportunities for Societal Impact

A.4.6.1 Data-Driven Policy Innovation

Games offer policymakers unprecedented opportunities to test interventions before real-world implementation. Economic simulations can model the effects of tax policies, social experiments can explore governance structures, and urban planning scenarios can evaluate infrastructure decisions. This approach transforms policymaking from educated guesswork into evidence-based practice, potentially saving billions in failed initiatives while optimizing social outcomes.

Success requires games that accurately simulate real-world dynamics, strong partnerships between developers and government agencies, and frameworks for translating behavioral insights into actionable policy recommendations. The challenge lies in ensuring that simplified game mechanics capture the complexity of actual social systems.

A.4.6.2 Enhanced Social Understanding and Accessibility

Digital behavioral research promises deeper insights into human social dynamics, cultural differences, and interpersonal communication patterns. These findings can inform educational curricula, social work practices, and community building initiatives. Games also enable the development of personalized assistive technologies—digital companions for elderly individuals, cross-cultural communication tools, and adaptive interfaces for people with disabilities.

Realizing these benefits demands ethical data collection practices, interdisciplinary collaboration across psychology and sociology, and effective communication strategies that translate complex research findings into practical applications for diverse communities.

A.4.6.3 Psychological Research Revolution

The rich behavioral data captured through games could fundamentally advance our understanding of human cognition, emotion, and decision-making. Digital twins — sophisticated AI models trained on individual behavioral patterns — enable researchers to study psychological processes in controlled environments while predicting responses to various scenarios. This capability has profound implications for personality psychology, social psychology, and behavioral economics.

Progress requires comprehensive data acquisition systems, longitudinal studies capturing behavioral evolution over time, and advanced computational modeling techniques including

natural language processing and reinforcement learning to create dynamic psychological models.

A.4.6.4 Healthcare Transformation

Game-based behavioral analysis offers revolutionary potential for healthcare applications. Early detection systems could identify mental health conditions through subtle changes in gameplay patterns. Personalized treatment plans could adapt based on behavioral responses captured through therapeutic games. Virtual therapists powered by behavioral AI could provide accessible mental health support at scale.

Medical applications demand rigorous clinical validation, seamless integration with existing healthcare systems, and clear regulatory frameworks governing the use of behavioral data for diagnostic and therapeutic purposes.

A.4.6.5 Educational Innovation

Adaptive learning systems based on behavioral insights could personalize education for individual cognitive styles and learning preferences. Real-time assessment through educational games could identify learning difficulties early while optimizing engagement and retention. Sophisticated simulations could provide immersive training experiences for complex professional skills.

Educational applications require alignment with curriculum standards, comprehensive teacher training programs, and accessibility features ensuring equitable access across diverse student populations.

A.4.6.6 Urban Planning and Environmental Design

Virtual city simulations enable planners to test designs before expensive real-world implementation. Behavioral data from these simulations can reveal how residents might actually use public spaces, transportation systems, and community resources. Environmental impact modeling could optimize sustainability initiatives while maintaining livability.

Urban applications need accurate environmental modeling, robust stakeholder engagement processes, and long-term data analysis capabilities to track the effectiveness of planning decisions over time.

A.4.7 Roadmap to Realizing Societal Impact

Step 1: Automatic Data Instrumentation (Read)

- Develop cross-platform, cross-engine data collection systems that work universally across games
- Implement memory-level data capture to extract gameplay data without requiring developer integration
- Create open-source frameworks for plug-and-play behavioral data collection
- Integrate qualitative methods (surveys, interviews) with quantitative gameplay metrics
- Establish standardized data formats and ethical collection protocols

Step 2: Universal Modding System (Modify)

- Build unified modding frameworks that work across any game regardless of built-in modding support
- Develop dynamic injection tools for real-time game modification
- Create standardized experimental manipulation tools for researchers
- Establish protocols for controlled variable testing within existing games
- Partner with game studios to leverage modding systems for rapid prototyping and player research

Step 3: Procedural Content Generation & Synthetic Humans (Create)

- Develop AI-driven systems for generating game content, levels, and mechanics on demand
- Create synthetic human agents that mimic realistic player behaviors for controlled experiments
- Build adaptive game environments that adjust parameters based on research requirements
- Implement procedural scenario generation for studying specific psychological phenomena
- Establish frameworks for testing human-AI interaction in controlled gaming environments

Step 4: Evaluation & Understanding (Analyze)

- Deploy AI-assisted analytics dashboards for pattern recognition and insight extraction
- Establish benchmarking systems and reproducibility frameworks for game-based research
- Create automated research tools for literature review, experiment design, and report generation
- Develop explainable AI models for interpreting complex behavioral patterns
- Build comprehensive databases linking gameplay behaviors to psychological and social outcomes
- Formulate meta-theories of human behavior in digital spaces that inform broader scientific understanding

A.5 Building sustainable and scalable research infrastructure

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A.5.1 Abstract

Games research, as a young and emerging field, requires structured development to ensure its sustainability and scalability. To this end, we propose three key aspirations: establishing a canon of seminal work, creating a platform for archiving and sharing game-related artifacts, and developing a mentoring hub for professional growth.

1. **Establishing a canon to address the current lack of a consolidated understanding of foundational research.** The organic growth of the field has led to a situation where researchers risk "reinventing the wheel" because of insufficient awareness of prior work. To remedy this, the vision proposes curated narrative reviews by leading experts, presented through publications, keynotes, and workshops. An editorial team will oversee the quality and scope of these reviews. In addition, an online repository, complete with a visualization system, will document key contributions, theories, and research games. This structured approach will ensure a coherent progression of knowledge, allowing new research to build on established foundations.
2. **Creating a platform for archiving and sharing game-related artifacts to mitigate fractured work and promote reproducibility, and accessibility.** Empirical games research often involves creating unique games for specific studies, which are rarely archived or shared. This lack of readily available resources hinders progress and limits the rigour of games research. The proposed platform will serve as a repository for these artifacts, ensuring their technological, methodological, and archival sustainability. It will also support data storage, analytics, and visualization, tackling the legal, technical, and infrastructural hurdles associated with long-term accessibility.
3. **Developing a mentoring hub aims to support the professional journey of game researchers at all career stages.** Navigating the complex ecosystem of academia and industry presents numerous challenges, including understanding career growth potential, identifying key contacts, and managing expectations. These challenges impede individual and community growth. The proposed mentoring hub will provide researchers with the necessary tools, resources, and personal support. It will facilitate connections between researchers across academia and industry through online and in-person support. This global network will empower new talent and assist senior researchers in transitioning between sectors, strengthening the community.

These three aspirations - establishing a canon, creating an artifact platform, and developing a mentoring hub - collectively address the structural needs of our young, evolving games research field. By fostering a shared understanding of foundational knowledge, enabling access to research artifacts, and supporting professional development, these initiatives will contribute to the maturity and long-term impact of games research on both research and society.

A.5.2 Vision

Games research is a young but rapidly growing field. To thrive as a community, we need to develop structures: conceptual, in terms of theories, methods, and frameworks, as well as technological, in terms of shared resources and infrastructures. This will enable the creation of a sustainable and scalable research environment that contributes to the lasting impact of games research within the field and beyond. Below, we explicate our vision, comprising three key aspirations.

Games research establishes a canon of the field's seminal work. Over the past decades, foundational works, concepts, and theories have developed organically, forming an emerging awareness of games research. However, collecting research findings considered most important or influential is still taking shape. This naturally presents the risk of researchers reinventing the wheel due to a lack of awareness of prior work. To this end, our vision is that games research establishes a canon of the field's diverse seminal research. This ensures that new research efforts build upon previous findings, resulting in a coherent flow of knowledge. To address this, curated narrative reviews by thought leaders will be published, presented at keynotes, and shared through workshops. An editorial team will oversee topics, contributors, and quality standards. Additionally, an online repository with a visualization system will document contributions, theories, and research games used.

Games research establishes a platform to archive and share game-related artifacts. Our community's grounding in empirical work requires access to research artifacts — games and tools — often created from scratch by a research team for a singular research objective. The lack of readily available, archivable, reusable, and shareable research games and related tools to accelerate future research and improve rigor and reproducibility is a significant barrier for individuals, teams, and the broader community. To this end, our vision is that games research establishes a platform to support its artifact-rich ecosystem. This platform archives and shares ready-made game-related artifacts to support diverse research objectives while ensuring technological, methodological, and archival sustainability. This platform will also support data storage, analytics, and visualization, addressing legal, technical, and infrastructural challenges for long-term accessibility.

Games research establishes a mentoring hub to support the professional journey. Early and even later career game researchers struggle to navigate academia and industry as their work ecosystem. This comprises a variety of challenges, including knowing what growth potential there is for individual researchers, what is needed to evolve within the community, who the "right" people are to talk to, and what can be demanded when negotiating contracts. These challenges prevent the effective growth of individuals and, by that, the community at large. To this end, our vision is that games research establishes a mentoring hub, providing researchers with the tools, resources, and personal support needed throughout the professional journey, from empowering new talent to advance in academia to helping senior researchers transition to industry. This global mentoring hub connects researchers across academia and industry, offering online and in-person support, empowering individual researchers, and strengthening the game research community.

Collectively, these three key aspirations - the widespread knowledge of foundational theories, methods, and concepts in games research, the platform to archive and share games-related artifacts, and the mentoring hub to support the professional journey through all stages of

the games researcher's career — will promote the maturity of the games research field and increase its impact on research and society in the long term.

A.5.3 State-of-The-Art

Here we list the diverse efforts and findings related to our three key aspirations for establishing the sustainability and scalability of games research.

1. SOTA related to establishing a canon of seminal work: Certain contributions at the *CHI PLAY* conference series' such as the *"Perspectives on Play"* track address the need to refer to each other's work more, e.g., *Five CHI PLAY Papers I Like: On Championing Published Work That Has Merit* [120]. Work has also already been done on standards for describing artifacts used in games research, see, for instance, *Reflections on rigor and reproducibility: Moving toward a community standard for the description of artifacts in experimental games research* [67].

2. SOTA related to establishing a platform for game artifacts: Some individual research groups have built core technologies and competencies within their teams that facilitate a direct extension of their work along a relatively narrow set of research questions. These resources are almost never shareable across teams and are limited in their breadth.

Other fields (e.g., high-energy physics) have developed shared platforms that define a range of functionalities to support multiple research teams and address current and potential future research questions. It would be interesting to understand how these fields approach the archiving, documenting, and sharing of these artifacts.

3. SOTA related to a mentoring hub to support the professional journey: Despite being a young research community, there are some opportunities for early-career games researchers, depending on their specific domain, to find support when entering our field and advice on advancing their careers. For example, at different conferences there are some structures in place:

- *ACM Annual Symposium on Computer-Human Interaction in Play* (CHI PLAY) conference provides a mentoring lunch, AC and reviewer training.
- At *ACM CHI Conference on Human Factors in Computing Systems* (CHI) and *CHI PLAY*, a doctoral consortium is provided. Other conferences offer this as well, e.g., *Foundations of Digital Games* (FDG).
- At CHI, workshops are organized to provide early-career researchers with more information.

Examples of Local/National Mentoring Programs:

- The *German Informatics Association:* 1 year one-to-one mentorship with senior academic mentors of an associated but outside the mentee's research field. The program includes regular meetings about once every 3 months, support with writing applications, etc.
- The *University of California Mentorship Program [UCOP]:* similar one-to-one relationships across disciplines
- Postdoc support programs, such as *EXCELLerate*

Examples of International/Global Programs:

- Doctoral consortia across conferences organised by academic publishers such as ACM and IEEE, for example, the aforementioned CHI PLAY, CHI, and the *International*

Symposium on Mixed and Augmented Reality (ISMAR).
- Mentoring lunches at conferences.
- Summer Schools, e.g., the *International Summer School on Artificial Intelligence and Games*.
- The *Global Game Jam*'s Mentor Match-Up Program.
- *Women in Games International Mentoring*
- *Queer in HCI*
- The *International Game Developer's Association* such as the *Special Interest Groups on Games Research and User Experience (IGDA SIG on GRUX)* and on *Game Analytics* (IGDA SIG on GA).

While the above is most definitely not a complete list and has a focus on HCI-related work, it serves as an example of the kinds of community-driven structures that have emerged in games research to support early career researchers.

A.5.4 Key Challenges and Barriers

First, as general barriers, we point out that all three key aspirations rely on volunteers willing to devote their time and expertise [33]. Additionally, games research is a young field characterized by a surplus of young, untenured researchers; many among us are already overburdened yet in uncertain positions. Moreover, there is still a stigma on 'games' as not being valuable in themselves. Much of the game research must disguise itself as research on "immersive interactive experiences", as "AI research", or "digital engaging learning tools". When the home institution or the wider academic field does not recognize game research as worthwhile, this may lead to a de-prioritization of engaging in volunteering efforts.

Challenges & Barriers to establishing a canon of seminal work: As game research is still a young field, the agreement on what is considered seminal or foundational is still emerging. Therefore, selecting what goes into a 'canon' can be considered highly 'subjective' and remains dynamic. This points to the need for a strong 'editorial team' covering a diverse set of backgrounds to discuss who thought leaders are, and there is a risk of becoming hermeneutic.

