The Alan Turing Institute

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AI, Children's Rights, & Wellbeing: Transnational Frameworks

Mapping 13 Frameworks at the Intersections of Data-Intensive Technologies, Children's Rights, and Wellbeing

Sabeehah Mahomed, Mhairi Aitken,
Ayça Atabey, Janis Wong, Morgan Briggs

About The Alan Turing Institute

The Alan Turing Institute is the UK's national institute for data science and AI. The Institute is named in honour of Alan Turing, whose pioneering work in theoretical and applied mathematics, engineering, and computing is considered to have laid the foundations for modern-day data science and AI.

The Institute's goals are to advance world-class research in data science and AI and apply it to national and global challenges, build skills for the future and train a new generation of scientists, and drive an informed public conversation around data science and AI.

About the Public Policy Programme

The Public Policy Programme was set up in 2018 with the aim of developing research, tools, and techniques that help governments innovate with data-intensive technologies and improve the quality of people's lives. We work alongside policymakers to explore how data science and AI can inform public policy and improve the provision of public services. We believe that governments can reap the benefits of these technologies only if they make considerations of ethics and governance a priority.

About the Children's Rights and AI Team

The Children's Rights and AI team at The Alan Turing Institute is part of the Public Policy Programme's Ethics & Responsible Innovation Theme. Our research aims to advance child-centred approaches to the design, development, deployment, and governance of AI. We collaborate with a range of organisations (including UNICEF, Council of Europe, and Scottish AI Alliance) both in the UK and internationally to examine the ways that AI impacts children's rights, how children's rights can be protected in a digital world, as well as developing and testing approaches to meaningfully involve children in decision-making relating to AI. Our previous research includes piloting UNICEF's **Draft Policy Guidance on Children** and AI and working with **Children's Parliament and Scottish AI Alliance** to engage primary school children (aged 7 – 11) with AI and children's rights.

Acknowledgements

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Executive Summary

As data-intensive technologies, including artificial intelligence (AI), is becoming more commonplace, children are being impacted since birth and over the course of their lives. However, currently, research is scarce when considering a comparative view of existing frameworks relating to AI, children's rights, and wellbeing. Our research aims to fill this gap by exploring the emerging international governance landscape in this context, emphasising transnational frameworks to offer a comprehensive view of this landscape.

Our report explores the international and global reach of AI to assess how children are directly and indirectly affected by AI. First, we introduce a glossary of key terms, followed by our methodology outlining the frameworks reviewed and key themes. These themes encompass **children's rights, children's wellbeing, and child-centred recommendations and policies**. We then present two heatmaps which assesses the key themes across 13 transnational frameworks and the extent to which they address specific considerations within these themes. These include integrating children's rights, considering children's wellbeing and sociotechnical factors, involving children's voices, and addressing both opportunities and risks related to AI. Finally, we conclude with a brief discussion and point to areas for future research.

Our research aims to provide insights for policymakers, researchers, public sector stakeholders, and civil society to understand the evolving landscape of AI frameworks concerning children's rights and wellbeing on a global scale. The main findings of our analysis, focusing on the key areas of children's rights, children's wellbeing, and child-centred recommendation and policies, are summarised below:

CHILDREN'S RIGHTS

For the first theme on children's rights, we analysed the extent to which frameworks integrated children's rights according to the United Nations Convention on the Rights of the Child (UNCRC). At a granular level, we analysed four specific groups of children's aligned with certain Articles[3] of the UNCRC namely, non-discrimination, best-interests of the child, views of the child, and child exploitation.[4]

Limited Substantial Discourse on Children's Rights	Despite all frameworks making some mention of 'children's rights', less than half had a strong focus on children's rights as defined by the UNCRC.[5]
(Ir)responsible Governments	Frameworks primarily focused on the role of governments and policymakers in upholding children's rights through regulation and guidelines. However, the majority did not sufficiently address government's responsibility to avoid infringing on children's rights themselves.
Protection from Child Exploitation	Across all frameworks there was consensus on the importance of protecting children from exploitation.[6] Specific concerns included online child sexual abuse and economic exploitation (via personal data monetisation, profiling, and microtargeting). Safeguarding children from these risks amongst others are crucial.
Child Exploitation in Digital Environments	Frameworks indicated a growing concern regarding child exploitation in digital spaces, its **intersection** with unfair data and design practices in the technology sector, as well as poor or fragmented regulation.
Relationship with Other Rights	Inclusion and accessibility of data-intensive technologies are considered in connection with children's rights such as non-discrimination and their impact on other rights such as the right to education, participation, play, and freedom of expression, amongst others.

[3] Articles 2, 3, 12, 13, 19, 32, 34-36.
[4] See 'Heatmap 2'
[5] Frameworks which included more than 50% coverage on children's rights according to the UNCRC.
[6] Guided by UNCRC Articles 19, 32, 34, 35, and 36.

CHILDREN'S WELLBEING

For the second theme, we analysed the extent to which children's wellbeing and related considerations in relation to data-intensive technologies were included across frameworks, including specific considerations from a sociotechnical, socio-economic, and socio-cultural perspective. Additional considerations include the extent to which frameworks focused on the benefits or risks of technology to children's wellbeing and children's empowerment and agency amongst others.

Lack of Distinction between Children's Rights & Wellbeing	Many frameworks do not clearly define 'wellbeing' and do not explicitly differentiate wellbeing from children's rights.
Benefits and Risks of Technology to Wellbeing	There is acknowledgment of the dual impact of data-intensive technologies. Positive impacts were highlighted in educational, health, entertainment, and social contexts. Risks and online harms tended to focus on discrimination, safety, profiling, cyberbullying, harassment, abuse, and negative effects on physical and mental health (e.g. technology addiction). Most frameworks concentrate more on the risks of data-intensive technologies rather than their potential benefits, despite children generally expressing enthusiasm for technology.
Accessible Information is Insufficient for Children's Agency	Frameworks which discussed children's agency tended to emphasise the importance of ensuring children have access to age-appropriate information about their rights in the digital world. However, children's engagement can go beyond providing accessible information and should also extend to participatory processes that involve children in decision-making processes throughout the design and development of policies or services which impact their lives.
Digital Inclusion | and Equality	Frameworks that addressed digital inclusion emphasised the link between access and equality in relation to unfair treatment of children and their data and the risks that could arise from these.

CHILDREN'S WELLBEING (CONT.)

Disadvantaged & Vulnerable Groups	All frameworks acknowledged the importance of considering disadvantaged and vulnerable groups of children to different extents. Some provided explicit examples of disadvantaged or vulnerable groups. Various frameworks emphasised supporting vulnerable and disadvantaged children with additional needs, specifically in education and internet access contexts.
Gender and Cultural Considerations	Frameworks considered gender aspects and cultural norms that can influence children's enjoyment of their rights and wellbeing.
Limited Environmental Focus	Only one framework linked the impact of technologies to the physical environment and discussed children's present and future wellbeing related to the environmental impacts of AI.

CHILD-CENTRED RECOMMENDATIONS & POLICIES

The final theme focused on existing or future recommendations and policies that were child-centred or at the least, focused on upholding children's rights and wellbeing. This included recommendations such as age-appropriate measures, impact assessments, as well as both binding and non-binding requirements related to children's rights, wellbeing, and data-intensive technologies.

Generalised Policy Recommendations	Overall, most recommendations were high-level and generalised, which may be due to their transnational focus.
Child Rights Impact Assessments (CRIA)	Less than half of the reviewed frameworks mentioned or recommended a child rights impact assessment (CRIA).
Engagement with Children	There was less mention of *direct* engagement with children in the private sector, and instead often indicated as a more general consideration of children's perspectives instead.

CHILD-CENTRED RECOMMENDATIONS & POLICIES (CONT.)

Accountability and Liability	The question of accountability and liability were addressed differently across frameworks. Only some frameworks called for binding regulations and holding both public and private stakeholders accountable.
Need for Decisive Global Collaboration	More discussion and practical steps are needed on global collaboration. Some frameworks recommended an international approach to data governance and child-centred digital regulation and policies.
Influence of Geopolitics	Limited mention was made regarding the growing role of geopolitics and how to address these imbalances and implications in relation to children's data governance and child-centred regulation.

Policymakers should work together with transnational organisations and other key stakeholders to uphold children's rights, wellbeing, and ensure child-centred AI for children. The frameworks included in this analysis cover diverse impacts of AI, recognising that it touches all aspects of children's lives and may pose significant consequences and opportunities for their education, play, sense of self, relationships, mental health, and social, emotional, and cognitive development (amongst others). It is vital that regulation, policy, and research engage with impacts on children as an urgent, high priority focus as technical innovation continues alongside the increasing deployment of AI technologies across almost all sectors and industries. Researchers could extend similar mappings of frameworks from less developed countries. There are additional key areas for further comparative analysis including, data protection, privacy, addressing manipulation and misinformation, enhancing enforcement measures, ensuring practical application of these frameworks, and fostering international collaboration to protect children's rights globally. We hope that this analysis provides a starting point for future research as well as a useful resource for policymakers and practitioners to explore ways forward in developing and applying child-centred approaches to AI.

Glossary

For the purposes of this report, we have adopted the following definitions

Child – Any person under the age of 18 is considered a 'child' as defined in Article 1 of the United Nations Convention on the Rights of the Child (UNCRC).[1]

Data-intensive technologies – Technologies which are underpinned by the collection, processing, or use of data. While the term 'data-driven' is often used to describe these technologies, this can imply that data that are used pre-exists and shapes innovation or industry practices, whereas data are in fact, continually created and curated through these systems.[2] We use the term 'data-intensive' to acknowledge the central role of data in underpinning and sustaining these technologies, as well as the function of these technologies in creating and curating data.

Frameworks – We adopted a broad approach to what constitutes a 'framework' for our analysis, including but not limited to binding and non-binding policy guidelines, recommendations, reports, policy briefs, tools, or concept notes meant to inform policy and guidelines in relation to data-intensive technologies and children's rights and wellbeing. This includes guidance documents aimed at different stakeholders, excluding academic literature or reports that do not explicitly aim to address the creation or implementation of an existing legal or policy framework.

Sociotechnical – This term is used to describe how technology does not exist in a vacuum but instead is embedded in society and institutions. Thus, the reciprocal nature across the lifecycle of these technologies must be considered in relation to individuals, communities, and the environment.[3]

Transnational – Extending beyond and across national boundaries of at least two or more countries.[4] Here, we focus on transnational frameworks which were created by authors across and representing different countries and are not specific to any particular national context.

