

Digital Childhood

Addressing childhood development milestones
in the digital environment

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**5RIGHTS
FOUNDATION**

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Author biographies

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In 2018, Kidron introduced the Age Appropriate Design Code (AADC) as an amendment to the Data Protection Act 2018. The Code has prompted the largest redesign of digital products and services in a decade and introduced concepts and definitions that have become the benchmark for child-focused digital legislation in the EU, US and beyond. In September 2022, the California Age-Appropriate Design Code Act was signed into law by Governor of California, Gavin Newsom.

Baroness Kidron is Chair of 5Rights Foundation, which has pioneered a range of international policies and programmes, including child protection policies for governments and international organisations; technical standards and codes of conduct for business, publishing ground-breaking research; and supporting the UN Committee on the Rights of the Child in drafting general comment no. 25 on the relevance of children's rights to the digital environment.

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Introduction

To a child, today's digital world appears very different from that of 2017 and not necessarily better. Indeed, many of the 5Rights Youth Advisors express relief at not being younger children now, with the advent of new and even more demanding products and services.

Digital Childhood: Addressing Childhood Development Milestones in the Digital Environment was first published in 2017. Since then, we have seen technology play a pivotal role in delivering remote learning during the pandemic, maintaining its centrality in the classroom. Device ownership among ever younger age groups is prevalent 55% of 8-11 year olds owning a phone in 2022, and 63% of the same age group using social media¹. Games and social media have become more immersive and automated with the arrival of alternative, virtual and extended realities, as well as powerful generative AI services like ChatGPT. Meanwhile new services come online, for example, TikTok now plays an important role in many young people's lives.

The year after this report was first published, the World Health Organisation classified 'gaming disorder' as a mental health condition. In 2019, the National Centre for Gaming Disorders opened in the UK.² The average age of those receiving treatment at the clinic is 17, with children as young as 13 being referred. The same year, the UK's Chief Medical Officer published a commentary on screen-based activities and children's and young people's mental health and psychosocial well-being.³ Earlier this year, US Surgeon General Vikan Murthy expressed his belief that 13 is too young for children to be on social media, noting that "the skewed and often distorted environment of social media often does a disservice to many of these children."⁴

This revised version of the "Digital Childhood" report considers the landscape of children's digital and technology use as it plays out in 2023. Once again, it illustrates how growing up in the digital environment directly impacts a child's developmental trajectory and concludes that a managed transition from infancy to adulthood is as important in the digital environment as it is in the offline world. For many readers, this may be the first time they have considered how the design and commercial purposes of the digital world impact children's and young people's ability to meet their developmental milestones. The report takes each age group in turn, outlines what we know about child development and the major digital interactions and impact on children at that age.

Where there is existing research evidence, it is cited, and where the authors have extrapolated from their professional practice, it is indicated. We thank the large number of experts whose work we have built upon and the children and young people who have shared their views and experiences so generously.

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¹ Ofcom Children and Parents: Media. Use and Attitudes Report 2023 (March 2023).

² *The National Centre for Gaming Disorders*. (n.d.). www.cnwl.nhs.uk.
<https://www.cnwl.nhs.uk/national-centre-gaming-disorders>

³ Davies S.C., Atherton F., Calderwood C., McBride M. United Kingdom Chief Medical Officers' commentary on 'Screen-based activities and children and young people's mental health and psychosocial wellbeing: a systematic map of reviews'. Department of Health and Social Care (2019).

⁴ Brown, A. G. (2023, January 29). *Surgeon General says 13 is "too early" to join social media*. CNN.
<https://edition.cnn.com/2023/01/29/health/surgeon-general-social-media/index.html>

Executive summary

There are over one billion children online⁵. Each day, hundreds of thousands more go online for the first time. The digital world is not optional for children. It is the environment in which they access education, entertainment, and health services and build and maintain their relationships or engage in civic and social activities.

With many children now spending time at school using digital technologies as well as in much of their free time⁶, realising their rights and ensuring their well-being in the digital environment is of no less importance than in any other setting.

The digital environment is entirely person-made, designed primarily to meet the business interests of companies and their shareholders. The defining objectives of technology companies is to increase the number of service users, maximise the time, and generate high levels of engagement – all of which serves to produce more personal data which is used to drive advertising revenue – the more eyeballs, attention and clicks, the greater the revenue.