Challenges & barriers to establishing a platform for game artifacts: While some individual research groups have built core technologies and competencies, these are often focused on a narrow set of research questions and are usually not shared with external parties. This impacts uptake by other researchers and results in research that is fractured. Hence, the team that discusses the standards for the platform as an online repository will need to invest time, and there will need to be considerable debate to reach a consensus. We want to avoid yet another repository next to those already provided by organisations and publishers such as *ArXiv, ACM, IEEE*, etc. Besides the instruments themselves, research on games requires a surrounding ecosystem that facilitates the research processes and ensures its replicability. This often involves resorting to solutions not initially developed with games research in mind or, again, custom-made solutions that are not sustained across studies.

Challenges & Barriers to establishing a mentoring hub to support the professional journey: Currently, there is neither an umbrella organization that connects early-career and later-career games researchers for long-term guidance and interdisciplinary connections, nor a best practice career development program that could be easily applied in

different institutions. Local or national mentoring programs exist in some countries, which are, however, limited on a larger, international scale. Early-career game researchers outside of these systems do not have access to them. Furthermore, the challenge is accompanied by an intergenerational communication gap, leading to limited knowledge transfer and contributing to "having to reinvent the wheel" as an early career person.

A.5.5 Key Enablers Needed

Research and development of games and game-adjacent fields strongly drive technological advancements. Topics such as virtual reality, artificial intelligence, rendering, and user interface design are in high demand and find applications beyond gaming. Moreover, games become ever more dominant in society as a form of leisure, but equally in terms of economic impact and as valuable cultural expressions. More specifically, for these three key aspirations, we list the following key enablers:

Key Enablers for establishing a canon of seminal work: In October 2024, the inauguration of the 'lasting impact' award at the CHI PLAY conference took place. This yearly award aims to promote reflection and look back at seminal work, 10 years prior, published at CHI PLAY. Additionally, CHI PLAY provides master classes that aim to give thought leaders a platform to introduce interested researchers to specific concepts, methods, and frameworks within games research.

Key Enablers for establishing a platform for game artifacts: The games industry's adoption of a small collection of powerful toolkits (e.g., *Unity, Unreal, Havok*), each defined with APIs that are well-tuned to industry practice. While these tools certainly contributed strongly to ideation and prototype development in academia, they are targeted towards the needs of commercial developers who are their primary users.

Key Enablers for establishing a mentoring hub to support the professional journey: Established associations like ACM and industry partners may be able to provide funding for career counseling and development within games research. SIGCHI, for example, has the Development Fund [167]. The UK also provides a local games fund [63] to support. Both receive valuable, non-monetary benefits from their engagement in the program, such as networking and hiring opportunities for excellent and highly skilled people, and knowledge transfer and growth.

A.5.6 Opportunities for Societal Impact

Increasing sustainability and scalability will improve the academic output and efficiency of game research and influence research in various fields beyond game research [131]. Specific to the three key aspirations:

- **Societal impact of a canon of seminal work in games research**: Shared awareness of foundational theories and methods will improve the uptake of game research beyond our field. It may contribute to better research on games or with games in fields that address education or psychology, and help them make more valuable scientific contributions.
- **Societal impact of a platform for game artifacts**: The clear description of prior work, including video games as research artifacts, will help speed up work and avoid wasting precious research funding. In addition, the platform will increase transparency into game developments and soft-/hardware dependencies that impact game research.

- **Societal impact of a mentoring hub to support the professional journey**: A global mentoring platform for game researchers will empower individuals and strengthen the game research community's effectiveness and competitiveness in other research fields and industries.

A.5.7 Five-Step Roadmap to Realizing Societal Impact through Sustainability and Scalability

Five-Step Roadmap for establishing a canon of seminal work.

1. To develop this coherent collection of curated reviews by thought leaders, we need to set up an editorial team.
2. This team needs to set up a list of topics and candidate thought leaders, as well as expectations and evaluation metrics for the curated articles.
3. Next, the editorial team must invite thought leaders to create these articles and manage the publishing process.
4. These narrative reviews are created by thought leaders in the field and contain commentary mechanisms. These are published in an indexed venue, so that they are also accessible by researchers outside of our community. Moreover, these thought leaders are also invited as keynote speakers at the respective conferences and asked to host workshops to share the content of their narrative reviews.
5. As a series, collectively, these publications provide a canon of the field of games research. Finally, to ensure awareness of this canon, the field of game research needs an online repository, including a visualization system to easily explore contributions, theories, key takeaways, and, importantly, the games and tools created for or used in research (see next key aspiration).

Five-Step Roadmap for establishing a platform for game artifacts

1. To develop this platform to support technological, methodological, and environmental needs and contribute to documentation, archival processes, and continued access, we need to set up a team overseeing these efforts.
2. This team will need to define a range of functionalities to support multiple and diverse research teams in current and potential future research questions. a) From a data perspective, this requires establishing shared and secure data storage solutions. Additionally, we must provide a data analytics toolbox, which, in turn, may involve interfacing with existing ones or building new ones. Allowing researchers to integrate their analytics and visualization solutions will also increase longevity and may encourage up-take by others, helping in increasing reach and impact. b) To overcome the relatively short-lived access to games due to the fast-moving technology, the system would need to include versioning and ensure long-term technical accessibility, which, apart from guaranteeing access, will also support longitudinal studies. c) Such a platform would contribute to the documentation of games used in research by providing a repository, further supported by functionality that produces audiovisual materials for documentation purposes. Indeed, providing an ecosystem that supports empirical research should be another key consideration. This could include functionality for recruitment, remuneration, in-game surveys, etc. While solutions to these problems do exist, an integrated solution would circumvent the patchwork nature of this, increasing reusability and decreasing effort. d) Ultimately, the platform will need to consider the different, sometimes perhaps even opposing, legal regulations to be usable by game researchers across the globe.

3. Following a modular design paradigm, building such a platform will thus be key.
4. Next, the platform must be deployed.
5. Finally, the platform must be maintained.

Five-Step Roadmap for a mentoring hub to support the professional journey

1. This first requires identifying and bringing together leading representatives from games research in academia and industry globally. We suggest creating an international and interdisciplinary network that brings together early-career researchers and senior experts.
2. Second, we will define the format of the network for which we suggest an online hub and a variety of in-person, online, and hybrid meeting formats, e.g., one-to-one or group meetings. This could be initiated by the CHI PLAY committee or another ACM SIGCHI group.
3. Third, at least two persons must be identified to champion the mentoring hub and its program, organize meetings and platform development, advertise events, etc. Accounting for the scalability of the program, we suggest starting on a volunteer basis and growing the program first. The program leaders would recruit and help connect mentors and mentees, and set evaluation measures in place to evaluate the efficiency of the program.
4. Fourth, the mentoring hub needs to be rolled out.
5. Finally, this mentoring hub will need evaluation and refinement.

A.5.8 Ethics & Risk Management

Ethics & Risk Management of a canon of seminal work: As aforementioned, constructing a canon is also a highly political endeavour: what is considered seminal, and who has the power to make such a decision. Therefore, there is a need for transparency of the decision-making process and for an explication of biases. Moreover, mechanisms should be in place to ensure and recognize the dynamic nature and the need for nuance.

Ethics & Risk Management of a platform for game artifacts: Building a platform for sharing and distributing artifacts for game research will involve a variety of legal and ethical considerations. This includes but is not limited to matters such as adhering to permissions for the use and distribution of digital assets used as part of these artifacts, selecting appropriate licences (e.g., CC-BY) under which the artifacts can be used and adapted, how they should be credited and cited, and ensuring transparency with regards to potential presence of data tracking functionality. To address this, various applicable sets of measures, such as a term of use for the platform and a standardized description of the artifacts, should be implemented.

Ethics & Risk Management of a mentoring hub to support the professional journey: To develop and run the mentoring hub, we must account for ethical risks and challenges regarding potential power misuse of mentors towards mentees, favoritism, conflict of interests through leading members and industry/academia representatives, or inequality due to limited network accessibility. The mentoring hub is a new development, which will require testing and be phased rather than a big bang rollout, limiting the immediate availability and access at a large scale. To counterbalance those challenges, we will define a code of conduct that each member has to comply with. Furthermore, we will set evaluation mechanisms and contacts for potential misuse to allow for direct and anonymized feedback and reporting. Additionally, we will communicate about the hub at different events and through varying media channels to spread awareness about its existence as widely as possible.

A.6 Bridging industry and academia: knowledge translation and policy mediation for digital well-being

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A.6.1 Abstract

The game industry generates behavioral data at a scale unmatched by most digital sectors: billions of player sessions logged daily through proprietary pipelines, yet this data remains largely inaccessible to researchers studying player well-being [198, 203, 163]. Unlike mature industries, games lack consistent ethical standards for monetization design (loot boxes, battle passes, fear-of-missing-out (FOMO) mechanics), labour protections, and regulatory clarity, limiting responsible innovation and effective collaboration with academia [121]. The industry's fragmentation into AAA publishers, indie studios, mobile developers, and platform holders each operating under different economic pressures compounds these problems.

We propose a global consortium to foster an interdependent partnership among academia, industry, and policymakers, building on existing bridges such as the IGDA, DiGRA, CHI PLAY, and national game industry associations. The consortium will translate research into practical ethical tools aligned with game production cycles, build capacity through developer and researcher training, and mediate policy development to align commercial goals with player well-being.

A phased roadmap guides progress: immediate actions establish shared values and engage policymakers around frameworks like the EU Digital Services Act; short-term goals formalize ethical partnerships and develop tools; medium-term efforts introduce certification and ethics-aligned matchmaking; and long-term, the consortium institutionalizes governance to embed responsibility as an industry norm.

A.6.2 Vision

Unlike older sectors with long-standing professional norms and institutional checks, the game industry lacks consistent ethical standards, labour protections, and regulatory clarity [121]. This is partly due to the industry's relative youth - roughly 50 years old, compared to centuries of professional norms in medicine or engineering - but it also reflects the industry's structural fragmentation. Major publishers control most global game revenue [87, 37], while indie studios, mobile developers, and platform holders operate under fundamentally different conditions. Each segment has different data access, ethical postures, and collaboration capacity. A mobile free-to-play studio monetizing through in-app purchases faces different ethical pressures than an indie studio selling a premium narrative game or a AAA publisher managing a live-service title with millions of concurrent players [95].

operate under fundamentally different conditions than the thousands of indie studios, mobile developers, and platform holders that make up the rest of the ecosystem. Each segment has different data access, ethical postures, and collaboration capacity. A mobile free-to-play studio monetizing through in-app purchases faces different ethical pressures than an indie studio selling a premium narrative game or a AAA publisher managing a live-service

title with millions of concurrent players [95].

This fragmentation is compounded by a speed mismatch particular to games. Game development operates on 6-18 month production cycles - significantly faster than most industries academia collaborates with. A peer-reviewed study that takes two to three years from design to publication may analyze a game that has already been sunset or fundamentally redesigned through live-service updates. Academic findings about player behavior in a specific game economy may be obsolete before they reach print.

To address this, we envision **a global, institutionalized consortium** that redefines the relationship between academia, industry, and policymakers - not as a service hierarchy, but as an interdependent partnership. This consortium would facilitate sustained, structured collaboration that respects the different tempos, incentives, and strengths of each actor, with player well-being as its organizing principle. Rather than forcing academia to accommodate industry's needs, or expecting industry to adopt academic ideals wholesale, we aim to build mechanisms for ongoing negotiation, shared goals, and mutual accountability.

Following the triple helix model of innovation [54] the consortium will serve three core functions:

1. **Knowledge translation**, enabling academic research to inform game design and development through timely, actionable outputs - such as player well-being metrics, ethical monetization frameworks, behavioral analytics tools, and design guidelines - aligned with production realities and delivery timelines that match the pace of game development.
2. **Capacity building**, supporting education and training that prepare a new generation of game researchers and developers with not only market-ready skills, but a foundation in ethics, policy awareness, and understanding of games' societal impact on player well-being and community health.
3. **Policy mediation**, acting as a liaison between game research, development, and regulation by translating findings on topics such as loot box mechanics, predatory monetization, and data practices involving minors into concrete, enforceable standards, and advocating for legislation that balances innovation with player protection.

Our long-term goal is to create a shared infrastructure for responsible game development - one that aligns commercial viability with player well-being. This includes co-defining operational measures of player well-being, replacing predatory monetization and dark-pattern design with sustainable alternatives, and providing SMEs with access to the tools, data, and frameworks needed to keep pace with legal and cultural change. In this vision, academia maintains its role as a critical voice and ethical anchor, while the industry benefits from low-friction, high-value solutions that support both creativity and compliance; and policymakers gain the evidence base and structural clarity needed to enforce standards without stifling innovation.

State-of-the-Art The relationship between academia and the game industry is defined by a misalignment more acute than in most other sectors. Game development operates on rapid iteration cycles of 6-18 months, with live-service titles updating weekly or biweekly. Academic research operates on 3-5 year funding and publication cycles. This speed gap is wider than in traditional manufacturing, where product cycles are often multi-year endeavours. As a result, academic findings about player behaviour, monetization effects, or well-being impacts routinely arrive after the game or mechanic under study has already changed or disappeared.