Wellbeing – Although there is no universally accepted single definition of 'wellbeing', overall, as a summary, it can be described as a positive state that people and societies experience.[5] In this report, when addressing children's wellbeing, we follow UNICEF's approach that covers but is not limited to children's health and safety, life satisfaction, and happiness.[6]

[1] United Nations, 'United Nations Convention on the Rights of the Child (UNCRC)'.
[2] Aitken et al., 'Establishing a Social Licence for Financial Technology'.
[3] Abbas and Michael, 'Socio-Technical Theory: A Review'.
[4] Rouse, 'International, Transnational, Multinational, Global'.
[5] Chatila and Havens, 'The IEEE Global Initiative on Ethics of Autonomous and Intelligent Systems'; Digital Futures Commission, 'Glossary of Terms Relating to Children's Digital Lives'; OECD, 'Compendium of OECD Well-Being Indicators'; WHO, 'Health Promotion Glossary of Terms 2021'.
[6] Chandy, Marlin, and Teixeira, 'Understanding Child Subjective Well-Being | UNICEF Office of Global Insight & Policy'; UNICEF UK, 'A Child's Guide to the Child Well-Being Report'.

1. Introduction

Artificial Intelligence (AI) is playing increasingly varied and significant roles across society, becoming integrated into key processes and systems in both the public and private sectors. With AI being used to inform decision-making, process complex information, and personalise services in areas as diverse as online commerce, healthcare, policing, and education (to name a few), it is clear that AI increasingly touches and impacts the lives of everyone. Children are no exception, and indeed, since AI is informing decisions that have the potential to shape or influence their futures, as well as increasingly shaping how children access information about the world and establish or maintain social relationships, children are likely to be the group who are most impacted by AI over the course of their lives.

In response to the growing awareness of the risks presented by AI, there is significant interest in frameworks and related guidance documents to govern the development and use of AI, including important emerging regulation such as the proposed EU AI Act.[7] The majority of these frameworks focus on the development, deployment, and use of AI technologies rather than the experiences or needs of particular impacted communities. Yet, it is clear that children's experiences with AI may present a particular set of risks and require approaches that are specific to the vulnerabilities and needs of children. For example, if children access AI technologies that were designed primarily or exclusively for adult users, they may be exposed to harmful or inappropriate content. Additionally, children may be particularly vulnerable to the transformative effects of new technologies which affect how they access information about the world (e.g. through search engines or large language models [LLMs]) or how they establish and maintain social relationships (e.g. through social media).[8]

Our previous research found that while there is growing recognition of the importance of addressing children's rights and wellbeing considerations in relation to AI, this remains an under-researched area. In 2021, as part of UNICEF's policy pilot partnership, we examined UK public sector stakeholders' views on AI technologies in the public sector and the challenges of addressing considerations relating to children's rights in their current projects involving AI. We found that, in general, public-sector stakeholders felt they lacked clear or consistent guidance in this area.[9] Moreover, they often noted that due to the increasing number of frameworks relating to AI – with a small but increasing number of these focusing on children – it was increasingly difficult to navigate regulatory or governance requirements or to identify clear guidance on actions to take.

[7] European Commission, 'Proposal for Laying Down Harmonised Rules on AI and Amending Certain Union Legislative Acts'.
[8] Aitken and Briggs, 'Engaging Children with AI Ethics'.
[9] Pauwels et al., 'Case Study: Understanding AI Ethics and Safety for Children: The Alan Turing Institute'; UNICEF, 'Draft Policy Guidance on AI for Children 1.0'.

Therefore, following our findings, we set out to gain a clearer view of existing frameworks relating to data-intensive technologies, including AI, and children's rights. This report presents the findings of our research and seeks to provide an overview of existing frameworks and the extent to which they engage with considerations relating to children's rights and wellbeing in relation to data-intensive technologies and AI.

We begin in Section 2 by detailing our methodology. In Section 3, we present heatmaps which illustrate the key themes and considerations we identified across transnational frameworks relating to data-intensive technologies and children's rights and wellbeing and discuss the similarities and differences within these frameworks. Finally, in Section 4, we provide conclusions and point to future areas of exploration that will further develop this research.

2. Methodology

This report presents the findings of our analysis of frameworks relating to data-intensive technologies, including AI, and children's rights or wellbeing. The frameworks included broadly focused on three overarching themes: 1) children's rights, 2) children's wellbeing, and 3) child-centred recommendations and policies.

While our focus was on AI, we found that several frameworks may be relevant and applicable to AI even though they may not focus centrally on this subject. Frameworks which discussed data, or data-intensive innovation typically included considerations relevant to AI.[10] Our report explores the international, and global reach of AI, recognising that children around the world are impacted – directly and indirectly – by AI. Therefore, the analysis presented here focuses on transnational frameworks – frameworks which have been developed to apply beyond national boundaries. This approach was taken in recognition of the international, and indeed global, impacts of digital technologies and AI. With technologies and data-intensive systems being developed, deployed, or procured across international contexts, their impacts – while often experienced inequitably – will also be felt beyond national or regional borders.

Our approach was guided by a series of research questions and aims which are listed in greater detail in the **Appendix**. For this report, we reviewed existing frameworks and grey literature including but not limited to binding and non-binding policy guidelines, recommendations, research reports, policy briefs, and supporting documents. The primary focus of our heatmaps and frameworks analysis is children's rights frameworks as applied to AI and, where appropriate, to related aspects of data-intensive technologies.

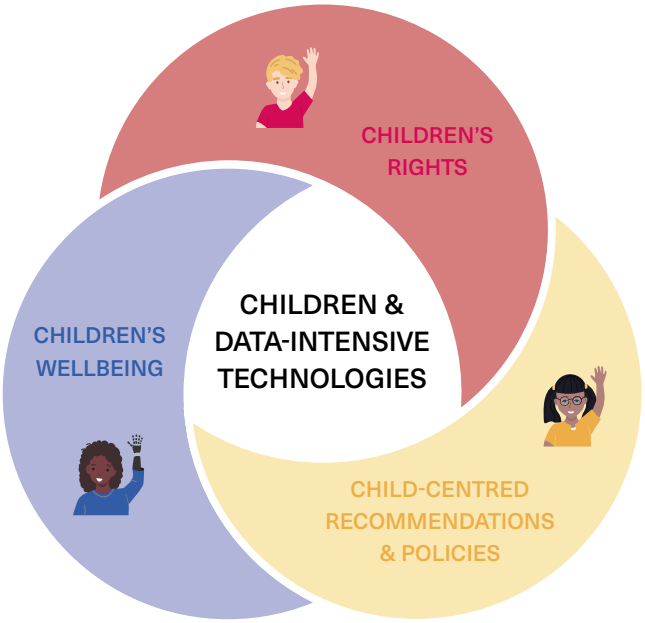
For the analysis in NVivo, key themes were drawn from the UNCRC, desk-based research, and a review of over 30 frameworks globally, as well as our ongoing work engaging children on AI.[11] The Appendix includes additional details on our approach to coding and intercoder reliability. Using a broad and inclusive approach, these themes were grouped into three overarching categories each related to children and data-intensive technologies, namely **children's rights, children's wellbeing**, and **child-centred recommendations and policies**.

The final selection criteria included only those frameworks published by transnational organisations in the last six years (Jan 2018 – June 2023) with a relevant focus area. We excluded journal articles and any country specific documents from our selection to ensure that our framework analysis represents concrete deliberations and considerations represented by transnational organisations.

[10] See more on this in the Appendix.
[11] Children's Parliament, Scottish AI Alliance, and The Alan Turing Institute, 'Exploring Children's Rights and AI: Stage 1 Summary Report'.

Frameworks selected for analysis were limited to those in English. As a result, the total number of transnational frameworks coded and analysed was thirteen. However, while country specific documents (many of which were informed by the transnational frameworks we analyse here)[12] were excluded in our coding analysis, we did reference a number of these frameworks in other sections of this report.

Key themes



CHILDREN'S RIGHTS

Integrating and upholding all children's rights according to the UNCRC in this framework

CHILD-CENTRED RECOMMENDATIONS & POLICIES

Developing and implementing child-centred recommendations and policies

CHILDREN'S WELLBEING

Children's sociotechnical, wellbeing, and related considerations

To gain a deeper understanding of each category, specific codes were assigned to each as follows[13]:

1. **Children's Rights:**
   Integration of children's rights according to the UNCRC

2. **Children's Wellbeing**
   Sociotechnical and wellbeing considerations
   Importance of children's voices and agency
   Opportunities and benefits to children
   Risks and harms to children
   Digital inclusion and access to technologies
   Disadvantaged and vulnerable children

3. **Child-centred Recommendations & Policies**

The following 13 documents were selected for analysis and are further discussed in detail in Section 4. As stated above, we adopted a broad approach to what constitutes a 'framework' for this report. For more information on the methods applied please see the **Appendix section**.

[12] Digital Futures Commission, 'Child Rights by Design'; ICO, Age Appropriate Design: A Code of Practice for Online Services; ICO, 'The Children's Code and Education Technologies (Edtech)'.
[13] More detail on each of the codes can be found in the Appendix.

Frameworks Reviewed

Organisation	Title	Link	Reference
African Union (AU) & ACERWC	Day of the African Child 2023: The Rights of the Child in the Digital Environment: Concept Note		AU & ACERWC (2023)
Council of Europe (CoE)	Guidelines to respect, protect and fulfil the rights of the child in the digital environment: Recommendation CM/Rec(2018)7 of the Committee of Ministers.		CoE (2018)
OECD	Companion Document to the OECD Recommendation on Children in the Digital Environment		OECD (2022)
UNESCO	Recommendation on the Ethics of Artificial Intelligence		UNESCO (2022)
UNICEF	Towards a Child-Centred Digital Equality Framework		UNICEF (2022)
UNICEF	Policy Guidance on AI for Children 2.0		UNICEF (2021a)
UNICEF	The Case for Better Governance of Children's Data: A Manifesto		UNICEF (2021b)
UNICEF Innocenti	The Metaverse, Extended Reality and Children		UNICEF Innocenti (2023)
UNICEF Innocenti	Responsible Innovation in Technology for Children: Digital technology, play, and child well-being		UNICEF Innocenti (2022)
United Nations (UN)	A Global Digital Compact — an Open, Free and Secure Digital Future for All		UN (2023)
United Nations (UN)	General comment No. 25 on children's rights in relation to the digital environment		UN (2021)
5Rights Foundation & Western Sydney University (WSU)	Our rights in the digital world: A report on the children's consultations to inform UNCRC General Comment 25		5Rights Foundation & WSU (2021)
World Economic Forum (WEF)	Artificial Intelligence for Children		WEF (2022)

3. Mapping Key Themes in Data-Intensive Technology Frameworks

The heatmap below shows the final mapping of each of the themes detailed in the Methodology section that were converted into codes for analysis across 13 transnational frameworks focusing on AI or data-intensive technologies.