The digital environment looks quite different when we look at it from the point of view of a child's ability to meet their development goals. It has the potential to be a landscape of opportunity, understanding, risk and challenge; designed with children in mind and overseen by regulatory protections that support parental advice or school supervision. In this version of the future, children would be considered at all points in the design cycle, so that they could be participants in a digital world that has considered their development stages and interacts with them on the basis of their age and maturity.

The vision of a rights-respecting digital world in which children are both early adopters and keen participants is far from the current norm in which there is an emphasis on safety (whilst often failing to keep children safe). Meanwhile, there remains little regard for concepts of childhood and evolving capacity or for the long-established societal norms that safeguard the rights and privileges of children at different stages of their development journey.

Digital habits start young and impact the journey to adulthood. The need to respect children's developmental milestones is paramount and must inform research, policy and practice in the digital environment. We cannot solely rely on the resilience or education of children. Digital service providers must design products and services fit for children⁷ by acting above and beyond commercial considerations, and legislation and regulation must ensure a robust regime of accountability, transparency and oversight.

Without access, they are disadvantaged. But access that is predicated on adult maturity provides a toxic environment that often gets in the way of a child's development. While much of what follows necessarily points at the risks children face, what is really needed is wholesale culture and regulatory change that normalises designing with children in mind, rather than asking children to behave with maturity and discernment beyond their years.

⁵ UNICEF Office of Research - Innocenti. (2020). *Growing Up in a Connected World: Understanding Children's Risks and Opportunities in a Digital Age*. Unicef-Irc.org.

<https://www.unicef-irc.org/growing-up-connected#:~:text=At%20the%20global%20level%2C%20it>

⁶ 12-15-year-olds spend more time online or on social media (1hr 24 minutes) per day than they do with friends (1hr 12 minutes) as cited in Ofcom's *Children and Parents: Media Use and Attitudes Report 2023* (March 2023).

⁷ Livingstone, S. & Pothong, K. (2023). *Child Rights by Design: Guidance for Innovators of Digital Products and Services Used by Children*. Digital Futures Commission, 5Rights Foundation.

https://digitalfuturescommission.org.uk/wp-content/uploads/2023/04/CRbD_singles-web.pdf

Using childhood development milestones to inform policy

The universal changes that occur during childhood; from walking and talking to beginning to understand the world in an adult way are well established. Child development has been used to inform education, policy and parenting practices for generations.

A large proportion of child development research predates the digital age. With developments in technology occurring at a quicker pace than research into its effects, it is difficult to get an accurate picture of the impact. The World Wide Web is only 35 years old and has only been ubiquitously in the hands of children, in connected countries, for the last 15. More than any other development, its features of portability, personalisation, profiling and virality enable children to participate in a global network with a great deal of autonomy and visibility from a very young age.

Current research is broadening from an agenda of adult-identified harms to one that captures all the experiences and anxieties children and young people face. For example, Przybylski & Weinstein (2017) suggest a “Goldilocks hypothesis” of screen time with very low and very high use being more associated with negative health outcomes, while moderate use of digital technology was not intrinsically harmful and may be advantageous in a connected world. The impact of digital use on learning has been shown to be mediated by parental involvement (e.g. Barr 2019), while both negative and positive impact of social media is now believed to differ according to the age of the user. “Younger adolescents demonstrated a different pattern of between-person associations than older adolescents: the relationship was more linear and showed more prominent differences between males and females” (Orben et al. 2022) whilst not necessarily agreeing with the Goldilocks hypothesis.

Illustrative Scenario

A child of 10 plays an online multiplayer game that offers ‘live streaming’, real-time chat, in-game purchases and random reward features (loot boxes). The game also rewards extended play and includes dark patterns and ‘nudges’ to encourage users to continue playing.

The 10-year-old may be able to negotiate the intuitive design of a game but may not yet have the capacity to understand why other users in a game use adult language or can stay online for longer or pay to build their lucky spell into a lucky streak.

Mirroring behaviour is a completely normal learning tool of growing up, from a baby mirroring a smiling adult, to a 10-year-old mimicking the language they hear playing a first-person shooter game. But if the context is unclear and the rules are adult, then a child can easily find that the behaviours they engage in are not appropriate for their age, whether that is chatting to adult strangers, playing late into the night or making in-game purchases.

In this example there are aspects of design that constitute risk of harm for a child, for example:

What is the context? Is the game interactive, social, public or private? Is it free to play, or does it require virtual or real-world currency to access certain features? Does it include advertising? Are there in-game payments or gambling-style features?

Who are the users? Adults, children, friends or strangers? Are they anonymous, traceable, many or few?