The data access problem is equally games-specific. Games generate behavioral telemetry at a scale few other fields can match - billions of sessions producing granular, timestamped records of player actions, spending, social interactions, and engagement patterns. But this data flows through proprietary analytics pipelines (*Unity Analytics, deltaDNA*, custom in-house systems at major publishers) and is treated as a core competitive asset. Unlike fields such as genomics or climate science, where public datasets and data-sharing norms are well-established, games research must negotiate access studio by studio, title by title. Projects like the UK-funded *WEAVR* project and the Video Games Research Framework (VGRF) [41] have demonstrated that structured data-sharing between academia and industry is possible, but these remain exceptions rather than norms.

The industry is also uniquely fragmented. AAA publishers control most of the revenue and data, operating global live-service ecosystems with hundreds of millions of players [87, 37]. Below them, thousands of indie studios, mobile developers, and mid-tier publishers operate under fundamentally different economic constraints [87, 37, 203, 46]. A mobile free-to-play developer monetizing through gacha mechanics and a premium indie studio have almost nothing in common in terms of data infrastructure, ethical exposure, or capacity for academic collaboration. This fragmentation means there is no single industry partner for academia to engage with. The sector requires differentiated collaboration strategies.

Nevertheless, both academia and industry have compelling reasons to collaborate on player well-being specifically. The former needs access to behavioral data and real-world design contexts; the latter wants to de-risk innovation and build public trust around increasingly scrutinized monetization practices. There is a hierarchy of needs in game development: once the base needs of technical stability and market readiness are met, developers strive to create psychological and societal impact. Academic collaboration - introducing well-being measurement, ethical monetization frameworks [164, 203, 199], and design guidelines grounded in player psychology - enters at this level. However, aligning research with production realities requires mechanisms for ongoing engagement. Isolated collaborations - a single study using data from a single title - often remain disconnected from both production pipelines and broader policy impact.

The translation of academic research into industry practice remains limited. Much games research is not directly industry relevant, and arguably is not intended to be. But even when academic research is aimed at industrial adoption, the outputs rarely reach the developers who design the systems under study. The International Game Developers Association (IGDA) provides networking but lacks the institutional mandate to drive research translation.

One exception is education and training. The industry relies heavily on academia for the training of skilled professionals in programming, design, art, and increasingly, data science and analytics. This dependency presents both a risk and an opportunity. The risk: large publishers' resource advantage could reduce universities to training facilities serving industrial needs [50]. The opportunity: embedding ethics, player well-being literacy, and responsible design principles into game education curricula means every graduate enters the industry with a baseline understanding of these issues. This is one of academia's most powerful levers for long-term cultural change in how games are made.

A.6.3 Key Challenges and Barriers

Achieving the vision of a truly interdependent partnership requires confronting structural, cultural, and ideological barriers specific to the game sector. These barriers often reduce collaborations to transactional exchanges rather than fostering the mutual co-creation needed to advance player well-being and responsible game development.

1. **Conflicting Priorities and Paces**: The speed mismatch between games and academia is more extreme than in most sectors. A concrete consequence: a researcher studying the well-being effects of a specific loot box implementation in a live-service game may find that the mechanic has been redesigned, rebalanced, or removed entirely before the study reaches peer review. This makes traditional longitudinal research designs difficult to sustain and creates tension around topics such as monetization ethics, player well-being, and user data practices, where academic inquiry may be perceived as slowing the production pipeline [116].

2. **The Shadow of Power Imbalances**: Despite aspirations for equitable collaboration, power often resides disproportionately with industry, particularly AAA giants, who own and control most of the resources. This concentration of resources creates a structural asymmetry: AAA publishers can set the terms of collaboration, restrict data access, and sideline research that challenges revenue streams or the perception of game products [133]. Meanwhile, indie and mobile studios are largely invisible to academic collaboration networks. This imbalance is especially problematic in areas central to player well-being - ethical monetization, data protection for minors, and responsible AI-driven personalization - where independent critical research is most needed.

3. **Bridging the Communication and Cultural Divide:** Academia and the game industry use overlapping but distinct vocabularies in ways that obscure shared concerns. These varied framings creates mutual incomprehension. Methodological preferences diverge too: industry relies on A/B testing and real-time analytics dashboards; academia favors controlled experiments and peer-reviewed validation. Without intentional translation effort, substantive alignment on player well-being goals is lost in terminological noise. Existing venues like CHI PLAY and FDG bring some cross-pollination, but most game studios have no to limited contact with academic research communities.

4. **The Legal and Bureaucratic Overhead:** The game industry presents IP complications that go beyond standard data-sharing agreements. Modding rights, streaming rights, user-generated content ownership, and the legal status of virtual economies create a uniquely tangled IP landscape. Player behavioral data raises additional complications: telemetry from minors, data collected across jurisdictions with different privacy regimes (GDPR, COPPA, China's minor protection rules), and the repurposing of gameplay data for AI training. SMEs and independent researchers often lack the legal infrastructure to navigate these complexities. Academic institutional review boards, designed for biomedical or survey research, frequently struggle with the novel ethical questions posed by large-scale behavioral telemetry from game environments. Without standardized frameworks for games-specific data sharing, collaboration remains prohibitively expensive in time and legal fees.

5. **Siloed Networks and Unequal Access:** The existing bridges between game academia

and industry are few and fragile. The IGDA provides networking but lacks research translation capacity. CHI PLAY and FDG attract researchers but few industry practitioners. DiGRA engages critical scholars but has limited developer participation. Games for Change connects impact-focused developers but operates outside mainstream commercial game development. Beyond these, the vast majority of active studios worldwide have zero academic contact. Collaborations depend on personal relationships - a professor who previously worked at a studio, a developer who attended a conference. This ad-hoc model excludes underrepresented groups, early-career researchers, studios outside major hubs, and the mobile and casual game sectors where some of the most pressing player well-being questions (predatory monetization targeting vulnerable players, data practices involving children) are concentrated.

6. **Navigating the Ethical Terrain Collaboratively:** Games present ethical flashpoints that are specific to the medium. Loot boxes and gacha mechanics that function as gambling-like systems, particularly when accessible to minors. Battle pass and FOMO designs engineered to compel daily engagement at the expense of player autonomy. Dark patterns that obscure spending or manipulate purchase decisions. Behavioral data collected from children without meaningful consent. These are not abstract ethical tensions - they are concrete design practices with documented effects on player well-being [190]. When academic research uncovers evidence of harm from these practices, studios face reputational and regulatory risk. The resulting defensiveness can shut down collaboration entirely. Building trust requires industry willingness to engage with uncomfortable findings about player well-being, and academic willingness to frame critique constructively and propose viable alternatives rather than simply condemning current practice.

A.6.4 Key Enablers Needed

There is growing mutual recognition that player well-being research requires the distinct contributions of both sectors. Industry increasingly recognizes that academic research can de-risk innovation in sensitive areas like monetization design and child safety, explore uncharted territory in player well-being measurement, and train future developers with ethical literacy. Academia increasingly acknowledges that the game industry provides access to behavioral data at scales unavailable elsewhere, real-world design contexts for testing well-being interventions, and pathways for translating research into player-facing impact. This recognition is already visible in co-authored publications, industry participation at CHI PLAY and FDG, and university-studio partnerships. However, moving from fragmented interaction to a structured ecosystem for player well-being requires strengthening specific enablers.

1. **Academics: Turning Critical Insight into Actionable Infrastructure:** Academic institutions already produce rigorous research on player well-being, monetization effects, and game design ethics with the potential to reshape how games are made and regulated. The shift needed is in delivery format and timing. Research outputs must move beyond journal articles toward scalable tools aligned with game production timelines: validated well-being measurement instruments that plug into existing analytics pipelines, ethical monetization design checklists usable during sprint planning, and evidence-based guidelines for age-appropriate design. Successful precedents exist: the WEAVR [19, 101] project demonstrated that structured data-sharing between UK game studios and univer-

sities can produce actionable research, and the Video Games Research Framework (VGRF) [41] showed how industry data can be made available to researchers while protecting commercial interests. These models should be scaled. Universities also play a central role in capacity building - embedding player well-being, ethics, and responsible monetization design into game development curricula so that every graduate enters the industry with baseline competence in these areas.

2. **Bridge-Builders: Formalizing Translational Roles:** Individuals who move between academia and industry - through joint appointments, industry secondments, or career transitions - are essential for translating between the *"engagement metrics"* language of studios and the *"behavioral reinforcement"* language of researchers. These bridge-builders negotiate timelines, align expectations, and de-risk collaboration. Currently, they operate without formal recognition or institutional support. The consortium should formalize these roles through governance positions, translational fellowships, and mediating bodies. Existing organizations provide infrastructure to build on: the IGDA's developer network, CHI PLAY's and FDG's research communities, DiGRA's critical scholarship community, and Games for Change's impact-focused network. National game industry associations (e.g., UkIE in the UK, GAME in Germany, SELL in France, IGEA in Australia) connect to studios that academic networks typically miss. By linking these existing networks through the consortium, bridge-builders gain institutional backing and their impact scales beyond individual relationships.

3. **Industry Actors: Aligning Market Needs with Player Well-being:** The game industry brings technical resources, behavioral data, and operational scale that academia cannot replicate. AAA studios have the resources to invest in player well-being research and ethical design—but lack structured mechanisms to integrate academic findings into development pipelines. SMEs are often more values-driven and agile but lack the data infrastructure, legal resources, and bandwidth to participate in formal collaborations or absorb new regulatory requirements. The consortium can support both segments by offering ethical monetization toolkits, lightweight compliance models for emerging regulations (e.g., EU Digital Services Act, national loot box legislation), and matchmaking platforms that connect studios with researchers working on relevant well-being questions. Many studios already experiment with player well-being features - screen time reminders, spending limits, transparent drop rates, accessibility options, community governance systems. These efforts can be documented, evaluated, and standardized across the sector. Using frameworks such as the Certus Collaboration Model [115] - adapted from software engineering - industrial players can structure ongoing research partnerships rather than one-off consulting arrangements.

4. **Policymakers: Building Regulatory Coherence for Player Well-being:** Policy actors increasingly seek to regulate game monetization, data practices, and content—but often lack the technical understanding and contextualized evidence needed to craft effective, proportionate legislation. Recent regulatory actions on loot boxes (Belgium's ban, Netherlands' attempted regulation, UK parliamentary inquiries) demonstrate both the appetite for intervention and the difficulty of getting it right without deep sectoral knowledge. The consortium can serve as a mediator: translating academic research on player well-being and monetization effects into usable regulatory models, while articulating game development realities to prevent blunt or counterproductive rules. Early and

sustained involvement of policymakers increases trust and positions player well-being as a regulatory norm rather than an afterthought.

A.6.5 Opportunities for societal impact

We aim to institutionalize a balanced partnership among academia, industry, and policymakers to support the creation of games that prioritize player well-being [89, 199, 57], ethical monetization, and societal benefit - not just profitability or academic output. The industry also benefits: studios that invest in player well-being see improved retention, stronger community trust, and reduced regulatory risk.

1. **Ethical game design as standard practice:** Replace predatory monetization patterns - manipulative loot boxes, exploitative FOMO mechanics, dark patterns targeting vulnerable players - with validated, player-centered alternatives [190, 199, 202, 147]. Academic research must produce actionable design recommendations, not abstract principles. Concrete outputs include: ethical monetization design guidelines usable during production, transparent spending interfaces validated through player testing, and age-appropriate design frameworks for games accessible to minors. Encourage ethical certification systems for games and studios (e.g., EU-approved ethics badges or PEGI-style well-being ratings). Certification provides market incentives for ethical compliance and lays foundations for linking public funding and platform access to verified responsible practices.

2. **Checks and balances through advocacy:** Academic institutions act not just as support, but as independent monitors of player well-being - documenting the effects of monetization practices, tracking industry compliance with emerging regulations, and advocating for policy reform. In today's environment, policy is often shaped by industry lobbying. Academia must serve as a credible, evidence-based counterweight, translating player well-being research into implementable policy recommendations and communicating regulatory requirements to studios in actionable formats.

3. **Player well-being as a measurable, shared goal:** Co-develop shared operational definitions of player well-being in games, moving beyond vague notions of "digital well-being" to game-specific constructs grounded in player psychology, behavioral telemetry, and self-report measures. Translate these into tools usable by studios: well-being dashboards integrated with analytics pipelines, design-phase impact assessments, and standardized metrics that allow cross-title and cross-studio comparison. These shared instruments also equip policymakers with evidence for regulation - turning player well-being from an aspiration into a measurable, enforceable standard.