Heatmap 1: Percentage coverage of children's rights, wellbeing considerations, and child-centred recommendations

	Children's Rights	Children's Wellbeing						Child-centred Recommendations & Policies
	Integration of children's rights according to the UNCRC	Sociotechnical and wellbeing considerations	Importance of children's voices & agency	Opportunities and benefits to children	Risks and harms to children	Digital inclusion and access to technologies	Disadvantaged and vulnerable children	
AFRICAN UNION & ACERWC (2023): Day of the African Child 2023: The Rights of the Child in the Digital Environment: Concept Note								
COE (2018): Guidelines to respect, protect and fulfil the rights of the child in the digital environment								
OECD (2022): Companion Document to the OECD Recommendation on Children in the Digital Environment								
UNESCO (2022): Recommendation on the Ethics of Artificial Intelligence								
UNICEF (2022): Towards a Child-Centred Digital Equality Framework								
UNICEF (2021A): Policy Guidance on AI for Children 2.0								
UNICEF (2021B): The Case for Better Governance of Children's Data: A Manifesto								
UNICEF INNOCENTI (2023): The Metaverse, Extended Reality and Children								
UNICEF INNOCENTI (2022): Responsible Innovation in Technology for Children: Digital technology, play, and child well-being								
UN (2023): A Global Digital Compact — an Open, Free and Secure Digital Future for All								
UN (2021): General comment No. 25 on children's rights in relation to the digital environment								
5RIGHTS FOUNDATION & WSU (2021): Our rights in the digital world: A report on the children's consultations to inform UNCRC General Comment 25								
WEF (2022): Artificial Intelligence for Children								

Key

0% 1-20% 21-40% 41-60% 61-80% 81-100%

PERCENTAGE COVERAGE

Direct engagement with children in the development of this framework

Next, we will discuss the results for each respective category in detail and highlight key similarities and differences across the frameworks analysed.

3.1 Children's Rights

	Children's Rights
	Integration of children's rights according to the UNCRC
AFRICAN UNION & ACERWC (2023): Day of the African Child 2023: The Rights of the Child in the Digital Environment: Concept Note	
COE (2018): Guidelines to respect, protect and fulfil the rights of the child in the digital environment	
OECD (2022): Companion Document to the OECD Recommendation on Children in the Digital Environment	
UNESCO (2022): Recommendation on the Ethics of Artificial Intelligence	
UNICEF (2022): Towards a Child-Centred Digital Equality Framework	
UNICEF (2021A): Policy Guidance on AI for Children 2.0	
UNICEF (2021B): The Case for Better Governance of Children's Data: A Manifesto	
UNICEF INNOCENTI (2023): The Metaverse, Extended Reality and Children	
UNICEF INNOCENTI (2022): Responsible Innovation in Technology for Children: Digital technology, play, and child well-being	
UN (2023): A Global Digital Compact — an Open, Free and Secure Digital Future for All	
UN (2021): General comment No. 25 on children's rights in relation to the digital environment	
5RIGHTS FOUNDATION & WSU (2021): Our rights in the digital world: A report on the children's consultations to inform UNCRC General Comment 25	
WEF (2022): Artificial Intelligence for Children	

One of the primary focal points of our research was to analyse the extent to which children's rights, according to the UNCRC, are meaningfully integrated in various technology frameworks. The UNCRC is the most widely cited and ratified convention in the world and one of the only documents that serves to uphold children's rights across the world.[14] Out of 197 Member States, all countries have ratified the UNCRC except one, the United States.[15] Analysing the extent to which technology-related frameworks align with the UNCRC can be employed as an effective benchmark.

All frameworks included in this review were found to have at least some mention of children's rights; however, less than half had a strong focus on children's rights as set out in the UNCRC .[16] Certain frameworks, such as UNICEF Innocenti (2022) and 5Rights Foundation & WSU (2021), predominantly focused on children's rights and sociotechnical and wellbeing considerations, and in some cases, this was almost the sole focus. In contrast, those frameworks with little to no focus on children's rights tended to blur the lines between what is a right for children and what are sociotechnical and wellbeing considerations. Many discussed children's rights as abstract considerations or merged the discussions of children's rights with broader human rights.

Overall, frameworks focused on how governments and policymakers must uphold children's rights through regulation and guidelines – both binding and non-binding. Interestingly, however, limited mention was

[14] United Nations, 'United Nations Convention on the Rights of the Child (UNCRC)'.
[15] United Nations, 'UN Treaty Body Database: Ratification Status for CRC - Convention on the Rights of the Child'.
[16] Here, we refer to those frameworks which included more than 50% coverage on children's rights.

made about the responsibility governments have to ensure they do not infringe on children's rights themselves. One of the few examples that mentioned the role of governments was the AU & ACERWC (2023) Concept Note which cautions Member States not to infringe on children's rights through 'unethical surveillance' or 'internet shutdowns'.[17]

Taking a closer look at children's rights

As shown in Table 1, at a granular level we analysed four specific groups of children's rights directly aligned to certain Articles of the UNCRC (Articles 2, 3, 12, 13, 19, 32, 34-36). We recognise that all 54 Articles of the UNCRC are equally important, and these four categories do not take precedence over those not listed here. However, for the purpose of this report, coupled with our background research and consideration of themes related to children and data-intensive technologies, we selected these specific Articles as a starting point for analysis. Three of the Articles (2, 3 & 12) included in our review are 'General Principles' of the UNCRC; [18] thus, their importance is acknowledged at a foundational level for all other rights to be achieved.[19]

Table 1: Selection of codes analysed from the UNCRC (United Nations, 1989)

Non-discrimination (Article 2)	The UNCRC applies equally 'to every child without discrimination, whatever their ethnicity, sex, religion, language, abilities or any other status, whatever they think or say, whatever their family background'.
Best interests of the child (Article 3)	'The best interests of the child must be a top priority in all decisions and actions that affect children.'
Views of the child (Article 12 & 13)	Children have the right to 'express their views, feelings, and wishes in all matters affecting them', and for this to be seriously considered. Children also have the right to 'freedom of expression' and to have access to information.
Child exploitation (Articles 19, 32, 34, 35, 36)	Children have the right to be protected from 'all forms of violence', 'economic exploitation', 'all forms of sexual abuse and exploitation', and all 'other forms of exploitation'.

[17] According to a report published by Access Now, 187 internet shutdowns were recorded in 2022 across 35 countries, with 84 occurrences in India alone. The majority of shutdowns took place across Asian, African, and Middle Eastern countries. Rosson, Anthonio, and Tackett, 'Weapons of Control, Shields of Impunity'.
[18] See 'General Principles'. UNICEF, 'How We Protect Children's Rights: With the UN Convention on the Rights of the Child'.
[19] UNICEF, 'Four Principles of the Convention on the Rights of the Child | UNICEF'.

The heatmap alongside shows the final mapping of each of the themes detailed in the Methodology section that were converted into codes for analysis across 13 transnational frameworks focusing on AI or data-intensive technologies.

Key

0% 1% 2-5% 6-10% 11-15% 15-20+%

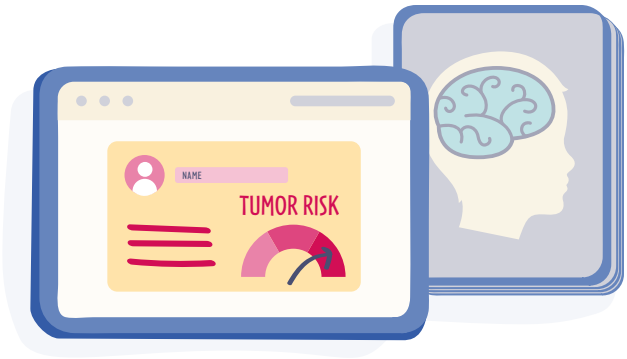
PERCENTAGE COVERAGE

Direct engagement with children in the development of this framework

Heatmap 2: Percentage coverage of key children's rights in relation to data-intensive technologies

	Children's Rights			
	Non-discrimination (Article 2)	Best interests of the child (Article 3)	Views of the child (Article 12-13)	Child exploitation (Articles 19, 32, 34-36)
AFRICAN UNION & ACERWC (2023): Day of the African Child 2023: The Rights of the Child in the Digital Environment: Concept Note				
COE (2018): Guidelines to respect, protect and fulfil the rights of the child in the digital environment				
OECD (2022): Companion Document to the OECD Recommendation on Children in the Digital Environment				
UNESCO (2022): Recommendation on the Ethics of Artificial Intelligence				
UNICEF (2022): Towards a Child-Centred Digital Equality Framework				
UNICEF (2021A): Policy Guidance on AI for Children 2.0				
UNICEF (2021B): The Case for Better Governance of Children's Data: A Manifesto				
UNICEF INNOCENTI (2023): The Metaverse, Extended Reality and Children				
UNICEF INNOCENTI (2022): Responsible Innovation in Technology for Children: Digital technology, play, and child well-being				
UN (2023): A Global Digital Compact — an Open, Free and Secure Digital Future for All				
UN (2021): General comment No. 25 on children's rights in relation to the digital environment				
5RIGHTS FOUNDATION & WSU (2021): Our rights in the digital world: A report on the children's consultations to inform UNCRC General Comment 25				
WEF (2022): Artificial Intelligence for Children				

3.1.1 Non-discrimination



Over the past few years, there has been heightened interest in the discriminatory outputs and bias of AI systems. Simultaneously, there is a growing evidence base of adults and children experiencing direct and indirect forms of discrimination.[20] The importance of upholding children's right to 'non-discrimination' is supported by Article 2 of the UNCRC which also intersects with other rights of the UNCRC as highlighted within frameworks such as UN (2021), 5Rights Foundation & WSU (2021), and UNICEF (2021b). In our review, we focused on specific references to how this right may be upheld for all children.

Interestingly, 5Rights Foundation & WSU (2021) – which included the highest number of direct quotations from children – indicated that children had specific concerns related to their right to non-discrimination in the digital environment and stated factors such as socio-economic status, religious and cultural identities, geographical location, infrastructure, and harassment (including bullying and death threats). Children clearly stated they want 'action to prevent and remedy discriminatory or aggressive behaviour'.[21]

Another point of concern for children was discrimination by exclusion, specifically the lack of access to data-intensive technologies and services in their first language (other than English). However, across the majority of frameworks we found the focus to be primarily on non-discrimination with regard to racial and gender bias and disabilities. Most frameworks cautioned against the risk of discrimination more generally, such as merely stating the risk of amplification of existing biases and inequalities.