What is the content? Virtual reality, reality or cartoon? Is it explicit, violent, or pornographic? Commercial, creative, user-generated or pre-moderated?

When and for how long? Does the game reward extended use or offer ‘time-outs’? Are the time of day and implications of playing with people in a different time zone obvious?

There may be nothing in the content that offers a problem or danger for this particular child. But the average 10-year-old, who needs 10 hours of sleep, finds it difficult to end their game when it is time for bed in the face of technology designed to keep them engaged and playing.

Even with age-appropriate content, a game may not have high default privacy settings, or it may include age-inappropriate adverts or commercial pressures.

It may even be that the game has creative elements that feed the child’s imagination, or that gameplay enhances hand eye co-ordination, but this rather innocuous scenario played out daily across the world in millions of children’s bedrooms requires a series of critical assessments and multiple acts of maturity. This would be hugely challenging for a very young child even for the 10-year-old cited in the example but rather less so for a young person of 17.

The context in which a child accesses the digital environment can be as important as the content they encounter. The kind of activity a child engages in is as important as the time spent engaging. The nature of the interaction is as important as the purpose. These nuances have been recognised in recent years, with the focus of debate shifting from concerns over excessive ‘screen time’ to the nature of children’s digital engagement and the risks and opportunities.⁸

Not only are children not adults, but children of different ages have vastly different levels of maturity, understanding and capacity. Children will experience periods of increased sensitivity relative to their developmental stage, but not necessarily at the same age. In girls, for example, social media use between the ages of 11 and 13 years is associated with a decrease in life satisfaction the following year, whereas in boys, this happens later between the ages of 14 and 15 years, suggesting that sensitivity to social media is linked to developmental changes that occur later in boys than girls.⁹ This factor is recognised by the UNCRC’s emphasis on evolving capacity, which is further explored in the General comment No. 25 on the relevance of children’s rights to the digital environment.¹⁰

Common features of the online world present specific problems for children at different points in their development, including reward loops, social affirmations and popularity metrics (numbers of likes, friends or followers), personal data collection, content rabbit holes, hidden advertising and profiling. Yet, with a few exceptions of ‘walled garden’ services for very young children, these developmental differences are rarely reflected in the design of digital products

⁸ Kucirkova NI, Livingstone S and Radesky JS (2023) Faulty screen time measures hamper national policies: here is a way to address it. *Front. Psychol.* 14:1243396. doi: 10.3389/fpsyg.2023.1243396

⁹ A. Orben, A. Przybylski, S.J. Blakemore, et al, Windows of developmental sensitivity to social media. *Nat Commun* 13, 1649 (2022)

¹⁰ UN Committee on the Rights of the Child, [General Comment No. 25 on children’s rights in relation to the digital environment](#) (2021), para. 19-21

and services. The Digital Future Commission's (DFC) report, *Playful by Design*, identifies the qualities of free play: diverse, open-ended, intrinsically motivated, voluntary, imaginative, immersive, social, emotional resonance, sense of achievement, stimulating, safety, risk-taking. Current designs in the digital world offer poor support for these because they fail to consider children's evolving capacities, needs and circumstances, in turn because digital business models commonly prioritise commercial interests over children's best interests. The seven *Playful by Design* principles map out a practical way forward to enhance children's imagination, safety and experimentation in the digital environment, also ensuring safety, lack of commercial exploitation and age-appropriate features. ¹¹

For children and young people to have a healthy and informed relationship with technology, digital design norms, education curriculum, and legislative and regulatory frameworks must consider the evolving capacity of children. These needs must be understood as a complex set of risks and opportunities-

Children are increasingly victims of fraud and scams online. Last year, official figures published by Action Fraud revealed reports of child victims of fraud had climbed during the pandemic, with the youth organisation Young Enterprise reporting that children as young as six are being targeted by scams online, primarily through gaming. Insights from parents also indicate the scale of the problem. According to a survey commissioned by Lloyds Bank, one in 10 parents said their children had fallen victim to fraud online - including identity fraud, hacking, phishing, grooming and fake goods.¹²

A case study from a clinical psychologist

Sophie (17) loves clothes and buys most of them using money she has saved from her waitressing job. She has her own bank account and card and is keen to find vintage clothes so that she can develop her own style. Sophie bought a dress from a website which looked official and had all the information about returns and T&Cs. But when she checked her bank balance after she noticed there had been several transactions for things she hadn't bought. Her card details had been used fraudulently. Sophie feels cheated and stupid. She also feels embarrassed - she was trying to be independent and adult-like, using her own money to buy clothes that fit her own style and brand but has been scammed. Even though she has explained to her parents that she did all the checks to make sure the site was a valid one, she believes they still think she has been impulsive and careless. The dress hasn't arrived, and Sophie doesn't feel as confident to explore her own fashion via online sites.