4. **Workforce and cultural change:** Train a new generation of game designers and developers grounded in player well-being, ethics, and systems thinking. Shift industry culture from minimum viable compliance to meaningful responsibility through incentives (funding, certification, community recognition). If we want the industry to internalize player well-being as a design value, academia must understand production realities and deliver tools that fit within existing workflows. Beyond design ethics, both sectors must invest in developer well-being. The shift from boxed products to live-service models [49] - with always-on content cycles, escalating budgets, and relentless update schedules - puts enormous pressure on developers, particularly early-career professionals fresh from university. Sustainable labor practices must become a shared priority in how we educate

and employ future game developers.

5. **Policy impact and structural change:** Move game regulation from suggestive guidelines to enforceable standards, with academic research providing the evidence base and implementation support. Push for publicly funded mechanisms that reward studios aligning with player well-being standards. Specific targets include: evidence-based loot box regulation informed by behavioral research rather than moral panic, data protection standards tailored to the realities of game telemetry (including data from minors), and labor protections addressing crunch and live-service burnout. Grant access and tax incentives linked to compliance can drive adoption, particularly among SMEs that need economic justification for ethical investment.

A.6.6 Roadmap

This roadmap reframes the role of academia from service provider to equal partner in shaping the future of games and player well-being. By building structures for sustained collaboration, co-defining values, and offering practical tools for ethics, training, and policy, we lay the foundation for an ecosystem where games contribute positively to player well-being and society.

1. **Immediate actions:** Establish shared foundations by initiating cross-sector roundtables - not around generic project expectations, but around games-specific values: player well-being, transparent monetization, data responsibility for minors, and sustainable development practices. Form an ethics working group co-led by academic researchers and industry designers, building on existing communities (IGDA ethics committee, CHI PLAY and FDG research networks, national game industry associations such as UKIE, GAME and IGEA). Engage policymakers involved in enforcing frameworks like the *EU Digital Services Act* and national loot box regulations early, ensuring collaboration remains grounded in regulatory realities. Map existing successful collaboration models (WEAVR, VGRF, individual university-studio partnerships) to identify replicable structures.

2. **Short-term goals (1-3 years):** Formalize an *"ethical partnership framework"* explicitly outlining roles, value alignment, data-sharing protocols, and protections for independent critical research. Pilot lightweight governance tools: development-integrated ethics checklists for monetization design, player well-being impact assessments usable during sprint reviews, and informal review boards for data-sharing agreements. Co-create accessible self-assessment tools that studios, especially SMEs without dedicated ethics or legal staff, can realistically use. Launch pilot data-sharing agreements between academic institutions and willing studios, using WEAVR and VGRF as templates. Establish bridge-builder fellowships placing researchers in studios and developers in academic labs for 3-6 month rotations.

3. **Medium-term goals (3-5 years):** Introduce an *"Ethical Game Development"* certification linking responsible practices to funding access and platform visibility. Move academic-industry matchmaking beyond technical skills to include shared values around player well-being, creating more durable and aligned collaborations. Develop regulatory

toolkits that translate emerging legislation (loot box regulation, data protection, age-appropriate design codes) into implementable actions tailored to different studio sizes and business models. Build standardized, privacy-preserving data-sharing infrastructure that reduces the legal overhead of each individual collaboration.

4. **Long-term vision (5+ years):** The consortium evolves into a global, institutionalized structure - building on and connecting existing organizations (IGDA, DiGRA, Games for Change, national industry associations, academic networks) - that safeguards player well-being standards while promoting creativity and innovation. Industry KPIs incorporate player well-being, community trust, developer welfare, and long-term sustainability alongside commercial metrics. Ethical game development is recognized not as anti-commercial but as a strategy for long-term viability and public trust. Through this structure, the game sector develops the self-governance capacity of more mature industries - not in conformity, but in its ability to balance commercial success with responsibility toward players and society.

A.6.7 Ethics & Risk Management

The proposed consortium is predicated on the recognition that video games are cultural and social artifacts that shape player identity, community, and well-being at a scale few other media achieve - reaching billions of players daily, including large populations of minors [202, 203]. Ethical responsibility for player well-being cannot be left solely to market pressures or fragmented self-regulation.

1. **Key Ethical Considerations: Player Data Responsibility:** Ensuring transparency, consent, and fairness in the collection, sharing, and analysis of gameplay telemetry - particularly data from minors, data collected across jurisdictions with different privacy regimes (e.g., GDPR, COPPA), and data repurposed for AI training or behavioral prediction. Games generate uniquely granular behavioral data (every click, purchase, social interaction) that demands correspondingly robust governance. **Monetization and Design Ethics:** Safeguarding against predatory monetization (loot boxes accessible to minors, FOMO-driven battle passes, dark patterns obscuring spending) and promoting design that prioritizes player well-being, autonomy, and informed choice. **Labour and Equity:** Supporting sustainable labor conditions in game production, mitigating exploitative practices such as crunch and live-service burnout, and ensuring SMEs and underrepresented groups have equitable access to knowledge, tools, and collaboration opportunities. **Research Integrity and Translation:** Avoiding the instrumentalization of academic research as a narrow service to industry needs, while ensuring that player well-being insights and critical perspectives are meaningfully translated into game design practice and policy. **Sustainability:** Considering the broader societal and environmental footprint of the game industry, including the energy use of AI-driven systems, the cultural impact of game narratives, and the long-term sustainability of development models.

2. **Risks:** Key risks include power imbalances where AAA publishers dominate consortium governance and agenda-setting, player well-being ethics being reduced to symbolic checklists or marketing claims *"well-being washing"*, and academia's independence being eroded, with universities relegated to training facilities or cheap R&D providers for industry.

Shared data infrastructures may unintentionally enable privacy violations, surveillance of player behaviour, or biased AI personalization systems if data governance is not robust. SMEs risk being excluded from meaningful participation due to resource constraints, while weak policy integration may leave player well-being guidelines aspirational rather than enforceable, leaving SMEs vulnerable to compliance shocks and large players free to exploit regulatory gaps.

3. **Risk Management Strategies:** To mitigate these risks, the consortium must establish governance structures that distribute power across AAA, SME, academic, and policy stakeholders. **Immediate:** Roundtables on core values including player well-being and data ethics, an ethics working group with protected independence, and early engagement with policymakers working on game-specific regulation. **Short-term (1-3 years):** Formalizing partnership frameworks with explicit protections for critical research, piloting lightweight governance tools, and co-developing practical data-sharing protocols with built-in privacy safeguards, particularly for telemetry involving minors. **Medium-term (3-5 years):** Scaling through certification schemes that reward genuine player well-being investment (not performative compliance), ethics-aligned matchmaking, and regulatory toolkits that help SMEs meet requirements like loot box disclosure rules and age-appropriate design codes. **Long-term (5+ years):** Establishing the consortium as a global steward of player well-being standards, embedding community trust, player welfare, labour equity, and sustainability into industry-wide KPIs. Research independence is safeguarded structurally, ensuring that player well-being remains a driver of innovation rather than a constraint. Through these strategies, the consortium shifts ethical responsibility from afterthought to structural foundation.

A.7 Societal Awareness of Games' Impact through Rigour in Assessment, Evidence, and Knowledge Mobilization

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A.7.1 Abstract

This theme explores how we can create societal awareness of games' impact through 1) supporting rigorous assessment at scale, 2) rigour and flexibility in how we understand, synthesize, and meta-assess the interdisciplinary evidence resulting from that assessment, and 3) successful knowledge mobilization outside of our field. We envision this future within our field's assessment-to-evidence pipeline, as well as its outward communication, by breaking it down for closer view through these three lenses:

> Vision 1: Assessment is integrated in large-scale broadly shared platforms that support rigorous assessment at scale.

The conduct of games research is currently in large parts scattered, siloed, and one-shot. This means that substantial effort is wasted by different people working towards the same goals in different locations and at different times. Additionally, because of the required effort, many studies are limited in scale, leading to smaller knowledge gains. Better support for games research to be conducted in a way that conserves and shares resources across the field and allows studies of larger scope and greater complexity would speed up the field's progress tremendously.

> Vision 2: Games research as a highly interdisciplinary field will establish an understanding of different research paradigms for their own standards, to create meta-assessment criteria for itself as a field, and thereby combating stigma about games research.

Games research is highly interdisciplinary, which is reflected in the diverse methods used for assessment. The origins of our methods span fields of science, engineering, design, humanities, and the arts. This means that there are a lot of different ideas about how and when to employ different assessment methods, and how to value and assess different types of knowledge. Sometimes these interdisciplinary differences result in slower publishing times for work. Further, it can hinder interdisciplinary collaborative efforts even though they are necessary for studying the full range of contexts within and around games and player-game interaction.

To advance the field, different types of knowledge creation (assessment and evidence) need to be understood flexibly and embraced by the community as a whole. This requires clearly but contextually defined and widely accepted assessment criteria for research in game studies, along with standardized terminology. These criteria need to be tailored to the contributions arising from different research paradigms and epistemologies, supported by exemplary papers,

and recognizing trade-offs between different types of validity (internal, external, ecological), and in-depth, authentic understanding of players' experiences.

> Vision 3: Games research advances knowledge mobilization by establishing evidence maps that can be tailored to different audiences like funding agencies, policy makers, player communities, educators, or the general public.

The impact of games research is currently limited by being published and cited primarily within specific venues; cross-discipline engagement with the produced knowledge (e.g., through citations) is rare. This limits the impact, scope, and depth of games research. Additionally, the many different types of knowledge that are being produced are scattered, making it difficult to tailor synthesized results to different audiences like funding agencies, policy makers, player communities and the general public. These stakeholders are often not widely aware of the benefits of games in society, which limits their application, and blocks funding pathways.

By drawing on the community's knowledge to establish "evidence maps" to tailor the field's knowledge about specific topics based on the targeted audience, the impact of our field can achieve greater reach. This may also combat stigma against games research as an "unserious" field and enable stronger funding pathways.

A.7.2 State-of-the-Art

Broad scale assessment platforms, data donation platforms, and research material automation:
There have been increasing efforts to pool resources on national or international levels to enable large-scale research, such as the *National Research Project* [128] (primarily US based but with partners in other countries), national research foundations in various countries (e.g., South Africa's *National Research Foundation* [3]), the *UK Longitudinal Linkage Collaboration* [21], distributed computing infrastructures like the Pegasus system [39], or explorations of automated scientific workflows (cf. this report by the US-based *National Academies of Sciences, Engineering and Medicine* [130]). Not only does large-scale collaborative research support answering more ambitious research questions and tackling problems on a global scale, it also enables an exploration of evidence applicability and generalizability across different populations and cultures [195]. Some research problems and approaches (e.g., meta-scientific or many-analysts projects [168]) can only be addressed sufficiently on a broad scale. A starting point in the context of games may be the US-based *Higher Education Video Games Alliance* [4].

A fairly recent paradigm in research data collection frames user data as something that can be donated by participants, rather than sampled from them. This partly results from increasing awareness of and interest in supporting individuals' rights to their own data and transparency in research processes [10]. (Similarly, there is increasingly a distinction between study subject and study participant [22].) One example framework and tool developed for this purpose is the *Open-Source Data Donation Framework (OSD2F)* [10]. One challenge here are characteristics of information platforms: it is often difficult even for individuals to access their own data, thus hindering subsequent donation [78]. Pfiffner & Friemel [148] have explored social media users' motivations for and willingness to engage in data donation for research purposes. They found that such willingness coincides with the data being perceived as relevant and less sensitive, but also depends on the donation process, donation

purpose, individuals' privacy concerns. Gómez Ortega et al. [70] propose a method for data donation specifically for sensitive or intimate data; based on feminist principles, this approach emphasizes balancing value for the researcher and data donor, informed and ongoing consent that recognizes the sensitive nature of the data, and active data donor involvement through articulation of shared goals. With a combination of large-scale research collaboration through shared platforms and resources, as well as data donation platforms, games research could be positioned to break the monopoly of industry on large-scale telemetry and player data.

Different ways of knowing and rigour in assessment/evidence across disciplines:

There is a long history of different research paradigms that immediately affect what is understood as an appropriate "way of knowing" across disciplines. This is often exemplified by tensions surrounding quantitative, qualitative, and mixed-methods research methods; these tensions have a long history [75, 91, 137] but remain points of discussion to this day [174, 35]. These paradigm tensions have direct impact also on concepts of research quality, which can be understood in terms of rigour [151, 174], transparency [174], trustworthiness and credibility [69] or many other related definitions and interpretations.

Evidence maps and evidence stories:

Evidence can be used to advocate for policy impacts, as for example is common in medical and healthcare contexts [59, 176]. One common way to support evidence-based impact is through evidence maps (or evidence and gap maps) and knowledge graphs. One suggested definition for these is "a systematic search of a broad field to identify gaps in knowledge and/or future research needs that presents results in a user-friendly format, often a visual figure or graph, or a searchable database" [124]. This is broadly considered "an important tool for facilitating evidence-based decision-making and research efficiency" [138], as well as a way to identify gaps in the evidence and thereby direct future research [170]. Examples include the evidence maps maintained by the *American Speech-Language-Hearing Association (ASHA)* [12], *Alma Economics* [51], and the knowledge graphs hosted through the *Open Research Knowledge Graph (ORKG)* project [77]).