3.1.2 Best interests of the child

The 'best interests of the child' is a core principle set out in Article 3 UNCRC and applies to all actions and decisions concerning children. It requires active measures to protect children's rights and promote their survival, growth, and wellbeing. Certain frameworks such as UNICEF (2021b), CoE (2018), and 5Rights Foundation & WSU (2021) explicitly address this holistic approach, which includes the importance of balancing different child rights.

[20] GPAI, 'Data Justice: Data Justice Stories: A Repository of Case Studies'; O'Neil, Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy.
[21] Third and Moody, 'Our Rights in the Digital World: A Report on the Children's Consultations to Inform UNCRC General Comment 25'.

There is an increasing interest in exploring the legal, ethical, and practical implications of UNCRC Article 3 in the digital world. Upholding the best interests of the child requires a consideration of the impact a decision or act may have on children's rights, more broadly. Conducting a child rights impact assessment (CRIA) may be a practical tool to upholding the best interests of the child. For example, in the design context, we see emerging frameworks such as the Digital Futures Commission reports on the Child Rights Impact Assessment[22] and Child Rights by Design[23] focusing mainly on these implications within a UK context. We also see non-country-specific frameworks such as the Designing for Children's Rights (D4CR) focusing on the design implications of child rights for the development of products and services which uphold ethics and children's best interests.[24]

Certain frameworks such as UNICEF (2021b) point to the UK ICO's 'Age-Appropriate Design Code',[25] 'Best Interests framework',[26] and the 'IEEE 2089™-2021 – Standard for Age Appropriate Digital Services Framework – Based on the 5Rights Principles',[27] as good practices, emphasising their focus on children's best interests. Furthermore, we see that these frameworks underscore the strong link between designing for children's best interests and conducting impact assessments, more specifically, CRIAs. Another common consideration across the frameworks is the ethical and lawful uses of children's data to ensure that their best interests are prioritised, while protecting children's rights to privacy and other rights such as non-discrimination.

3.1.3 Views of the child

Children are important stakeholders and have the right to 'express their views, feelings and wishes in all matters affecting them' and importantly, to have their views 'considered and taken seriously'.[28] This category complements the section on 'Consideration for the importance of children's voices & agency' in Heatmap 1 with a more nuanced focus on recommendations and suggestions which directly reference Articles 12 and 13.

In addition to 5Rights Foundation & WSU (2021) and UNICEF Innocenti (2022), the OECD (2022) recognises the need for engaging children as key stakeholders and emphasises

[22] Mukherjee, Pothong, and Livingstone, 'Child Rights Impact Assessment: A Tool to Realise Child Rights in the Digital Environment'.
[23] Digital Futures Commission, 'Child Rights by Design'.
[24] Designing for Children's Rights, 'D4CR Design Principles 2.0'.
[25] ICO, Age Appropriate Design: A Code of Practice for Online Services.
[26] ICO, 'Children's Code: Best Interests Framework'.
[27] Ruth, 'IEEE Publishes New Standard to Address Age Appropriate Design for Children's Digital Services'.
[28] United Nations, 'United Nations Convention on the Rights of the Child (UNCRC)'.

the importance of the views and needs of the individual child and groups of children.

Frameworks which directly engaged children tended to have a higher percentage of coverage for UNCRC Articles 12 and 13. The AU & ACERWC (2023) Concept Note specifically includes 'child participation' as one of its guiding principles aligned with Article 7 'Freedom of Expression' of the African Charter on the Rights and Welfare of the Child (ACRWC).[29] Other frameworks such as UNESCO (2022) made minimal reference to children's participation, keeping it non-specific and open-ended. For instance, 'Member States, as well as all stakeholders, should put in place mechanisms to meaningfully engage children…with regard to the impact of AI systems on their lives'.[30] Other frameworks such as 5Rights Foundation & WSU (2021) and UNICEF (2021b) specifically call for children's consultation and inclusion across the AI lifecycle, including before an AI system is designed and developed, starting with how children's data are managed.

3.1.4 Child Exploitation

The UNCRC calls for children to be protected from economic exploitation (Article 32) among other forms of exploitation (Article 36). Over the last decade, additional considerations relating to child exploitation have arisen though new forms of child exploitation in the digital world.[31] Exploitative practices include but are not limited to stealth advertising placing children at risk of exclusion, discrimination, or future biases, because of the way in which services are designed; or unfair commercial practices.[32]

The emerging forms of child exploitation in today's digital world and their intersection with unfair data and design practices were a common concern addressed across the frameworks. The intersection and potential overlaps between different forms of exploitation under the UNCRC is also important to address here. For example, exploitative data and design practices which undermine children's right to be protected against economic exploitation and other forms of exploitation (Articles 32 & 36) can cause children to experience significant harms that can intersect with other children's rights (Articles 34 & 35). For example, age-inappropriate design or content could result in a child taking part and/or being exploited without them knowing or exposing children to potential contact with adults with malicious intentions.

Several frameworks address this intersection between different forms of exploitation and data uses. For example, UNICEF (2021b) addresses children's right to be protected from exploitation (Articles 19 & 32), stating that the use of children's data may result in physical or mental violence, injury or abuse, negligent treatment, maltreatment, or exploitation. The report also addresses children's right to be protected from economic exploitation, which can occur through various means such as the monetisation of personal data, profiling, microtargeting through

[29] African Union, African Charter on the Rights and Welfare of the Child.
[30] UNESCO, 'Recommendation on the Ethics of Artificial Intelligence'.
[31] van der Hof et al., 'The Child's Right to Protection against Economic Exploitation in the Digital World'.
[32] Council of Europe, 'Guidelines to Respect, Protect and Fulfil the Rights of the Child in the Digital Environment: Recommendation CM/Rec(2018)7 of the Committee of Ministers'.

advertising, distribution of child sex abuse images, and unauthorised artistic child labour.[33]

The AU & ACERWC (2023) Concept Note has a strong focus on ensuring children's rights are upheld in relation to online child sexual exploitation and abuse, online grooming, harassment, and cyberbullying. Given that children in certain areas in Africa are increasingly vulnerable to such exploitation due to ongoing war and conflict, abduction, human trafficking, forced recruitment as child soldiers, displacement, lack of education, and a lack of law enforcement amongst other factors, they are at an exceptionally high risk of being exploited. However, the AU & ACERWC (2023) Concept Note does not refer to other forms of exploitation outside of this such as economic exploitation, which may include commercial exploitation or digital child labour.[34] These are important factors that children are increasingly aware of and concerned about as shown by the number of direct quotations included in the chapter titled 'Economic Exploitation' in 5Rights Foundation & WSU (2021), amongst other frameworks. These are not factors that may impact children in the future, they are already impacting children, and regulation for the most vulnerable and disadvantaged groups of children are falling far behind.

3.2 Children's Wellbeing

We analysed the extent to which children's wellbeing and related considerations in relation to data-intensive technologies were included across frameworks, including specific considerations from a sociotechnical, socio-economic, and socio-cultural perspective. Additional considerations include the extent to which frameworks focused on the benefits or risks of technology to children's wellbeing and children's empowerment and agency amongst others.

[33] UNICEF, 'The Case for Better Governance of Children's Data'.
[34] van der Hof, Verdoodt, and Leiser, 'Child Labour and Online Protection in a World of Influencers'; van der Hof et al., 'The Child's Right to Protection against Economic Exploitation in the Digital World'.

3.2.1 Sociotechnical and wellbeing considerations

	Children's Wellbeing
	Sociotechnical and wellbeing considerations
AFRICAN UNION & ACERWC (2023): Day of the African Child 2023: The Rights of the Child in the Digital Environment: Concept Note	
COE (2018): Guidelines to respect, protect and fulfil the rights of the child in the digital environment 	
OECD (2022): Companion Document to the OECD Recommendation on Children in the Digital Environment	
UNESCO (2022): Recommendation on the Ethics of Artificial Intelligence	
UNICEF (2022): Towards a Child-Centred Digital Equality Framework	
UNICEF (2021A): Policy Guidance on AI for Children 2.0 	
UNICEF (2021B): The Case for Better Governance of Children's Data: A Manifesto	
UNICEF INNOCENTI (2023): The Metaverse, Extended Reality and Children	
UNICEF INNOCENTI (2022): Responsible Innovation in Technology for Children: Digital technology, play, and child well-being 	
UN (2023): A Global Digital Compact — an Open, Free and Secure Digital Future for All	
UN (2021): General comment No. 25 on children's rights in relation to the digital environment 	
5RIGHTS FOUNDATION & WSU (2021): Our rights in the digital world: A report on the children's consultations to inform UNCRC General Comment 25 	
WEF (2022): Artificial Intelligence for Children 	

From a sociotechnical and wellbeing perspective, it is crucial to consider the nuances of children's wellbeing in relation to AI and data-intensive technologies. Using a broad approach based on a wide and inclusive understanding of 'sociotechnical' and 'wellbeing' considerations, we reviewed each framework from a sociotechnical and wellbeing lens. Our analysis expanded beyond the benefits and harms of data-intensive technologies and encompassed a wider set of considerations including socio-economic backgrounds of the children, as well as the emotional, psychological, physical, social, cultural, spiritual, and any other related aspects of children's wellbeing. This also included a child's sense of self, self-esteem, identity, sense of belonging and relationships, mental health, and social, emotional, and cognitive developmental stages, as AI systems can impact each of these areas.

How is children's wellbeing considered in the context of children's rights?

While some frameworks had a strong focus on the sociotechnical and wellbeing considerations of AI technologies that may impact children, other frameworks tended to blur the line between children's rights and children's wellbeing. UNICEF Innocenti (2022) highlights the need to clarify this distinction as children's rights 'are fundamental principles that explain how all children should or should not be treated, while wellbeing (objective or subjective) is an individual state that describes how a child is experiencing life'. It goes on to draw out the relationship between upholding children's rights and wellbeing, explaining how they are linked but not linear, as a child who may have all their rights respected may still have low wellbeing.[35]

[35] Kardefelt Winther, 'Responsible Innovation in Technology for Children: Digital Technology, Play, and Child Well-Being', 24.

How is wellbeing conceptualised and considered?

The majority of frameworks did not clearly define or conceptualise 'wellbeing' and did not make an explicit distinction between wellbeing and children's rights. However, in discussing wellbeing considerations, a wide range of topics were covered. This included the positive impacts of digital technologies such as facilitating access to education and entertainment and playing an important role in children's friendships and relationships. Risks to children's wellbeing through online harms (e.g. cyber-bullying, harassment, sexualisation) and impacts on both physical and mental health (e.g. through addictive technologies) were also covered. For instance, the AU & ACERWC (2023) Concept Note does not explicitly reference children's 'wellbeing' (despite the high volume of references to children's rights) but highlights the consideration of how certain factors may adversely impact children's lives. For example, the lack of access to technology or the exposure to risks and harms of digital technologies may make children feel unsafe in the digital environment.