¹¹ Livingstone, S. & Pothong, K. (2021). *Playful by Design: A Vision of Free Play in a Digital World*. Digital Futures Commission (London: 5Rights Foundation).

<https://digitalfuturescommission.org.uk/wp-content/uploads/2021/11/A-Vision-of-Free-Play-in-a-Digital-World.pdf>

¹² *Parents fear children will fall victim to "gaming fraud."* (2022, July 26). The Independent.

<https://www.independent.co.uk/news/uk/home-news/video-games-fraud-online-scams-b2131308.html>

The voices of children and young people

Children have a right to be heard and listened to and for their views to be taken seriously. This right is considered so fundamental that it is one of four general principles of the UN Convention on the Rights of the Child (UNCRC). Respect for children's views should be considered a lens through which the implementation of all other children's rights should be viewed.

Consulting with children is critical to understanding how their interaction with digital products and services impacts their development journeys. Without hearing their views, it is impossible to get a full picture or to understand how their experiences may differ according to their age, development capacity and levels of critical understanding.

Children and young people are early adopters of technology and new products and services, and their voices should be at the forefront of research. Importantly, future research must identify the needs of vulnerable children, the age-determined vulnerabilities of *all* children, and how they are influenced in a digital context.

Children's Experiences of age-inappropriate content and interactions online

In 2021, 5Rights published [Pathways](#) – a research study looking at how digital products and services impact the lives of children. Using avatars (online profiles based on real children), the research showed how design features of popular services among children enabled automated pathways that led to graphic images of self-harm, extreme diets, pornography and introduced them to adult strangers.

The following year, we re-ran the experiment and found little had changed. Children were nudged towards harmful content by recommendation systems powered by algorithms. Innocent searches for things likely to appeal to different age groups, such as trampolining, Minecraft and slime, led to harmful and pornographic content in just a few clicks. For example, it took just three clicks from a search of 'trampolining' on TikTok to reach eating disorder content and in just a few clicks to reach self-harm content. On Reddit, one click from a search of 'Minecraft' and 'slime' led to pornography. A search for 'Ariana Grande' on Google led to explicit and sexually violent content on the social network site 'Wattpad'.

Weak and easily bypassed age assurance systems often allow children to set up social media accounts with a different age. They also allow adults to register as children, undermining safety measures that would prevent unknown adults from messaging children who do not follow them.

While the adult world sees children through the lens of its own anxieties, children have a very different range of anxieties that often make them feel undermined or disempowered. To see children's views as non-trivial is the first step of good policy – since, in many cases, they lead to a different analysis of how to anticipate or regulate problems designed into the digital world. Children's views

were consulted during a workshop on the Child Online Safety Code of Practice with the Young Advisory Group (YAG) and Gifted Young Generation (GYG) Global in 2022. Other views were consulted during a workshop solely with the YAG in 2021 that briefly discussed the Draft Online Safety Bill, and asked young people what they would do to improve digital platforms and services.

“We all have different emotional intelligence. All services should assume that, so everyone is kept safe rather than a few.”

-Vivien, 16

“Really young children who go on TikTok are so easily influenced by those TikTokers that start huge trends, and these trends become lifestyles for such young people who haven’t really found themselves yet.”

-Vivien, 16

“I think that most services should assume that young people are going to be on it because young people are all over the internet. The internet is our oyster so everyone just wants to try everything and go everywhere they can.”

-Vivien, 16

“I use it a lot for school and to watch educational videos but then I’m on the same account I use to watch just random videos so then when I’m trying to do revision, I see all these videos that I want to watch and it’s quite distracting.”

-Molly, 18

“It’s almost an experiment, the idea that we are the first, or, at least, one of the first to come of age with this technology. And what that can do to the way we behave and the way we interact with the world.”

-Ben, 17

“Is it 13 that you can join Instagram? I feel like it almost makes people age. I don’t know how to put it. It makes people act older than they are.”

-Josh, 15

“I remember joining TikTok and literally after a few days, it had predicted more about me than I had taken time to figure myself out in 18 years. It was just scarily able to know everything about me.”