A.7.3 Key Challenges and Barriers

Vision 1 Challenges: Large-scale supported assessment is currently hindered by a lack of data collection at scale, which would enable the provision and collection of national- and international-level evidence. Additionally, rigorous assessment at scale through secondary research synthesis such as meta-analyses is rare. Partly this is due to a lack of specific types of studies (interventional studies and replications) and slow uptake in reporting effect sizes in HCI study reporting, which are necessary for conducting that kind of research. With broadly and rigorously collected evidence showcasing the benefits of games, games research could be funded and progressed at a greater speed and in a more targeted manner.

Vision 2 Challenges: (Meta-)assessment in inter-and transdisciplinary fields has many challenges, key among them a lack of agreed-upon quality criteria, knowledge, and awareness about how to assess diverse types of research among researchers and policy makers. This is further compounded by a lack of knowledge and awareness about how to "translate" between different types of knowledge and synthesize across them. This is also a big challenge for HCI more generally as an inter-/transdisciplinary field.

Vision 3 Challenges: Knowledge mobilization in the games research context is scattered.

Specific stakeholders like policy makers require and/or expect specific information and specific types of information presentation in order to take action and this is currently missing. Challenges here involve the need to translate qualitative work into the types of evidence that funding agencies care about, and to advocate for the impact that in-depth contextual work could have on policy. These challenges also connect with those of Vision 1: There is a lack of support for marketing research games and similar efforts towards enabling larger-scale data collection, and to productize research games into fully realized games to support large-scale assessment.

A.7.4 Key Enablers needed

Enablers of Vision 1 (large-scale assessment):

1. Large, global, field-defining projects that can create large-scale coalescence in the games research domain / Matchmaking services towards building large consortia & centralized focus on big challenges [coordination]
2. Sustainable grants beyond 5 years / infrastructure for sustainable research (funding death)
3. Centralised, sustained and maintained infrastructure for data collection, data donations, and data maintenance (data collection plugins for engines, repository of community-agreed-upon [assessment platform] imports for questionnaires etc.) but also semi-automation or human-in-the-loop automation of certain research steps, as well as generally academic sharing of projects, tools, data, games

Enablers of Vision 2 (interdisciplinary appreciation):

1. Shared vocabulary and cognitive flexibility to ensure researchers from different disciplines and paradigms understand and learn to value each other's methods and contributions
2. Interdisciplinary networking and exposure through conferences or seminars as well as collaborative projects can bring researchers from different fields together to address problems via a multi-pronged approach
3. Systemic incentives and support can further enable this by encouraging interdisciplinary work through grants and review policies.

Enablers of Vision 3 (knowledge mobilization):

1. Community-generated and curated knowledge/evidence maps that can be tailored to different audiences (funding agency, policy makers, etc.), which in turn may need research to identify audience-specific framing, "storytelling", and visualization and how best to translate research findings into insights valued by specific audiences.
2. Policy, legislation, and public outreach campaigns are needed to combat games research stigma.

A.7.5 Opportunities for Societal Impact

Large-scale assessment (Vision 1) would result in more impact from evidence-driven and contextually informed, targeted game design and deployment, and ultimately, in better games that have real impact. Smoother research support on a broad scale will also result in happier researchers, while careful engagement with data donations from players will increase transparency surrounding games research and increase societal and individual agency in games research.

Advancing interdisciplinary appreciation (Vision 2) would benefit HCI as a whole, as

well as other highly interdisciplinary fields. By establishing more agreement among academics, this vision could lead to more diverse and numerous collaborative projects, which, in turn, would result in improved research output.

Finally, improving knowledge mobilization (Vision 3) could result in better and increased funding opportunities, targeted deployment of games for social impact (e.g., educational games or games for therapeutic purposes). It could also result in better regulation and policy-making based on evidence-based guidelines that support ethical principles and prioritise player wellbeing. Socially, it could also strengthen media literacy by communicating impacts of gaming to a broad public audience (players, parents, educators) and encouraging healthy gaming habits.

A.7.6 Four-Step Roadmap to Realizing Societal Impact

Based on the above, we propose the following roadmap for implementing our vision of assessment, evidence, and knowledge mobilization:

Step 1: Immediate actions to address key challenges

1. Find researchers willing to join a committee to work on expanding from the current CHI PLAY starting point on evaluating different contribution types [2] (V2)
2. Encourage authors to write more diverse and more critical papers, as well as viewpoint articles around methodological contributions (V2)
3. Find researchers and other stakeholders willing to join a committee or advisory group to work on promoting large-scale research platforms for games research (V1)
4. Find researchers and other stakeholders willing to join a committee or advisory group to work on knowledge mobilization for games research (V3)

Step 2: Short-term goals (1 year) for foundational work

1. Start work on the expansion and broader update of the above table, to also encompass more than just CHI PLAY, and search for example articles (V2)
2. Map existing platforms, tools, and datasets to assess where integration into a large-scale is possible and viable, and what existing resources could be used as a starting point (V1)
3. Identify key knowledge gaps as well as stakeholders and their needs through interviews and surveys (V3)
4. Recruit policy makers, educators, and other stakeholder representatives to the knowledge mobilization advisory group (V3)

Step 3: Medium-term goals (3–5 years)

1. Take steps to broaden awareness of this expanded resource, among prospective authors, reviewers, associate chairs, etc. (V2)
2. Develop workshops to support awareness of different research paradigms among the research community (V2)
3. Identify large-scale field-defining projects and research problems that could serve as focal points for large consortia and funding acquisition (V1)
4. Partner with game studios to embed assessment tools into commercial and educational games and launch a recognition system to encourage sustained collaborative contributions from academia and industry (V1)
5. Advocate for funding agencies to prioritize large-scale, collaborative research grants (V1)
6. Prototype a new evidence map platform or start adding needed features to an existing evidence map platform (V3)

7. Generate policy briefs and audience-specific evidence summaries (e.g., infographics, interactive visualizations, videos, podcasts) and add these to the evidence map platform (V3)

Step 4: Long-term vision (5+ years)

1. Hold awareness workshops among the research community to develop and maintain interdisciplinary awareness among researchers. (V2)
2. Maintain, utilize, strengthen, and expand established large-scale research platforms and resources (V1)
3. Effectively advocate for more large-scale and international games research grants based on the deployed evidence map platform (V3)

A.7.7 Ethics and risk management

Executing this roadmap requires privacy-by-design and data minimization throughout; clear, informed, and revocable consent (with special protections for children and other vulnerable groups); and strong governance for data donation, linkage, storage, and secondary use (including audit trails, right-to-erasure, provenance tracking, and purpose limitation).

Partnerships with industry must address power asymmetries via transparent data-sharing agreements, conflict-of-interest disclosures, and guarantees of academic independence. Evidence platforms and meta-assessments should document uncertainty, sampling limits, and known biases, and include procedures to detect and mitigate algorithmic harms and re-identification risks. Equity and inclusion are paramount: protocols should ensure accessibility, cultural sensitivity across jurisdictions, fair benefit-sharing with participant communities, and multilingual communication.

Finally, institutions and communities need to establish independent ethics oversight (e.g., a standing cross-disciplinary board with player/community representation), harmonize IRB/REC review across sites, and adopt open-science practices that balance reproducibility with confidentiality – so that knowledge mobilization advances societal good without compromising participant rights or wellbeing.

A.8 Building a global funding infrastructure for games research

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A.8.1 Abstract

The advancement of games research requires a global infrastructure that enables large-scale collaboration and funding across national and disciplinary boundaries. We first envision that a global consortium for Research seeks to create an interconnected ecosystem where researchers leverage shared expertise and resources. This initiative aims to align national funding with international collaboration to drive impactful games research worldwide. We also envision that a global advocacy group dedicates to championing games research, amplifying its positive impact, and securing its recognition among diverse audiences. This advocacy group strives to legitimize and elevate the role of games as a catalyst for beneficial change.

Vision 1: A Global Consortium for Games Research. Games research teams are formed and thrive in a global environment, where expertise and facilities are collected and used from many different participants across local and national boundaries. National funding agencies are encouraged to connect their investments with global network, enabling larger-scale and new types of research and outcomes that benefit people from all over the world.

A.8.2 Definitions and Scope

Games research will significantly benefit from collaborative efforts across borders to advance the field, and funding such initiatives globally is challenging. There are examples to learn from (e.g., CERN [30], Human Genome Project [152]), but those are very aspirational and also would require substantial evidence that the field can work collaboratively together - the infamous chicken-and-egg problem when it comes to funding. Importantly, even the Human Genome Project is funded by NIH, an American funding body, and so while an aspirational example further confirms that funding is typically localized, despite that some mechanisms exist for international collaboration.

As we would like to accomplish both goals, to work together globally to address important topics in the field to significantly advance the field as well as find ways to support game research to be funded, we define and scope this effort as the creation of a global infrastructure that has coordinating mechanisms for international collaboration but which also provides support for researchers to fund their research locally. Aspirational in this global infrastructure is that it can directly fund game researchers, in the way foundations operate. Such funding can be fairly minimal to support international collaboration (e.g., travel support, organizing workshops) or be in the form of seed funding to support junior scholars in breaking through funding barriers. However, the priority when obtaining any funding as part of the global infrastructure would be to scale and maintain the infrastructure by hiring staff and supporting leadership. All of the above are considerations to be further considered and explain the direction of the vision behind this topic.

A.8.3 State-of-the-Art

The fundamental question that this vision addresses is how to effectively secure, allocate, and manage sustainable financial resources to advance the study and development of games research across academic, industry, and international collaborations. This vision explores the role of large-scale funding initiatives, multinational grant consortia, and interdisciplinary partnerships in supporting innovative game-related research, including technological advancements, social impact studies, and creative development. It also examines the challenges of navigating diverse funding landscapes, aligning research priorities with grant objectives, and fostering cross-border collaboration among institutions, government agencies, and industry stakeholders to maximize the global impact of funded projects. Integral to this work is the idea of the establishment and ongoing support of a broader community, with the idea that large-scale funding typically benefits a larger community effort to achieve results that a single individual researcher or smaller-scale research team could not hit. It also includes the support for (a) the training of new researchers, resulting in the increase in capacity to do large-scale research; (b) matchmaking processes to bring together effective teams, resulting in the creation of well-defined teams that are competitive for funding and effective and achieving the advancements targeted by funders.

A.8.4 Key Challenges and Barriers

The establishment of a global consortium for game research presents several significant challenges. Although the vision aims to create shared infrastructure and facilitate international collaboration, structural, disciplinary, and organizational barriers complicate its realization. The following outline key obstacles specific to the game research field, as well as broader organizational and systemic challenges that must be addressed to build a sustainable and effective global research framework.

Challenges Specific to the Games Field The games research field faces several specific challenges. Individual researchers are globally dispersed, making it difficult to coordinate interests, contributions, and successes in a way that benefits the broader community. Currently, there are no dedicated funding programs specifically for games research, forcing scholars to compete within broader categories. Additionally, the field's interdisciplinary nature—spanning areas such as computer science, psychology, media studies, and education—creates competition and complicates collaboration. This fragmentation ultimately reduces the field's competitiveness compared to more unified research domains.

Organizational Challenges Organizational challenges include fundamental questions around decision-making—specifically, who determines what should be funded and how priorities are set. Ensuring the independence of the organization is also critical, particularly in avoiding conflicts of interest when funders may disfavor or avoid certain research topics. Furthermore, while the consortium is intended to operate on a global scale, regional differences in how funding agencies function present significant barriers to truly international coordination.

External/Larger Scale Challenges At a broader level, external challenges include ensuring the long-term sustainability of the consortium. Securing continuous funding for a global initiative expected to operate beyond five to ten years is particularly difficult. Additionally, while there have been multiple attempts to establish infrastructures for games research,

many of these efforts have fallen short of their goals or remain largely unknown to the wider research community, highlighting the difficulty of building lasting and visible structures in this field.

A.8.5 Key Enablers needed

To realize the vision of a global research consortium for games, specific internal and external enablers must be in place. These enablers will ensure both operational sustainability and a broader engagement across academic, government, and public spheres [175]. Internally, the consortium must be structured and resourced for long-term stability. Externally, support from the academic community and coordination with advocacy efforts are crucial to build legitimacy, capacity, and global impact.

1. Internal / Organizational enablers
Key internal enablers include acquiring a sustainable source of funding to support staff, infrastructure and data resources. It is essential to identify a Chief Financial Officer (CFO) who can effectively manage and grow the organization's financial base. In addition, the initiative requires dedicated champions to lead the development of the consortium and plan leadership transitions to ensure long-term continuity. Building internal expertise in diverse funding models, agency procedures, and national and international research, economic, and societal priorities is also crucial to the success of the consortium.

2. External / Global Enablers
Key external enablers include providing meaningful incentives for faculty participation, such as sabbatical opportunities or rotational leadership roles within the consortium. It is also important to establish strong connections with the advocacy organization, which helps build the public and political foundation necessary to support games research. The research outputs of the consortium can be strategically leveraged by the advocacy group to amplify impact and grow external support networks.

A.8.6 Roadmap to Realizing Societal Impact

The following roadmap outlines a phased approach to establishing a global research consortium for games. It provides a clear structure for action—from initial organization to long-term sustainability—highlighting the steps needed to secure funding, build partnerships, and scale infrastructure in a way that maximizes global impact.