Which age groups are addressed?

For many of the frameworks, children are broadly referenced as anyone under the age of 18 and different age groups are often not separated, but in practice, the experience may be very different for younger children compared to teenagers. Only three frameworks explicitly mentioned infants and children below the age of two; namely, OECD (2022), CoE (2018), and 5Rights Foundation & WSU (2021).

Are there mentions of the environment and ecosystem?

Image 1: Biospheric Harm by Turing Commons.[36]

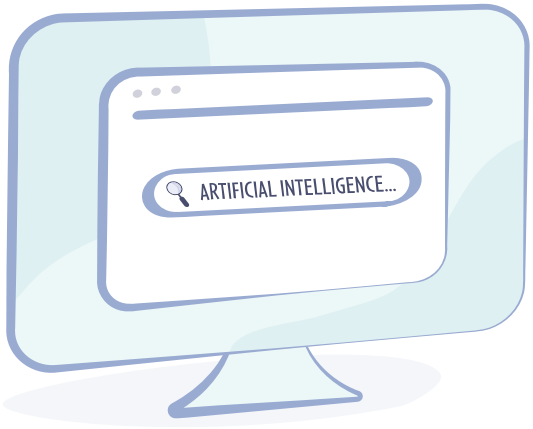
We found only one framework which linked the impact of technologies to the physical environment and children's present and future wellbeing. UNICEF (2021a) directly links AI systems with environmental sustainability and children's wellbeing and states, 'AI systems should not negatively impact the physical environment, in particular through their carbon footprint, so that children can live on a

[36] Illustration designed by Jonny Lighthands and Eléonore Guerra. Available at Turing Commons, **https://raw.githubusercontent.com/alan-turing-institute/turing-commons/main/docs/assets/images/illustrations/biospheric-harm.jpg**

sustainable and healthy planet.'[37] It also draws out the potential for data-intensive technologies to be used positively to help address climate change.

Other frameworks such as UNESCO (2022) discuss the ecosystem and environmental impact of AI systems more broadly. Concerns surrounding the adverse environmental impacts of AI and data-intensive technologies have been well documented in both policy and research; however, children and their present and future wellbeing are at risk given that they are the group that will be most impacted if this is not effectively addressed.

What are the overall perceptions regarding dependence on AI and digital technologies?



Across all frameworks, we found a strong perception of the inevitability of AI and digital technologies and a growing technological dependence on these systems for our survival and wellbeing – children and adults alike. The UN (2023) Policy Brief made no direct mention of children's wellbeing, but instead alluded to general wellbeing for all humans as dependent on technology in the same way as we are dependent on the earth's natural resources for survival.[38] Overall, there was little to no discussion challenging or considering whether data-intensive technologies are needed to begin with.

3.2.2 Importance of children's voices & agency

	Children's Wellbeing
	Importance of children's voices & agency
AFRICAN UNION & ACERWC (2023): Day of the African Child 2023: The Rights of the Child in the Digital Environment: Concept Note	
COE (2018): Guidelines to respect, protect and fulfil the rights of the child in the digital environment	
OECD (2022): Companion Document to the OECD Recommendation on Children in the Digital Environment	
UNESCO (2022): Recommendation on the Ethics of Artificial Intelligence	
UNICEF (2022): Towards a Child-Centred Digital Equality Framework	
UNICEF (2021A): Policy Guidance on AI for Children 2.0	
UNICEF (2021B): The Case for Better Governance of Children's Data: A Manifesto	
UNICEF INNOCENTI (2023): The Metaverse, Extended Reality and Children	
UNICEF INNOCENTI (2022): Responsible Innovation in Technology for Children: Digital technology, play, and child well-being	
UN (2023): A Global Digital Compact — an Open, Free and Secure Digital Future for All	
UN (2021): General comment No. 25 on children's rights in relation to the digital environment	
5RIGHTS FOUNDATION & WSU (2021): Our rights in the digital world: A report on the children's consultations to inform UNCRC General Comment 25	
WEF (2022): Artificial Intelligence for Children	

[37] UNICEF, 'Policy Guidance on AI for Children 2.0'.
[38] United Nations, 'A Global Digital Compact — an Open, Free and Secure Digital Future for All'.

How did engagements with children inform various frameworks?

Across frameworks, it was generally noted that children have the right to express themselves freely in relation to any matters that affect them, half of the frameworks reviewed were developed with direct engagement with children and included their voices and opinions. Other frameworks, such as UNESCO (2022), included discussion of the importance of children's participation in relation to policy or practice that impacts their lives but did not report involving children in the development of the framework.

In frameworks which did report that children had been engaged, only minimal information was given about how this engagement was undertaken. Furthermore, frameworks did not include guidance on approaches to meaningfully engage children. Our previous research with public sector stakeholders in the UK found that further resources and guidance in this area are much needed.[39]

It is interesting to note a tension between the reported responses of children who were engaged in developing frameworks and the overall approach taken across frameworks. Frameworks which significantly incorporated children's voices indicated that children were largely enthusiastic about using technology and its potential benefits and opportunities. However, almost all the frameworks had a central focus on the risks and harms of data-intensive technologies rather than benefits and opportunities. This points to the importance of engagement with children to ensure that future approaches are informed by the real experiences, concerns, and interests of children and to maximise their relevance and value for children.

How are children's autonomy and agency referred to in the context of meaningful engagement?

Those frameworks which discussed children's agency tended to emphasise the importance of ensuring that children have access to age-appropriate information about their rights in the digital world, as well as about the ways that their data are collected, used, stored, or processed in any other way. Children's engagement can go far beyond providing accessible information. As set out in the CoE (2018),[40] engagements should also extend to consultations with children to understand their views, needs, and concerns and to participatory processes which involve children in the design and development of policies or services which impact their lives. The European Commission's Better Internet for Kids Report , for example, addresses involving children as key advisors as well as the need to avoid adult-centred definitions and vocabularies to ensure a child-centred approach.[41]

The AU & ACERWC (2023) Concept Note is one of the only frameworks in our review which mandates the 'participation of children in decision-making processes' in the use of digital technologies and emphasises the importance of ensuring participation includes

[39] Mahomed et al., 'Navigating Children's Rights and AI in the UK'; Pauwels et al., 'Case Study: Understanding AI Ethics and Safety for Children: The Alan Turing Institute'.
[40] Council of Europe, 'Guidelines to Respect, Protect and Fulfil the Rights of the Child in the Digital Environment: Recommendation CM/Rec(2018)7 of the Committee of Ministers'.
[41] Verdoodt, 'Better Internet for Kids: Children's Rights in the Digital Environment: Moving from Theory to Practice: Best-Practice Guideline'.

diverse children representing 'varying identities'.[42] While the Concept Note strongly focuses on the inclusion of children's voices, it conversely contains little to no mention of promoting children's autonomy and agency in relation to data-intensive technologies and was predominately paternalistic and protective in nature.[43] In contrast, the 5Rights Foundation & WSU (2021) report demonstrates that children have repeatedly voiced how those in authority tended to be more protective and restrictive and called for more autonomy and empowerment to use digital technologies responsibly. Given that the AU & ACERWC (2023) is a Concept Note, a risk-based approach may have been considered a necessary first step to develop frameworks in regions where guidance is severely lacking. However, it is equally important that from the outset, frameworks relating to children and data-intensive technologies strive to achieve a healthy balance between protection and risk mitigation and children's empowerment and agency. This balance will ensure that children can responsibly enjoy their rights and simultaneously maximise the potential benefits and opportunities of data-intensive technologies.

Various frameworks included considerations related to children but did not directly engage with them. Therefore, there is a concern that some frameworks may have been developed without a direct understanding of children's interests, concerns or needs, leading them to take a paternalistic approach.

3.2.3 Opportunities and benefits vs Risks and harms to children

	Children's Wellbeing	
	Opportunities and benefits to children	Risks and harms to children
AFRICAN UNION & ACERWC (2023): Day of the African Child 2023: The Rights of the Child in the Digital Environment: Concept Note		
COE (2018): Guidelines to respect, protect and fulfil the rights of the child in the digital environment		
OECD (2022): Companion Document to the OECD Recommendation on Children in the Digital Environment		
UNESCO (2022): Recommendation on the Ethics of Artificial Intelligence		
UNICEF (2022): Towards a Child-Centred Digital Equality Framework		
UNICEF (2021A): Policy Guidance on AI for Children 2.0		
UNICEF (2021B): The Case for Better Governance of Children's Data: A Manifesto		
UNICEF INNOCENTI (2023): The Metaverse, Extended Reality and Children		
UNICEF INNOCENTI (2022): Responsible Innovation in Technology for Children: Digital technology, play, and child well-being		
UN (2023): A Global Digital Compact — an Open, Free and Secure Digital Future for All		
UN (2021): General comment No. 25 on children's rights in relation to the digital environment		
5RIGHTS FOUNDATION & WSU (2021): Our rights in the digital world: A report on the children's consultations to inform UNCRC General Comment 25		
WEF (2022): Artificial Intelligence for Children		

[42] African Union and ACERWC, 'Day of the African Child 2023: Theme: The Rights of the Child in the Digital Environment: Concept Note'.
[43] For more information on this, see Section 3.2.3

As shown above, these two categories were coded separately but jointly discussed for comparative analysis. There was a common focus across several frameworks on the need to balance risks and harms of data-intensive technologies with opportunities and benefits, while understanding possible impacts on children's rights. However, as shown in Heatmap 1, frameworks typically had a greater focus on the risks and harms.

Where benefits and opportunities of data-intensive technologies were highlighted, this typically related to educational and health use-contexts that were specifically addressed in certain frameworks such as 5Rights Foundation & WSU (2021), UN (2021), UNICEF (2021a), and UNICEF (2021b). In the 5Rights Foundation & WSU (2021) report, children voiced how passionate they are about climate change and found online platforms as an avenue to advocate and learn more about topics they were interested in.

In instances where benefits were discussed, several frameworks highlighted the value of responsible data practices and the opportunities that exist to empower children and promote their wellbeing and best interests. For example, UNICEF (2021a) addressed potential benefits specifically on medical or behaviour science education and CoE (2018) highlighted the opportunities for children's education, play, and leisure as well as access to information.

3.2.4 Digital inclusion and access to technologies

	Children's Wellbeing
	Digital inclusion and access to technologies
AFRICAN UNION & ACERWC (2023): Day of the African Child 2023: The Rights of the Child in the Digital Environment: Concept Note	
COE (2018): Guidelines to respect, protect and fulfil the rights of the child in the digital environment	
OECD (2022): Companion Document to the OECD Recommendation on Children in the Digital Environment	
UNESCO (2022): Recommendation on the Ethics of Artificial Intelligence	
UNICEF (2022): Towards a Child-Centred Digital Equality Framework	
UNICEF (2021A): Policy Guidance on AI for Children 2.0	
UNICEF (2021B): The Case for Better Governance of Children's Data: A Manifesto	
UNICEF INNOCENTI (2023): The Metaverse, Extended Reality and Children	
UNICEF INNOCENTI (2022): Responsible Innovation in Technology for Children: Digital technology, play, and child well-being	
UN (2023): A Global Digital Compact — an Open, Free and Secure Digital Future for All	
UN (2021): General comment No. 25 on children's rights in relation to the digital environment	
5RIGHTS FOUNDATION & WSU (2021): Our rights in the digital world: A report on the children's consultations to inform UNCRC General Comment 25	
WEF (2022): Artificial Intelligence for Children	

Digital inclusion is addressed in most of the frameworks, and we see an emphasis on the changing scope of it over time (e.g. from a

narrower approach of addressing the digital divide – who can or cannot access the internet to a broader view that covers digital skills or the design of products). An emerging area of concern in several frameworks is children's exclusion, specifically in relation to internet access and educational content as well as the design of online products and services that do not always cater for the needs of different groups of children. The need to consider gender-related issues in relation to potential gender biases and particular needs of disadvantaged and vulnerable children were addressed in several frameworks, for example, in CoE (2018), UNICEF (2021a), 5Rights Foundation & WSU, and UNICEF (2022).

How do the frameworks address barriers to accessibility?

Several frameworks address the design aspect of accessibility with links to transparency and data protection regulations and equality laws and signal the need to cater for the needs of different groups of children. For example, CoE (2018) addresses the need to ensure equality for all children, including vulnerable groups such as those with learning disabilities or ethnic minorities.

Many frameworks addressed the link between access and equality in relation to unfair treatment of children and their data and the potential risks that could arise. Such risks include gender bias and exacerbating already existing vulnerable situations for certain groups of children. UNICEF (2022) explicitly addresses this risk by stating that 'the digitization of society does not have a universal effect on all children. Digital exclusion reflects and amplifies existing social, cultural, and economic inequalities.' The CoE Report on children with disabilities in the digital environment builds on the work of the CoE regarding children's rights in the digital environment and highlights the importance of adopting an inclusive approach.[44]

Importantly, 5Rights & WSU (2021) included children's views, reporting that children linked 'access' to digital technologies with achieving a sense of agency and empowerment and to enjoying the benefits and opportunities of these technologies. Children also linked access with understanding their rights. Most of the frameworks considered inclusion and accessibility issues in the context of non-discrimination and their impact on other rights such as the right to education, the right to

[44] Also referred in Verdoodt, 'Better Internet for Kids: Children's Rights in the Digital Environment: Moving from Theory to Practice: Best-Practice Guideline'.

participate, the right to play, and freedom of expression, among others.

3.2.5 Disadvantaged and vulnerable children

	Children's Wellbeing
	Disadvantaged and vulnerable children
AFRICAN UNION & ACERWC (2023): Day of the African Child 2023: The Rights of the Child in the Digital Environment: Concept Note	
COE (2018): Guidelines to respect, protect and fulfil the rights of the child in the digital environment 	
OECD (2022): Companion Document to the OECD Recommendation on Children in the Digital Environment	
UNESCO (2022): Recommendation on the Ethics of Artificial Intelligence	
UNICEF (2022): Towards a Child-Centred Digital Equality Framework	
UNICEF (2021A): Policy Guidance on AI for Children 2.0 	
UNICEF (2021B): The Case for Better Governance of Children's Data: A Manifesto	
UNICEF INNOCENTI (2023): The Metaverse, Extended Reality and Children	
UNICEF INNOCENTI (2022): Responsible Innovation in Technology for Children: Digital technology, play, and child well-being 	
UN (2023): A Global Digital Compact — an Open, Free and Secure Digital Future for All	
UN (2021): General comment No. 25 on children's rights in relation to the digital environment 	
5RIGHTS FOUNDATION & WSU (2021): Our rights in the digital world: A report on the children's consultations to inform UNCRC General Comment 25 	
WEF (2022): Artificial Intelligence for Children 	

All frameworks made some mention of disadvantaged and vulnerable groups of children – including minority and marginalised groups – as an important stakeholder group. Some frameworks included a more detailed consideration and explicitly stated what may classify as an added vulnerability or disadvantage. UNICEF (2021a) and 5Rights Foundation & WSU (2021) are two such examples, with the latter highlighting girls as a key stakeholder group to address gender equity.[45]

In the context of education and access to the internet, we see a common focus on the need to particularly support vulnerable and disadvantaged groups of children, such as children with additional needs. Consideration of gender aspects and social norms that might impact children's enjoyment of their rights, especially in certain geographies was also a frequent focus.

How are harms such as profiling linked to special considerations?

On the topic of profiling, the OECD (2022) draws on the UK ICO's Age-Appropriate Design Code, and as a broad principle, recommends automated profiling of children should not be allowed unless there is 'a compelling reason' to do so. For example, profiling may be used to ensure 'a service is accessible to a disabled child' who may need subtitles or other features activated.[46] However, in practice this may lead to children with disabilities being vulnerable to economic exploitation through microtargeting or being charged higher prices for certain products and services.

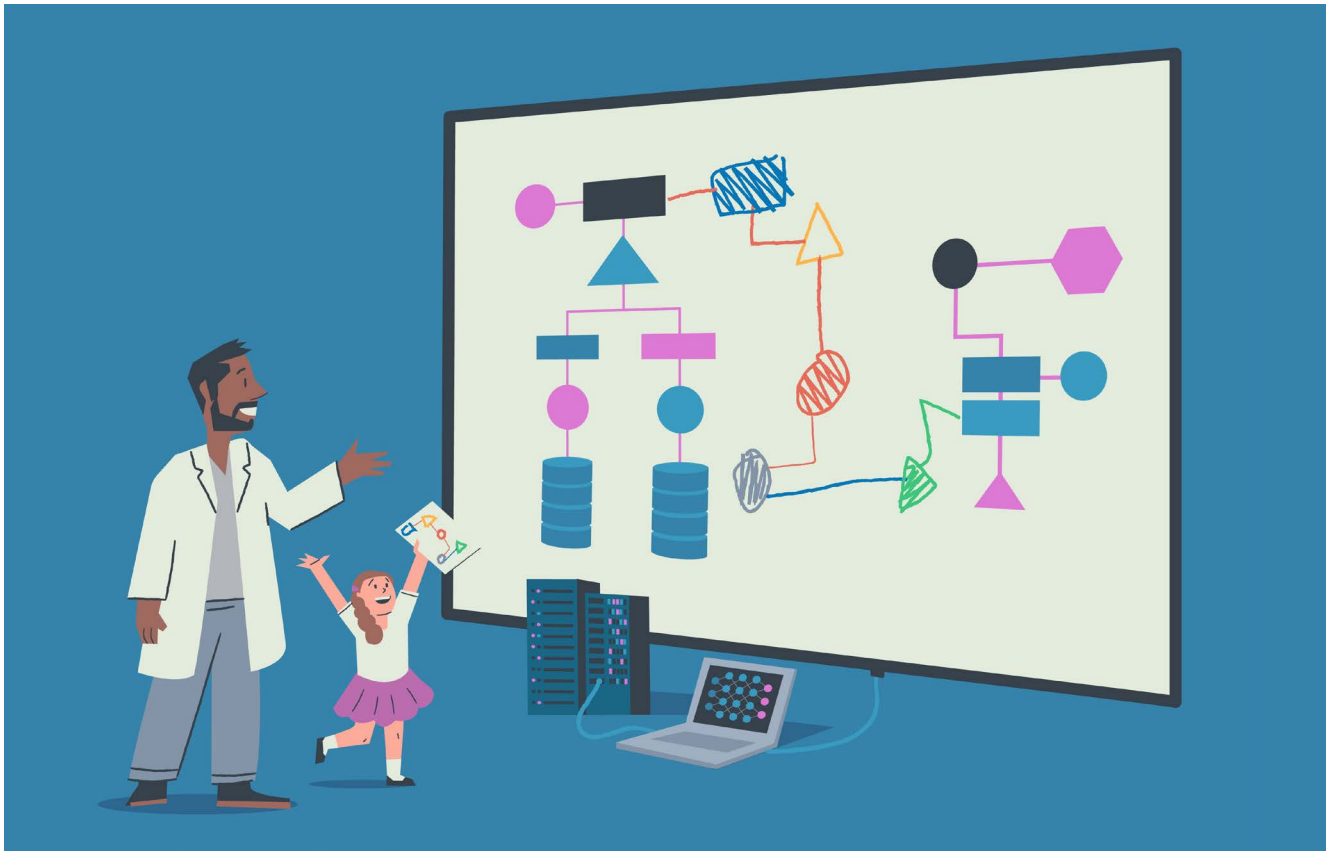
[45] See 'Fostering girls' participation in AI' UNICEF, 'Policy Guidance on AI for Children 2.0', 27. and 'Gender as a barrier to access' and 'Gender and violence online' (Third & Moody, 2021, p. 21 & 69)
[46] The ICO's AADC is binding only in the UK. For more information see, ICO, Age Appropriate Design: A Code of Practice for Online Services.

How might socio-cultural limitations impact understandings of disadvantaged or vulnerable communities?

In our analysis, while transnational frameworks were selected and includes a broad range of countries and continents within the organisations, the authorship and language are still global north centric. The organisations which published the selected frameworks are headquartered predominantly in the global north and developed countries. Even as vulnerabilities and disadvantaged groups are highlighted with care, the pool of experts writing on these issues may not understand the wider daily lived realities of these communities. As a result, we are acutely aware of potential biases regarding access, engagement, and relationship with technologies and AI that may differ from perspectives and experiences by similar groups in the global south. For example, there may be different perceptions on cultural values related to children's rights, wellbeing, and AI that are difficult to capture across the forms of engagement explored within the frameworks we analysed.

3.3 Child-centred Recommendations & Policies

Image 2: Child-centred AI by Turing Commons.[47]



[47] Illustration designed by Jonny Lighthands and Eléonore Guerra. Available at Turing Commons, **https://raw.githubusercontent.com/alan-turing-institute/turing-commons/main/docs/assets/images/illustrations/child-centered-ai.png**

The final theme focused on existing or future recommendations and policies that were child-centred or at the least, focused on upholding children's rights and wellbeing. To move from theory to practice, we took a broad approach when coding. Some frameworks were written as policy briefs or guidelines and as a result may have a higher prevalence percentage; however, we were interested in looking at all recommendations and suggestions that involved children.