Step 1: Immediate Actions – Vision Formation and Community Coagulation
The first step involves clearly defining and articulating the vision of the consortium to establish a shared understanding of its goals and values. Initial organizational meetings should be held to outline the structure, roles, and responsibilities. At the same time, key stakeholders—including potential funders, academic partners, and operational staff—should be engaged through targeted communication and invitations to participate. This phase also includes informal community building by identifying early supporters and forming a founding working group to guide the initial development.

Step 2: Short-Term Goals (1–3 Years) – Foundational Setup
In the first year, the consortium should operate with volunteer academic labor while working to secure initial seed funding to establish the infrastructure. By the end of Year 1, a Chief

Financial Officer and a Chief Development Officer should be hired to lead financial and strategic development. A leadership board composed of representatives from academia, industry, and government should also be established. In Year 2, partnerships with institutions from the academic sector, games industry, and global policy networks should be formalized. By Year 3, the consortium should launch its first round of medium-scale collaborative funding support and begin refining its operational processes.

Step 3: Medium-Term Goals (3–5 Years) – Growth and Consolidation
During the medium term, the consortium should expand its staffing to support core operations and external outreach. Efforts should focus on broadening the network of international partners and establishing regional nodes or chapters to enhance global representation. New programs should be developed to support junior scholars, initiate interdisciplinary projects, and promote the use of shared research infrastructure. In parallel, internal evaluation processes should be implemented to assess impact, adjust funding strategies, and refine governance structures.

Step 4: Long-Term Vision (5+ Years) – Sustained Impact and Institutionalization
In the long term, the consortium should secure sustainable funding through a mix of memberships, grants, philanthropic contributions, and public-private partnerships. It should become fully institutionalized with mechanisms for stable leadership transitions, endowments, and robust governance structures. The consortium's role should expand into a central hub for global games research, offering matchmaking services and fostering strategic collaborations. Most importantly, it must develop an infrastructure that ensures continuity beyond individual project cycles, enabling long-term, systemic progress in the field.

Vision 2: An Advocacy Group for Games Research and Its Impact in the World. Our vision is to establish a global advocacy group dedicated to championing games research, amplifying its positive impact, and securing its recognition among diverse audiences. By fostering stronger connections between researchers, policymakers, funding bodies, and the public, we strive to legitimize and elevate the role of games as a catalyst for beneficial change. Through strategic communication, education, and advocacy, we aim to combat lingering stigmas, equip stakeholders with accurate information, and ensure that the value of games research is understood and embraced throughout the world.

The rationale here is the same as that in Vision 1. When it comes to advocacy, similarly to research support, it is key to work on this across borders, but acknowledging that much advocacy work needs to be geared to local specifics. Then, it is important to recognize that research and advocacy are mutually interdependent: advocacy is needed to promote funding of games research but also promote the outcomes of games research, while such advocacy can only happen if research is happening that can be advocated for. As such, the envisioned global infrastructure must tackle both research support and advocacy.

Potential Benefits: Addressing this topic could lead to significant cultural, educational, and economic impacts. Although games are an integral part of everyday life, public stigma often leads to feelings of guilt or negative labeling among those who play. Recognizing games

as a healthy and natural part of life can change societal attitudes: from a focus on mere survival to a broader appreciation of meaningful and high-quality leisure. In addition, games have proven potential as vehicles for behavioral change, particularly in health and education. However, there is still untapped potential in other domains where games could be further developed to create a positive impact. This work could also drive a major paradigm shift in the way education and training are approached more broadly.

Stakeholder Needs: Multiple stakeholders will benefit from this initiative, including researchers, educators, students, developers, policymakers, and the public. To see real impact, they require recognition of games research as a legitimate field, access to funding, opportunities for collaboration, and support for public communication that challenges outdated stereotypes.

A.8.7 Key Challenges and Barriers

One of the central challenges in establishing an effective advocacy group for games research is the highly interdisciplinary and fragmented nature of the field. Games research spans domains such as computer science, psychology, media studies, education, and health sciences, each with distinct priorities, methods, and funding structures. This diversity often leads to competition for resources and recognition, making it difficult to present a unified voice in advocacy. Compounding this issue is the lack of dedicated, game-specific funding streams, which forces researchers to frame their work within broader categories where it may be undervalued or deprioritized. The absence of centralized funding not only limits opportunities, but also reinforces the perception that games research is secondary to more traditional disciplines.

Another major obstacle is the fragmentation of current advocacy efforts. Organizations like HEVGA, DiGRA, and SASDG already support aspects of games research, but their activities are typically discipline-specific, localized, or lack broader coordination. Without a cohesive international framework, these groups operate in silos, reducing collective visibility and limiting their ability to influence policy or public opinion. In addition, many of these organizations depend on funding sources that can shape or constrain their messaging, making it difficult to challenge misinformation or push bold advocacy agendas. Ensuring the independence of decision making from financial pressures is critical to maintaining credibility and impact.

Addressing these challenges requires a coordinated and strategic approach. A centralized advocacy coalition that connects existing organizations and interdisciplinary researchers could help unify messaging, reduce internal competition, and amplify collective influence. Securing independent funding, such as through philanthropic grants or ethically aligned industry partnerships, would help ensure autonomy and sustainability. Investing in public communication strategies, including media training for researchers, policy engagement, and the development of a shared repository of outreach materials, would further enhance the visibility and societal relevance of games research. The removal of these structural and systemic barriers is essential to build a credible, influential and globally connected advocacy movement.

A.8.8 Key Enablers needed

A key enabler in establishing a strong advocacy group for games research is forming strategic partnerships with existing organizations that share similar goals. Groups such as Games for Change, DiGRA, HEVGA, and SASDG already participate in advocacy, research, and policy, making them valuable allies. Rather than duplicating efforts, the advocacy group can collaborate to leverage existing networks, increase visibility, and drive coordinated action around public awareness, policy change, and funding opportunities.

Another essential enabler is securing sustainable funding to support full-time staff. Unlike volunteer-led efforts, a well-resourced organization can maintain momentum, respond to public discourse, and run long-term campaigns. An effective model is drawing leadership from faculty on sabbatical or rotating academic roles to ensure a close connection to current research. Financial stability can be supported through diverse funding streams, such as public grants and ethically aligned industry sponsorships, which also help maintain independence.

Finally, identifying and partnering with government agencies or national infrastructure projects that already support digital innovation or games research is critical. Many countries have initiatives in education, technology, or culture that align with the mission of the advocacy group. Engaging with these agencies through collaboration, policy advice, or funding applications can provide structural support and long-term legitimacy. Building a global advocacy framework will require not only support from academia and industry but also recognition from policymakers to position games research as a field of international relevance and impact.

A.8.9 Roadmap to Realizing Societal Impact

This roadmap outlines the phased development of a global advocacy organization for games research. Its goal is to promote the societal value of games research, support policy influence, and improve public understanding. The steps cover early organizational efforts, infrastructure development, funding strategies, and sustainable outreach models.

Step 1: Immediate Actions – Mission Definition and Founding Structure
The first step involves developing a detailed outline of the organization's mission, core values, and long-term objectives. Alongside this, a founding committee should be established, composed of diverse stakeholders from research, industry, and advocacy, to guide the early direction and decision-making of the organization.

Step 2: Short-Term Goals (1–3 Years) – Infrastructure and Initial Outreach
In the short term, the organization should identify and connect with existing groups conducting similar work at local or regional levels. Collaborating with these organizations will help uncover unmet needs and allow for the creation of complementary, synergistic initiatives. To support early operations, seed funding should be secured to hire key personnel, including a fundraiser, a lobbyist, a liaison to coordinate communication with researchers and stakeholders, and a vision developer who engages with games researchers across disciplines. Simultaneously, the organization should launch a basic website and a searchable database, including a grant resource library. Finally, establishing a legal entity will formalize the organization's structure and provide a foundation for long-term fundraising and governance.

Step 3: Medium-Term Goals (3–5 Years) – Growth and Financial Diversification
In the medium term, the organization should focus on developing and securing more sustainable funding mechanisms beyond initial donations. This includes creating membership structures—both individual and institutional—that generate recurring revenue. To build visibility and attract broader support, the organization should host high-profile events, such as TED-style talks, that communicate its mission to the public. Additionally, forming strategic partnerships with journalism and communications programs will help support consistent media coverage, enable compelling storytelling, and offer media training opportunities for researchers involved in games research.

Step 4: Long-Term Vision (5+ Years) – Visibility, Engagement, and Impact
In the long term, the organization should develop a matching platform to connect researchers, journalists, and policy makers with relevant experts in the field. Regular networking events, retreats, and convenings should be organized to foster collaboration and increase visibility. To support both impact and sustainability, the organization can host charitable and revenue-generating events focused on games research, and establish a content creation studio dedicated to producing high-quality outreach materials. Securing long-term funding through endowments and foundation support will be essential to maintain operations. Additionally, the organization should publish an annual report on the state of global games research, modeled after the Pew Research Center, with openly accessible survey-based data that inform the community and the broader public.

A.8.10 Ethics and Risk Management

Similar to any international or global organization that aims to support many different participants and collaborative efforts across local and national boundaries, an ethical challenge for both visions (i.e., a global consortium for games research, and a global advocacy group dedicated to championing games research) is equal participation in decision-making while avoiding conflicts of interest. For example, who determines what should be funded? How priorities should be set? How can we avoid the potential situation where funders may disfavor or avoid certain research topics based on different political, social, and cultural considerations across various geographical countries or regions? As these visions also involve close collaboration among academia, industry, and government, how to make the decision-making process impartial is also a concern.

To mitigate these ethical concerns, ensuring the independence of the organization is critical. In this sense, securing sustainable and independent funding sources for the global consortium and the global advocacy group would be essential. It is also important to make the decision-making process as transparent and explainable to the public as possible. This will not only contribute to a fair decision-making process but also help balance any potential power dynamics in this process.

A.9 Games Research: Responsibility and Impact

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A.9.1 Abstract

Games and gamees research holds tremendous potential for societal benefit, promising transformative impacts across education, healthcare, social interaction, and public policy. Yet, despite widespread academic interest and extensive research outputs, the realization of these benefits remains uneven, or perhaps even limited given the scale of games research and the potential of games. There are only a few examples of research translating into sustained real-world impact at scale. We here critically examine the responsibility and impact of games research, highlighting both successes and systemic barriers.

While notable achievements - such as academic-industry collaborations exemplified by the *WEAVR* esports project [101, 143, 144, 18, 19], citizen-science games like *Foldit* [125], and economic analyses of virtual worlds [29, 46], and more recently the *UK Smart Data Donation Service* [165] - illustrate the positive potential of academic research, these instances remain exceptions rather than the rule. Structural barriers, including misaligned incentives between academia and industry, scalability challenges in transitioning from prototypes to sustainable products, and institutional complexities in implementing games within educational and healthcare systems, consistently limit broader societal adoption.

To overcome these barriers, this document proposes a responsibility agenda that names the actors who can change the conditions inhibiting positive societal impact. This agenda include fostering stronger, intentional collaborations across academia, industry, and public sectors; incentivizing impactful research within academic evaluation frameworks; establishing shared infrastructure and standardized assessment tools; and proactively addressing ethical concerns and public perceptions related to games.

Realizing the potential societal benefit of games is a very hard road indeed, if not an impossibility, because it involves changing sectors in ways that does not come natural to them. This, in turn, forces them to change their incentive structures, and which requires strategic thinking. But considering what the roadmap to enact such change would look like can provide insights for levers that might be pulled, changes that could be made, perhaps in a smaller way or in certain areas.

Therefore, a structured, actionable - if idealistic - roadmap is suggested that provides immediate, medium-term, and long-term strategies to realize the envisioned benefits systematically. Ultimately, this document calls for a cultural shift towards responsible, impactful games research: prioritizing real-world outcomes and embedding games as essential tools for addressing complex societal challenges.

A.9.2 Vision

Games are unlike any other digital medium: they are simultaneously a creative art form, a software engineering discipline, a social platform, a behavioral laboratory, and a multi-billion-dollar industry reaching over four billion players worldwide [198, 46, 43]. This unique combination means that games research sits at an intersection no other field occupies - where insights about human motivation, learning, social dynamics, and economic behavior can be tested at scale in environments people voluntarily and enthusiastically engage with. The vision is that this distinctive position is leveraged systematically: games research across academia, industry, and public policy consistently translates discoveries into meaningful real-world change. Games actively contribute to human flourishing, educational advancement,

social well-being, and ethical innovation. Through a culture of responsibility and intentionality, researchers prioritize positive societal impact at scale, and academic performance criteria have adapted accordingly. Furthermore, academic insights regularly inform games-specific public policy - from age-rating systems and monetization regulation to the integration of game-based interventions in national health and education systems - shape ethical industry practices, and lead to the development of widely adopted, impactful game-based solutions.