	Child-centred Recommendations & Policies
AFRICAN UNION & ACERWC (2023): Day of the African Child 2023: The Rights of the Child in the Digital Environment: Concept Note	
COE (2018): Guidelines to respect, protect and fulfil the rights of the child in the digital environment	
OECD (2022): Companion Document to the OECD Recommendation on Children in the Digital Environment	
UNESCO (2022): Recommendation on the Ethics of Artificial Intelligence	
UNICEF (2022): Towards a Child-Centred Digital Equality Framework	
UNICEF (2021A): Policy Guidance on AI for Children 2.0	
UNICEF (2021B): The Case for Better Governance of Children's Data: A Manifesto	
UNICEF INNOCENTI (2023): The Metaverse, Extended Reality and Children	
UNICEF INNOCENTI (2022): Responsible Innovation in Technology for Children: Digital technology, play, and child well-being	
UN (2023): A Global Digital Compact — an Open, Free and Secure Digital Future for All	
UN (2021): General comment No. 25 on children's rights in relation to the digital environment	
5RIGHTS FOUNDATION & WSU (2021): Our rights in the digital world: A report on the children's consultations to inform UNCRC General Comment 25	
WEF (2022): Artificial Intelligence for Children	

What are the key framings of recommendations across the frameworks?

We found that most policy recommendations were rather generalised, which may be understandable given the transnational approach of the frameworks. In certain frameworks such as UNICEF (2021a) and UNICEF (2021b), we see the influence of region-specific guidance such as the UK ICO's Age-Appropriate Design Code[48]. UNICEF (2021b) also focuses on the growing role of geopolitics in relation to children's data and advocates for an 'international approach' to 'address geopolitical imbalances: geopolitical (among states), geo-commercial (among companies), and those between a child and actors responsible for realisation of their rights'.

Who are the recommendations directed towards?

A few frameworks articulated policy recommendations with more detail and focused on different stakeholders across public and private sectors, including businesses and governments such as UNICEF (2022). UNICEF (2021a) considers a diverse approach comprising of a 'broad range of stakeholders' and advocates for the inclusion of 'parents, teachers, child psychologists, child rights experts, and, where appropriate, children themselves'. It is also relevant to note that there is less mention of direct engagement with children when recommendations are mentioned in the context of the private sector. This is often indicated with a rather general and abstract suggestion to consider children's perspectives.

[48] ICO, Age Appropriate Design: A Code of Practice for Online Services.

Are child right impact assessments recommended?

Across the 13 frameworks reviewed, less than 50% (6 frameworks) made mention of CRIAs, namely, UN (2021), CoE (2018), UN (2023), OECD (2022), UNICEF (2021a) and (2021b). In the UN (2021), Member States are recommended to 'mandate the use of child rights impact assessments' and make these available to the public. The value of conducting data protection impact assessments (DPIA) alongside CRIAs was also recognised in certain frameworks such as UNICEF (2021b).[49]

How are issues of accountability and liability addressed, if at all?

Frameworks addressed the issue of accountability and liability differently, with some calling for binding regulation and others making no mention at all. The AU & ACERWC (2023) Concept Note has a strong focus on ensuring accountability of both public stakeholders (e.g., Member States) and private stakeholders (e.g. ICT companies) and explicitly calls for binding regulation to hold technology providers and businesses accountable for children's rights violations in the digital space. In terms of responsibility, the CoE (2018) recommends Member States 'require' the private sector to 'take reasonable, proportionate and effective measures to ensure that their terms and conditions of service are enforced'. UNESCO (2022) suggests Member States implement a 'liability framework' or at the least, 'clarify the interpretation of existing frameworks to ensure the attribution of accountability for the outcomes and the functioning of AI systems'. UNESCO (2022) also explicitly states only a human being(s) should be held accountable and not an AI system.

How are considerations of geographically bound legislation addressed?

On a practical level, certain frameworks such as the WEF (2022) considered that data-intensive technologies may be designed by default to primarily comply with the regulation of the geographic region where it was developed. WEF (2022) recommends this be 'explicitly' communicated to all end-users, including children, in a clear way. This aspect is currently missing in practice or often opaque, with an increasing number of reports of non-compliance against digital services and technologies with region-specific regulation.[50]

How are varying cultural contexts addressed across the frameworks, if at all?

In our analysis, we also reviewed how transnational organisations consider the various socio-cultural and socio-economic circumstances of children in their respective frameworks. Given that children in one part of the world may share different values and be faced with different challenges to children in another part of the world, we looked at those frameworks which suggested diverse

[49] For further information on CRIAs see, Mukherjee, Pothong, and Livingstone, 'Child Rights Impact Assessment: A Tool to Realise Child Rights in the Digital Environment'.
[50] EDPB, '1.2 Billion Euro Fine for Facebook as a Result of EDPB Binding Decision | European Data Protection Board'; Goujard, 'TikTok Hit with €345M Fine for Violating Children's Privacy'; Grant, Singer, and Krolik, 'YouTube Ads May Have Led to Online Tracking of Children, Research Says'; ICO, 'ICO Fines TikTok £12.7 Million for Misusing Children's Data'.

approaches for developing region-specific guidance. For instance, in UNICEF (2021b) different philosophical and ethical frameworks are included such as 'Ubuntu as an ethical human rights framework for artificial intelligence governance'.

To what extent are international contexts and synergies considered?

We found an acknowledgment that further international collaboration is needed to achieve child-centred policy, but very little about how or when this is to be done. The question as to when the imbalance and lack of child-centred digital policy and regulation globally will be addressed remains unclear, with children in some regions more likely to be adversely impacted than others.

In the African context, child-centred regulation is lagging far behind. In 2022, the AU published its 'Agenda 2040: 10 Aspirations for an Africa Fit for Children', with minimal mention of technology in relation to children. The only reference made is to ICT systems in the context of improving affordable access to technologies in schools and integrating 'technology' as a subject into the school curriculum. However, the Agenda makes no mention of the digital divide, digital technologies, AI, or children's data governance including data protection.[51,52] The AU & ACERWC (2023) Concept Note is a first step towards regulating data-intensive technologies that may impact children's rights across Africa, which is one of the reasons we have chosen to include it in our report.

More discussion and practical steps are needed around international collaboration, or global collaboration, on all aspects relating to children's rights, wellbeing, and children's data governance in relation to data-intensive technologies.

The frameworks included in this analysis covered diverse impacts of AI, recognising that it affects children's daily lives in significant ways, creating both opportunities and risks for children's rights and wellbeing. We see considerations of these risks and benefits reflected in child-centred policies and recommendations across the 13 translational frameworks we reviewed. Building on our analysis above, which focused on the key themes we identified across these frameworks, below, we continue the discussion and share conclusions.

[51] As of writing this paper, 20 African countries (out of 55) do not have data protection laws or a data protection authority in place. For more information see, ALT Advisory, 'Data Protection Africa | By ALT Advisory'; DLA Piper, 'DATA PROTECTION LAWS OF THE WORLD Full Handbook'.
[52] African Union and ACERWC, 'AGENDA 2040: 10 Aspirations for an Africa Fit for Children'.

4. Discussion and Conclusions

Our research highlighted key themes across 13 existing transnational frameworks on AI, children's rights and wellbeing in relation to data-intensive technologies. As this area is of increasing international interest, a growing number of frameworks are addressing these topics, including several international frameworks which – at the time of writing – are still in development and hence have not been included in this analysis. Our research has sought to summarise current themes and highlight differences within existing transnational frameworks. Future research will revisit this to examine how the regulatory and governance landscape relating to AI, children's rights, and wellbeing develops.

We identified key themes across the frameworks. Two notable themes are the importance of balancing benefits and opportunities with risks and harms of data-intensive technologies and a need to clearly understand what is meant by children's wellbeing as it is related to but separate from children's rights. While there were overlapping themes, we also found significant differences in the approaches taken across the frameworks. As indicated in our previous research examining public sector stakeholders' views on child-centred AI,[53] this inconsistency amongst existing frameworks presents challenges for stakeholders seeking to navigate the existing landscape or identify the requirements of best practice and compliance. We examine this further in a forthcoming paper which explores in more detail the implications of existing frameworks for current and future approaches to child-centred AI.[54]

Our review of frameworks found considerable variation in the extent to which children were engaged in the development of frameworks, and also the degree to which frameworks discussed children's agency and participation. We consider this significant as child-centred approaches which engage children as key stakeholders are crucial to understanding how AI impacts children's lives as well as to maximise the value and benefits of AI for children. A child-centred approach to the design, development, deployment, and governance of AI would ensure that each of these processes is shaped with the inclusion of children to reflect their actual experiences, needs, and concerns.

In our ongoing collaboration with the Scottish AI Alliance and Children's Parliament, we are developing and piloting innovative approaches to engaging children in relation to AI.[55] Our future research will continue to develop and critically evaluate methods for children's engagement with AI and will further explore how child-centred approaches to AI can be advanced and facilitated through international frameworks on children's

[53] Pauwels et al., 'Case Study: Understanding AI Ethics and Safety for Children: The Alan Turing Institute'.
[54] Mahomed et al., 'Navigating Children's Rights and AI in the UK'.
[55] Mahomed, Aitken, and Krook, 'What Can Children Teach Us about AI?'

rights and wellbeing in relation to AI or data-intensive technologies.

Future work may analyse themes which were not included in the scope of this review but are important in the development of frameworks relating to children and data-intensive technologies. For instance, the CoE (2018) Recommendation also discusses children's access to remedy where harms occur and the importance of digital literacy, awareness raising, and education measures aimed at the public, parents and caregivers, schools, and children, which were not included in our coding. Other important themes for further analysis are data protection and privacy, manipulation and misinformation, enforcement measures of frameworks, ways to ensure these frameworks are applied in practice, as well as effective international collaboration and cooperation to ensure children all around the world are being considered and their rights upheld.

Given that the transnational organisations represented in this mapping are predominantly based in European and North American countries[56], a similar mapping of frameworks of other regions may be beneficial, specifically those in less developed countries.

The frameworks included in this analysis cover diverse impacts of AI, recognising that this touches all aspects of children's lives with significant consequences for their education, play, sense of self, relationships, mental health, and social, emotional, and cognitive development. As technical innovation continues alongside the increasing deployment of AI technologies across all sectors and industries, it is vital that research, policy, and regulation engage with impacts on children as an urgent, high priority focus. We hope our analysis provides a starting point for future research as well as a useful resource for policymakers and practitioners to explore paths forward in developing and applying child-centred approaches to AI.

[56] Certain frameworks reviewed in this report have included engagements with individuals from developing and underrepresented countries; however, our reference is where the primary location or headquarters of the organisation is.

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Appendix

Methods

The following research questions guided our review and the aims of this report:

1. To what extent is the United Nations Convention on the Rights of the Child (UNCRC) meaningfully incorporated into key transnational frameworks relating to data-intensive technologies including AI?
2. Specifically, to what extent are Articles 2, 3, 12, 13, 19, 32, 34, 35, and 36 of the UNCRC meaningfully incorporated into key transnational frameworks relating to data-intensive technologies including AI?[57]
3. To what extent do transnational frameworks with a focus on children in relation to data-intensive technologies meaningfully include the following themes and considerations:
    a. Children's wellbeing and related considerations including:
        - Sociotechnical and wellbeing considerations
        - Importance of children's voices and agency
        - Opportunities and benefits to children vs Risks and harms to children
        - Digital inclusion and access to technologies
        - Disadvantaged and vulnerable children
    b. Child-centred recommendations and policies

As mentioned in the paper, frameworks from (2018-2023) ranging from binding and non-binding policy guidelines, recommendations, research reports, policy briefs, and supporting documents were selected. For the analysis, we followed a mixed methods approach of analysing the selected frameworks using a content analysis approach and measuring percentage coverage for each code detailed below. Percentage coverage was decided as the unit of measure over frequency counts to account for the varying lengths of the selected documents. Coding of all frameworks was carried out by multiple authors over a period of approximately 4 weeks using NVivo Software (Mac Release 1.7.1). Since NVivo handles white spaces differently depending on the file format, it was ensured that all files were in the same format before being uploaded to NVivo for coding and any necessary adjustments made. The authors discussed and mutually agreed on the coding categories and criteria before conducting a first cycle of coding. Thereafter, intercoder reliability (ICR) was calculated first, and subsequently, the authors reviewed and discussed any differences in the coding approach and criteria. Finally, second and third cycles of coding were carried out, and the ICR value re-calculated, with an improved Kappa value indicating a good, strong level of agreement, and an overall percentage agreement of 86%.

Heatmap Codes

In determining the codes of our heatmap and analysis, we identified key themes that emerged from the literature around children's rights

[57] For more information on the rationale for selecting these Articles, see section **3.1**

and data-intensive technologies based on a contextual understanding of the landscape. We outline the codes, how they are defined, and provide additional information below, as summarised in Table 2.

Given the significance of the UNCRC in setting the foundation for children's rights globally, we identified the "Integration of children's rights according to the UNCRC" as a parent code. Subsequent child codes to illustrate more nuanced considerations of children's rights according to Articles 2, 3, 12, 13, 19, 32, 34, 35, and 36 include the overarching UNCRC considerations of "Non-discrimination" (Article 2), "Best-interests" (Article 3), "Views of the child" (Articles 12 and 13), and "Child exploitation" (Articles 19, 32, 34-36). During the coding process, the exact words "children's rights" and related stem words were also coded to ensure that a broader understanding of children's rights was included.

In addition to children's rights, children's wellbeing in relation to data-intensive technologies is another key theme we identified across the frameworks, specifically considerations from a sociotechnical, socio-economic, and socio-cultural perspective. These include discussions regarding social or cultural rights, children's sense of identity, and recognition of the different stages of children's development in relation to data-intensive technologies, amongst others. This has been coded as "Sociotechnical and wellbeing considerations".

Coding whether and to what extent children's voices were included in the framework was also included as part of our heatmap given the importance of children's own perspectives and opinions within the framework development process. This included the incorporation of quotes or direct engagement with children within each framework. Related to the inclusion of children's voices, we made a distinction between simply incorporating children's perspectives and participation and empowering them and giving them agency either directly within the framework or as a recommendation. As a result, we coded for both the consideration of the "Importance of children's voices and agency" to identify the child-centred approaches undertaken.

In recognising that children are not a homogenous group, we believe that it is important to separate the special circumstances in which children's rights and wellbeing in relation to data-intensive technologies are considered for disadvantaged and vulnerable groups. Any mentions of children based on specific or protected characteristics that require special attention have been coded as "Disadvantaged and vulnerable children".

When discussing data-intensive technologies, we must recognise challenges, as well as efforts to improve, digital inclusion and access. To bring attention to how the lack of access can impact children's rights and wellbeing as well as to what extent measures that focus on reducing digital exclusion have been accounted for, we coded "Digital inclusion and access to technologies" as part of our heatmap analysis.

As much of the desk-based literature on children's rights and AI have already identified, there are both benefits and opportunities as well as potential risks and harms when it comes to children's engagement with data-intensive technologies. These have been coded separately as "Opportunities and benefits to children" and "Risks and harms to children" to identify how frameworks navigate the balancing act of encouraging while protecting and empowering children in the context of data-intensive technologies.

Finally, the consideration of child-centred recommendations and policies such as mandating age-appropriate measures, children's rights impact assessments, and increasing state responsibilities were coded as "Child-centred recommendations and policies". The coding was done to encapsulate a wide range of soft and hard as well as binding and non-binding requirements, guidance, and recommendations to provide a more comprehensive picture of the landscape of children's rights, wellbeing, and data-intensive technologies.

Table 2: Summary of codes and clarification notes for heatmaps

Key Theme	Code Name	Code Description
Children's Rights	Integration of children's rights according to the UNCRC	• Includes specific mention of 'children's rights', excluding broad focus of 'human rights' • Includes discussion of children's rights and any reference to the UNCRC • Aggregated from child codes (10 – 13)
	Child exploitation	• Child code to UNCRC • Specific reference to upholding Articles 19, 32, 34, 35, 36 of the UNCRC • All forms of child exploitation (including specific mention of 'online sexual exploitation', 'economic exploitation', 'commercial exploitation', 'microtargeting', 'child labour', etc.)
		• Includes specific mention of 'children's rights', excluding broad focus of 'human rights' • Includes discussion of children's rights and any reference to the UNCRC • Aggregated from child codes (10 – 13)
	Views of the child	• Child code to UNCRC • Reference to upholding Articles 12 and 13 of the UNCRC
	Non-discrimination	• Child code to UNCRC • Reference to upholding Articles 2 of the UNCRC (including specific mention of 'non-discrimination' of children)
	Best-interests	• Child code to UNCRC • Reference to upholding Articles 3 of the UNCRC (Including specific reference to 'best interests' of the child

Table 2: Summary of codes and clarification notes for heatmaps (cont.)

Key Theme	Code Name	Code Description
Children's Wellbeing	Sociotechnical and wellbeing considerations	• Beyond benefits and harms • Includes socio or cultural rights, child's sense of identity • Includes different stages of children's psychological, cognitive, emotional, and social development and wellbeing • Includes mental health considerations • Broad range including sociotechnical and socio-economic considerations of children in relation to AI and digital technologies
	Importance of children's voices & agency	• Including children's voices and participation in the development of this framework • Direct quotes from children • Implicit & explicit reference to the empowerment and active participation of children and their views in the design, development, regulation, and use of data-intensive technologies • Explicit mention of child's 'agency', 'autonomy', 'evolving capacities' in relation to data-intensive technologies • Includes recommendations
	Disadvantaged and vulnerable children	• Broadly construed with regard to specific characteristics that indicate extra care, taking into account disadvantaged and vulnerable groups • Specific reference to 'vulnerable', 'disadvantaged', 'minority', 'marginalised' or any such group such as 'migrant', 'refugee', etc.
	Digital inclusion and access to technologies	• Challenges to access to AI and digital technologies • Includes measures that focus on promoting inclusion, reducing digital exclusion, reducing the digital divide
	Opportunities and benefits to children	• Opportunities in terms of benefiting from the technology, AI-powered tools • Empower their exercise of rights, enjoyment of their rights
	Risks and harms to children	• Risks undermining children's rights • Any of the 4C risks[58] (also addressed in the GC 25) • Quite broad, can include content or activity or omission that gives rise to a risk of a physical or psychological impact • Any potential adverse impact • Specific mention of the word 'harm' or 'risk' in the context of an AI system and children

[58] The 4Cs risks refers to content, contact, conduct, and contract risks which children may be exposed to in the online digital environment. See, Digital Futures Commission, 2023. Glossary of terms relating to children's digital lives. Available at: https://digitalfuturescommission.org.uk/wp-content/uploads/2023/03/DFC-Glossary-180323-ready.pdf

Table 2: Summary of codes and clarification notes for heatmaps (cont.)

Key Theme	Code Name	Code Description
Child-centred Recommendations & Policies		• Hard and soft as well as binding and non-binding obligations, suggestions, and recommendations related to child-centred recommendations and policies for data-intensive technologies • Excluding policy recommendations without specific mention of children

Limitations

Due to the nature of this study, it is important to note the following limitations. Firstly, the coders used NVivo software for all coding and calculated the percentage coverage for each code as a measure to create the heatmap. These results were based on a percentage coverage of the entire document including white spaces, references, and appendices. Secondly, all frameworks reviewed and selected were in English and while a number of frameworks included direct engagement with children from various countries and cultures, the organisations represented in our report are predominantly based in Europe and North America. As part of our selection criteria, this report was limited to frameworks from transnational organisations only and therefore any country-specific frameworks, which may be relevant to the themes coded for, were excluded. Any new frameworks which may have been published after our initial scoping of frameworks were completed may also not have been included. The final selection of frameworks was chosen based on their topics and focus areas instead of the organisation which authored it. As a result, there is limited variation in the organisations represented with some included more than others.

While our focus was on AI, we found that several frameworks may be relevant and applicable to AI even though they may not focus centrally on this subject. Frameworks which discussed data, or data-intensive innovation typically included considerations relevant to AI. For instance, frameworks by the Council of Europe (CoE) and the African Committee of Experts on the Rights and Welfare of the Child (ACERWC),[59] made no specific mention of AI at all and instead adopted the terminology of 'ICT' or 'digital technology' in the 'digital environment'. For these reasons, our analysis, while framed by

[59] See Heatmap 1

a focus on AI, children's rights, and wellbeing, encompassed frameworks covering data and data-intensive innovation more broadly. There is also an increasing number of frameworks by transnational and national organisations relating to sectoral or specific considerations of digital technologies and children (e.g. AI and education).[60] While these frameworks were beyond the scope of our heatmap analysis, throughout the discussion sections in this report, we referred to a number of these examples to explore approaches taken.

This is an evolving area of research, and we acknowledge that our list of frameworks analysed may not be representative of all frameworks published by transnational organisations on the topic of children's rights and wellbeing in relation to digital technologies. However, this is a starting point for this important area of research and indicates the need for this work to continue and incorporate more frameworks in the future.

[60] Holmes et al., 'Artificial Intelligence and Education'.

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