A.9.3 State-of-the-Art

Games research has held the promise of revolutionary societal impact since the early 2000s, with visions of transforming education, responsive healthcare, and enhancing social connectivity. These wide-ranging impacts have not fully manifested. Researchers from fields as diverse as artificial intelligence, human-computer interaction, psychology, economics, public policy and beyond have contributed to an expanding body of work, but sustained real-world impact at scale remains the exception. The following examples illustrate what has been achieved:

Game AI: Academic institutions have played a pivotal role in shaping modern game AI techniques [192, 161], developing foundational methods for autonomous agents, procedural content generation, and adaptive gameplay mechanics. These contributions influenced the gaming industry through knowledge transfer and training of specialists who now occupy key roles within leading game studios. The role of academic research in getting game AI of the ground is clear, but the inequality in AI resource across academia and industry means that academic game AI research risks becoming a feeding channel of talent to the games industry (and wider AI industry), rather than a driver of knowledge.

Game analytics: Universities have pioneered data-driven methodologies for understanding player behaviors, preferences, and experiences, substantially influencing industry standards. However, academia's direct influence has waned as industry analytics teams have grown in size and expertise over the past 20 years, limiting academia's role largely to training of new talent and foundational research of limited impact [200, 164, 46, 160, 161].

Games User Research: Games User Research (GUR) [45] examines usability, accessibility, and player experience. Initially (in the early 2000s) driven by industry innovation - for example *Microsoft*'s early work on *HALO* [178] - academia expanded GUR's scope through heuristic evaluation, biometrics, and player psychology. Some methodologies have been adopted by the wider Creative Industries, but direct and measurable societal impacts remain elusive to pin down due to scalability and implementation challenges [84, 45].

Virtual economies: Early academic work on virtual economies [29] illuminated the economic significance of virtual worlds, framing games as legitimate socio-economic environments. This foundational work significantly influenced regulatory discussions and policy formation about digital economies and virtual asset management, by bringing these aspects of games to the awareness of the public. Today, work on game monetization, addiction and wellbeing in the context of games, carries on the spirit of early economics work (e.g., [203, 147, 189]. A persistent challenge to this work is the lack of large-scale data [46, 165].

Serious Games for Health and Education: Games research, or researchers using games as tools for research, have leveraged citizen science for over 20 years. For example, *Foldit*

[125] leveraged the cognitive capacities of hundreds of thousands of players to solve complex protein folding problems, yielding meaningful biomedical advancements. *EteRNA* is a citizen science game about RNA design, from academic research similar to *FoldIt*. Player-designed RNA molecules were synthesized and tested in wet labs, with results fed back into the game. Also in the domain of health, *Sea Hero Quest* is a mobile game developed across universities, health organisations and industry, focusing on spatial navigation. Millions of players have generated a dataset equivalent to 17,600 years of lab-based research [34]. The work informed early detection of Alzheimer´s, and forms an example of citizen science applied through games at large scale, similar to *FoldIt*. However, this success remains rare in academic game projects.

A few university-led games-related projects have over the past 20 years achieved demonstrable real-world benefits. In health, *Re-Mission* [149, 25], developed by the non-profit *HopeLab* [83] with research input from Stanford University, is a 3D shooter designed to engage teen and young adult cancer patients in their treatment. A randomized controlled trial with 375 patients showed that those who played *Re-Mission* maintained significantly higher chemotherapy adherence and cancer-related knowledge. Objectively measured antibiotic adherence was 16-19% better in the *Re-Mission* group. By 2012, over 200,000 copies had been distributed in 81 countries, free of charge, via partnerships with hospitals and insurers [149, 25].

Researchers at the University of Washington created *SnowWorld* [82], an immersive VR game where burn patients throw snowballs at virtual penguins in an icy canyon. Clinical research found that burn victims playing *SnowWorld* [140] during wound care experienced 35-50% reductions in pain compared to standard treatment. Like many promising prototypes, *SnowWorld* is (to the best knowledge of the authors) not in large-scale use - research funding typically ends at the prototype stage, and commercialization requires a market, clinical integration feasibility, and ongoing maintenance resources.

An important milestone for games used as health regulation is the *EndeavorOTC* (formerly *EndeavorRx*), the first video game to receive clearance from the US Food % Drug Administration (FDA) as a medical treatment. *EndeavorOTC* is authorized for use with children with ADHD aged 8-12. A randomiced control study (RTC) (the STARS project) demonstrated improvement in addentional function [9, 102], and in 2024 *EndeavorOTC* became an over-the-counter digital therapeutic.

SPARX is a game-based cognitive behavioral therapy intervention for adolescent depression, developed at the University of Auckland. A randomized controlled trial showed it was non-inferior to face-to-face therapy for mild-to-moderate depression. It was subsequently made freely available through New Zealand's health system, forming an example of how academic research utilizing games research can reach clinical deployment through public health channels [123].

It can be argued that many of the projects listed here are examples of academics outside of games using games as tools for health or education - as opposed to games research in itself generating real-world impact. It is not clear from the literature what the influence of games research was on these projects, but they nonetheless represent examples of how games can be used to drive real-world societal impact.

In education, *Scratch* [154] - a playful programming environment from *MIT Media Lab*

- is used by millions of children worldwide to learn coding through game-like creation. *Minecraft Education* is an example of a commercial educational game with widespread adoption. The academic research on *Minecraft*-based learning is extensive and the education edition's design was possibly influenced by it. *DragonBox* [47], originally a math learning game drawing on cognitive research, has seen adoption into school curriculum. *Kahoot!* [94], whose design was informed by engagement research, demonstrates how academic insights can influence widely-used ed-tech products.

There are further examples of games being utilized for health and education, which are omitted here to preserve space. In brief, these include the *Critical Core* tabletop role playing game system for neurodivergent children [1]. Notably, *Critical Core* delivered a commercial-grade physical game product. *iCivics*, a platform for civics education that drew on educational research, that has reached oveder 10 million US school students. *America´s Army* is a US recruitment and training game running from 2002-2022, and was one of the earliest example of large-scale serious games, which led to academic research on persuasive games and other topics.

Finally, it is worth mentioning the *"Corrupted Blood"* incident that occured in the MMORPG *World of Warcraft* in 2005. Due to a programming oversight, an unintended virtual "plague" spread through the game. The emergent behaviours — panic, quarantine evasion, deliberate spreading — were studied by epidemiologists and became a reference point in pandemic modelling discussions and was revisited during COVID-19. This is an unusual but well-documented case of games providing an unplanned natural experiment of direct relevance to public health research methodology [110].

Industry-academia partnerships: The *WEAVR* esports initiative in the United Kingdom [101, 143, 144, 18, 19] produced impactful innovations in personalized data-driven storytelling and visualization tools adopted within the esports community, benefiting dozens of millions of viewers and directly influencing industry practice.

Public policy: Games research influencing policy is not widespread, but examples exist. The *Video Games Research Framework* (VGRF) from the United Kingdom [41, 43], developed in collaboration across academics, industry and policymakers, provides a vision for the future of research into video games and has since formed a foundational discussion point for policymaking in the EU.

The UK government's call for evidence on loot boxes in 2020, motivated in part by academic findings and public pressure, was followed by a response in 2022 [72]. Academic experts such as Zendle et al. [202, 203], who reported spending data from 69 million players indicating that a small fraction of "heavy spenders" provide a large share of revenue, legitimized concerns and got regulators to pay attention. The UK government in 2022, while stopping short of legislation, pressed industry to adopt measures to protect children (e.g., parental locks on loot box purchases) [48, 72]. This has been followed up with newer initiatives aimed at protecting users in the UK and EU (e.g., [55])

The UK-based *Smart Data Donation Center* (SDDS) [165], funded by the public sector, which will empower individuals to understand their own online data and share it safely with researchers to improve digital wellbeing. The SDDS is a data service for research, not a research project. It taps into EU citizens' rights under the *General Data Protection Regulation*

(GDPR) [32] to request copies of the data companies hold about them. If the SDDS succeeds, games research could be significantly advanced by access to granular, large-scale data about online behavior across games and social media, and policymakers could gain insights needed to drive fair and effective public policy.

The SDDS is an example of a project that would not need to exist without collaboration across university research, industry research and the public sector. It is driven by a need to alleviate the imbalance in data about our online lives held by private companies versus that held by university researchers or the public sector.

A.9.4 Summary on the impact of games research:

The impact of academic games research since about the year 2000 has been real but diffuse. Unlike fields such as medicine - where a single discovery can save millions of lives - games research tends to influence society indirectly and cumulatively, primarily through knowledge transfer: universities educate professionals and develop conceptual tools that gradually shape the games and platforms billions interact with.

Many practices now standard in the games industry - such as A/B testing, player psychology modelling, and AI-driven game balancing - trace their conceptual roots to academic research (in and outside games research) [160, 164, 161, 45, 192]. However, these contributions are rarely recognized as academic breakthroughs. They evolve in tandem with industry practice.

The standout examples mentioned here show that under the right conditions, games research can generate substantial social value. But achieving such impact at scale remains rare, typically requiring extraordinary collaboration, sustained funding, and non-academic actors willing to shepherd distribution and integration.

The promises made for games research in the early 2000s (revolutionizing learning, promoting civic engagement, transforming therapy, etc.) have largely gone unrealized. This is not due to individual failings, but structural and systemic challenges: the difficulty of scaling from academic prototypes to production-quality interventions; deep misalignments between academic incentives (novelty, theory, publications) and industry or public sector goals (reliability, scalability, impact); and bureaucratic complexity in integrating games into systems like healthcare or education. Recognizing this shortfall is the first step toward redress.

A.9.5 Key challenges and barriers

Several structural and institutional barriers significantly limit the societal impact of games research. Some are shared with other fields; others are unique to games.

Misaligned incentives: Academic success is predominantly measured through publications, grant income and theoretical innovations, whereas industry success hinges on commercial viability and scalability. This misalignment frequently results in research that stops at proof-of-concept. Academic careers are built on grant income, citations and publications. A project that leads to a prototype game and a few papers in high-impact journals is a success regardless of whether that prototype ever reaches users.

Rapid platform evolution: Games research faces a challenge largely absent from other domains: the platforms it studies evolve at extraordinary speed. A study designed around one generation of game engine, console hardware, or online platform may be outdated by the time it is published. The typical 3-5 year cycle of a funded research project can span an entire hardware generation, and the shift from desktop to mobile to VR to cloud gaming has repeatedly invalidated assumptions underpinning ongoing research programs. Similarly, the rapid pace of innovation in commercial game and monetization design is outpacing academic research. This speed of change makes longitudinal research exceptionally difficult and discourages investment in long-term studies.

Proprietary infrastructure: The game development ecosystem is dominated by proprietary engines (*Unity, Unreal Engine*), closed platform APIs (e.g., *Steam, PlayStation, Xbox, Nintendo*), and walled-garden data environments. Academic researchers typically cannot access the telemetry data, player behavior logs, or engine internals that would enable the most impactful studies [203, 165, 41]. When platform holders change terms of service or deprecate APIs, entire research pipelines can be disrupted overnight. This proprietary lock-in has no close parallel in fields like biology or physics, where instruments and data formats are more standardized.

Cultural stigma: Games research faces a persistent credibility problem, perhaps unique among digital technology fields. The question *"you study video games?"* - delivered with amusement or skepticism by university administrators, funding panels, and the general public - reflects a cultural stigma that researchers in, for example, social media or cybersecurity may not encounter to the same degree. This stigma has material consequences, contributing to a lack of dedicated funding tracks with national research councils. The result is that researchers have to frame their work within other domains, e.g. health, education, human-computer interaction or applied machine learning, to secure funding. The result is that games-specific questions - about game design, player experience, or the societal role of play - are not getting addressed despite their societal significance.

Industry dominance and data asymmetry: Large game companies maintain extensive proprietary research teams that vastly out-scale most academic games research groups, reducing the need for external academic contributions [164, 160, 46, 200, 161]. This creates competition rather than collaboration, with industry-developed innovations overshadowing academic findings - as is the case for AI research in general [179]. However, at the same time, much industrial research is also confidential due to its commercial value. The data asymmetry is stark: publishers like *Electronic Arts*, *Activision Blizzard*, and *Tencent* hold behavioral data on hundreds of millions of players, while academic researchers typically work with samples in the hundreds or low thousands [164, 160, 46, 200, 161].

Scalability and the prototype graveyard: Academic research prototypes often fail to transition into products due to a lack of sustained funding, commercial infrastructure, and - in the case of games - the high production-value expectations of modern players. A health game validated in a clinical trial still needs art, sound, platform certification, and ongoing maintenance to reach patients. In education, integration of games into existing institutional structures is fraught with regulatory requirements, bureaucratic processes, overworked teachers and admins, underfunded education systems, and systemic resistance to change.

Public perception and moral panics: Negative associations driven by contentious research on violence and gaming addiction have hindered societal acceptance and policy support. Ethical concerns about data privacy and exploitative game mechanics (e.g., loot boxes) [48, 72, 199, 190] further complicate the landscape. As a major focus of human activity, games research is uniquely affected by cycles of negative narratives - from the debate about video games and violence in the 2000s to the controversies around online gaming disorder in the 2010s - that can redirect funding and political attention toward defensive research rather than constructive innovation.

Addressing these challenges requires not only the generic remedies of better collaboration and aligned incentives, but games-specific interventions: dedicated funding tracks, data-sharing agreements with platform holders, and sustained effort to establish games research as a legitimate and critical area of inquiry.

A.9.6 Key enablers needed

Realizing the full potential of games research requires key enabling factors that bridge existing gaps and overcome current barriers:

1. Creating stronger alignment between academia, industry and public organisations through incentive structures that reward impactful research is critical.

2. Academic evaluation frameworks should include explicit metrics for real-world applications, sustained partnerships, and societal benefit. Current incentive frameworks for academic researchers focus on grant income, citations and publication numbers. Not positive societal impact (whether economic, cultural or social). This is a problem across academic research, and likely one of the hardest barriers to overcome.

3. Dedicated funding mechanisms designed specifically to bridge the gap from prototype to market-ready solutions would help accelerate societal impact of games research. Such mechanisms should operate on a timeframe where industry can participate. This includes public and private funding schemes that explicitly support commercialization, scalability, and long-term sustainability of game-based innovations. This also needs to include better support for bringing academic prototypes to market, in situations where the economic incentives are not present for a private partner to handle productization and distribution. For example, to meaningfully change the situation around games-based learning, games that are not commercially viable will need to be productized and brought to educational systems, that in their own right may not have the funding or technical expertise to invest in such games.

4. Fostering robust cross-sector collaboration is essential. Structured platforms and partnerships connecting academia, industry, public institutions, and policy makers can facilitate seamless knowledge transfer, joint research initiatives, and coordinated efforts for large-scale implementation. Aligning incentive structures is a fundamental requirement.

5. Standardized assessment tools and shared infrastructure are vital. Developing universally accepted frameworks for measuring game effectiveness, ethical compliance, and impact can significantly streamline adoption across sectors, promoting transparency and trust.

6. Proactive management of ethical considerations and public perceptions is indispensable. Clear communication strategies, comprehensive risk management practices, and public education campaigns about the benefits and responsible use of games will help build societal acceptance and policy support.

Implementing these enablers - even if doing so is hard to consider as anything but an unrealizable ambition - will foster a conducive environment for responsible and impactful games research, improving its transformative potential for societal benefit.

A.9.7 The AI Dimension

The rapid advancement of generative AI and large language models is reshaping game development and, with it, the landscape of games research. The pace of change fast enough that this section is likely outdated before it goes to print, however, understanding, shaping, and where necessary constraining these changes is among the most pressing responsibilities facing games researchers today.

AI in game development practice: Generative AI is being integrated across the game development pipeline. Procedural Content Generation (PCG) - long a subject of academic research and industry practice [192, 161] - has been transformed by diffusion models and large language models capable of generating textures, 3D assets, level layouts, and narrative content at scale. The technology is not without its flaws, but at the time of writing, studios are already deploying AI-assisted tools for e.g., automated QA and playtesting, reducing the need for large manual testing teams. NPC behavior is shifting from scripted state machines to language-model-driven dialogue systems that can respond dynamically to player input. Companies including *Ubisoft*, *NVIDIA*, and *Inworld AI* have publicly demonstrated such systems [180, 134, 96].

New research opportunities: These developments open significant research avenues that are specific to games. Synthetic playtesting - using AI agents to simulate thousands of player sessions - could dramatically accelerate game balancing and accessibility testing, but raises questions about whether AI playtesters adequately represent the diversity of human play styles and motivations (e.g., [11]).

AI-assisted game design tools could help make game creation more broadly available, lowering barriers for independent developers, educators, and researchers who lack access to large production teams. Advanced player modelling, combining behavioral telemetry with generative models, could enable personalized game experiences that adapt in real time to individual players' skill levels, emotional states, and learning objectives - building on decades of academic work in adaptive systems and intelligent tutoring (e.g., [163, 194, 193, 150]), with, however, the ethical caveats noted above.

Ethical and societal risks: The integration of AI (broadly defined) into games introduces a distinct set of ethical challenges that games researchers are uniquely positioned to study [194, 122, 172, 177]:

Labor displacement: AI-driven automation of art production, QA, narrative writing, and localization may threaten jobs across the games industry, albeit the long-term impact remains unknown. A wave of studio layoffs in 2023-2025 [135] has coincided with increased AI adoption (or at least, this has been utilized as a reason), and the games workforce -

already characterized by precarious employment, crunch culture, and weak unionization - is particularly vulnerable. Games researchers with expertise in industry labour practices have a responsibility to document these impacts rigorously and help inform policy responses [53].

Content ownership and authorship: When a game's art, music, or narrative is generated by AI trained on existing creative works, questions of copyright, attribution, and creative ownership become acute. The games industry is already facing litigation on these issues, and regulatory frameworks remain unsettled. The EU AI Act and the US Copyright Office's evolving guidance on AI-generated works both have direct implications for game content [181, 55].

Manipulation through personalization: AI-driven personalization in games - dynamically adjusting difficulty, narrative choices, monetization offers, and social features based on individual player models - creates risks of manipulation that go beyond existing concerns about loot boxes [48, 72, 199]. A system that identifies a player's psychological vulnerabilities and tailors monetization pressure accordingly is, to the best knowledge of the authors, technically feasible based on current generation AI and existing work on the relationship between gameplay and player psychology. Absent regulation, such systems are commercially attractive. This is a games-specific manifestation of broader AI ethics concerns, and it demands games-specific research and policy responses. The Belgian and Dutch regulatory actions on loot boxes [199, 190, 189], and the UK government's 2022 response on the same topic [72], provide precedents, but existing frameworks do not address AI-driven dynamic monetization.

Synthetic media and deepfakes: Games increasingly serve as social platforms where players interact through avatars and voice chat. Generative AI enables real-time voice cloning, face synthesis, and behavioral mimicry that could be used for harassment, fraud, or manipulation within game environments. The scale of potential exposure - billions of player interactions daily across platforms like *Fortnite*, *Steam*, *Roblox*, and *Minecraft* - makes this a significant vector for synthetic media harms that the *EU Digital Services Act* (DSA) [32] has yet to address specifically in the context of interactive entertainment [122, 177].

The responsibility imperative: Games researchers have historically studied the impacts of new technologies *after* they have been widely deployed - the reactive pattern visible in the loot box debate, the violence-in-games controversies, and the gaming disorder discussion. With generative AI, the research community has an opportunity - and an obligation - to break this pattern. The technology is being adopted now; the time to study its impacts, develop frameworks for responsible deployment, and inform regulatory responses is now, not after harms have already materialized at scale. This requires proactive engagement: embedding researchers in studios adopting AI tools, establishing longitudinal studies of AI's impact on the games workforce, developing technical standards for transparency in AI-generated game content (e.g., requiring disclosure when NPC dialogue is AI-generated, or other form of labelling), and providing evidence to policymakers drafting AI regulation as it applies to interactive entertainment [194, 122, 172, 177].

A.9.8 Roadmap to realizing the vision

To effectively translate games research into sustained real-world impact at scale, a structured, phased roadmap is proposed. While inspirational, each action names specific actors to clarify

who should drive implementation:

1. **Immediate Actions (1-2 years):**
   A) *National research councils and regional research organisations* (e.g., NSF, ERC, UKRI, DFF) should establish cross-sector working groups involving games researchers, publishers, platform holders, and policymakers to define shared research priorities for games and society - building on the model of the *UK Video Games Research Framework* (VGRF) [41].
   B) *Games research associations* (e.g., DiGRA, ACM SIGCHI Games Community, GAME, the game-related IEEE task forces) should develop standardized assessment protocols for measuring the effectiveness and ethical compliance of game-based interventions, analogous to the CONSORT guidelines used in clinical trials.
   C) *Universities with games programs* should launch pilot initiatives that include real-world impact metrics (e.g., adoption rates, policy citations, industry partnerships) alongside traditional publication-based criteria in hiring and promotion decisions.
   D) *Games researchers* should establish dedicated research programs on generative AI's impact on game development labor, player experience, and content integrity, with initial focus on documenting current adoption patterns and workforce effects.

2. **Near-Term Actions (2-4 years):**
   A) *National and supranational funding bodies* (e.g., ERC, Horizon Europe, NSF) should create more dedicated funding tracks for games-focused research, not subsumed under other headers, with explicit requirements for industry co-investment and pathways to deployment.
   B) *Game publishers and platform holders* (e.g., *Valve/Steam, Sony/PlayStation, Microsoft/Xbox, Nintendo, Epic Games*) should establish data-sharing agreements with academic consortia, providing anonymized telemetry and behavioral data for research under agreed ethical frameworks. The SDDS [165] model offers one template.
   C) *Rating bodies* (PEGI, ESRB, USK) and *national regulators* should commission academic research to evaluate whether current age-rating systems adequately address AI-generated content, dynamic monetization, and emergent social interactions in games.
   D) *International bodies* (e.g., OECD, UNESCO, WHO) should initiate public communication campaigns, informed by academic evidence, to educate stakeholders on the benefits and risks of games, countering both moral panic and uncritical enthusiasm.

3. **Medium-Term Actions (4-6 years):**
   A) *The European Commission*, building on the Digital Services Act [32] and AI Act [55], should develop games-specific regulatory guidance addressing AI-driven personalization, dynamic monetization, and synthetic content in interactive entertainment, informed by academic evidence.
   B) *National education ministries* and *health agencies* (e.g., NHS England, CMS in the US, national education boards) should pilot the integration of validated game-based interventions into school curricula and clinical pathways, with structured evaluation and feedback mechanisms.
   C) *Universities* should institutionalize impact metrics within academic evaluation and funding criteria for games research, moving beyond pilot programs to systemic adoption.
   D) *Game engine developers* (e.g., *Unity Technologies, Epic Games, Godot Foundation*) should provide academic licensing tiers with access to engine internals, telemetry pipelines, and documentation sufficient for reproducible research.

4. **Long-Term Actions (6-10 years):**
   A) *National research councils* and *industry consortia* should co-fund shared research infrastructure, data repositories, standardized player modeling frameworks, and open-source game-based intervention toolkits, that reduce duplication and lower barriers to entry for games researchers globally.
   B) *Governments* should integrate game-based solutions systematically within key societal institutions, with games research evidence directly informing procurement and implementation decisions in education, healthcare, and public services.
   C) *International standards bodies* (e.g., ISO, IEEE) should develop and maintain technical standards for transparency in AI-generated game content, ethical monetization design, and data practices in games.

5. **Continuous Improvement (10+ years):**
   A) All actors should embed continuous improvement mechanisms, including ongoing research, feedback loops, and iterative enhancements to game-based interventions.
   B) *Regulatory bodies* should conduct regular reviews of games-specific regulation, adapting to emerging technologies (post-generative-AI developments, brain-computer interfaces, extended reality) and evolving societal expectations.
   C) *The games research community* should maintain sustained public engagement and stakeholder education, positioning games research as an essential contributor to evidence-based policy on digital life.

Following this roadmap will require political understanding and will, sustained funding, and a willingness from all actors to compromise on established practices. It is ambitious. But the alternative, allowing the societal impacts of games to be shaped entirely by market forces, with academic research relegated to commentary after the fact, is potentially worse.

A.9.9 Ethics and Risk Management

Robust ethical oversight and effective risk management are essential components of responsible games research. Ethical considerations encompass data privacy, informed consent, and transparency in how user data is collected, analyzed, and utilized within games-based solutions. Researchers must actively mitigate risks related to data misuse, algorithmic bias, and potential psychological or behavioral harms stemming from game design [201, 189, 165, 203, 46]. Currently, there are relatively strong protections in place in academia in many countries, with less protections in others. Across the industry, the need to consider ethics and risk management will always be at odds with revenue generation. This conflict can only be addressed through legislation - legislation that is based on representative-scale data analysis, is reasonable for all involved stakeholders and which is rigorously enforced [201, 189, 165, 203, 46].

Concretely, three games-specific policy instruments deserve attention as models or starting points, despite their flaws and limitations: (1) the *PEGI* and *ESRB* rating systems, which provide existing infrastructure for communicating game content risks to consumers but need updating to address AI-generated content and dynamic monetization; (2) the Belgian and Dutch (among other countries) regulatory actions on loot boxes, which demonstrated that national governments can and will intervene when academic evidence supports it, but which also revealed the limitations of fragmented national approaches within the EU (see

also [201, 189]); and (3) the *EU Digital Services Act* [32], which imposes transparency and risk-assessment obligations on very large online platforms - a category that increasingly includes game platforms like *Steam*, *PlayStation Network*, and *Roblox* - but which does not yet contain games-specific provisions. Games researchers should actively contribute to the implementation and review of these instruments, providing evidence on emerging risks (AI-driven manipulation, synthetic media in social game spaces, cross-border virtual economies) and evaluating the effectiveness of existing measures.

Regular ethical reviews, independent audits, and stakeholder consultations will ensure continuous adherence to best practices and adaptation to evolving societal expectations. By embedding these ethical frameworks and risk management practices within all phases of games research, we can ensure that the transformative potential of games is realized responsibly and sustainably.

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