-Fleur, 17

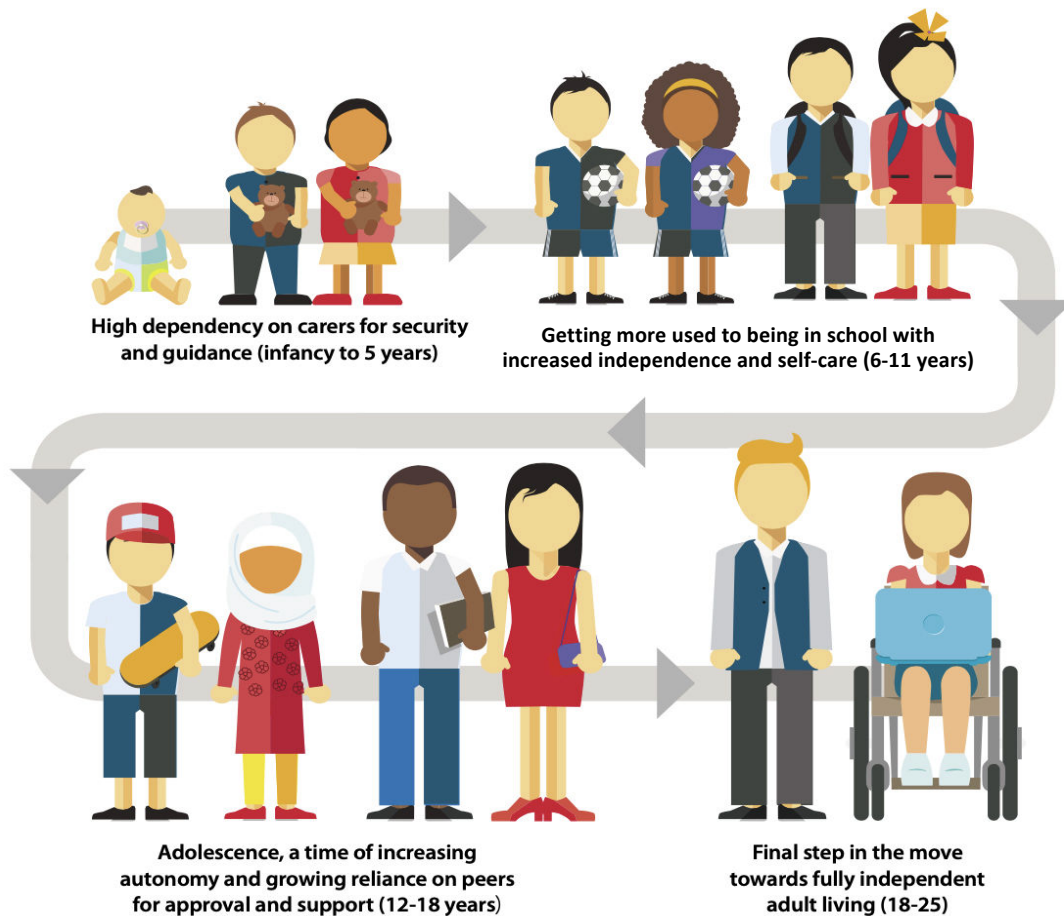
“When I first got it, it was this really exciting thing because it was the first-ever type of social media that I had. Posting on it was all new and fun and all my friends could see it. And then as I got older, it felt like a weight around my neck. I felt pressured to take photos of things to prove that I had a social life. And I felt pressured to take good photos of myself to prove that I’m just as pretty as whoever.”

-Kate, 16

Designing with childhood milestones in mind

Both industries and governments around the world have focused on the harms children face as if children were a homogenous group. However, risk and harm should be seen through the lens of children at different ages and stages of development.

In broad terms, childhood development moves from a state of high dependency on parents or carers for security and guidance (infancy to 5 years), towards increased independence and self-care (6-11 years), through to adolescence which is a time of increasing autonomy and growing reliance on peers for approval and support (12-18 years) and the final step in the move towards fully independent adult living (18-25). [Post-18 is out of the scope of this report.]



Risk, harm and opportunity

There are two dominant narratives around children and technology. First, it creates the risk of harm, and second, it creates unmissable opportunities, leading to conflicting and confusing messages for policymakers, teachers, parents and particularly children.

It is broadly understood that children must take risks to grow and that adults should collectively try to prevent them from coming to harm. And that is no different in the digital environment than any other.¹³

Some of the most articulated risks are simply an ‘outcome’ of a child playing in an adult space and not having the developmental capacity to negotiate adult-designed content, behaviour or interactions, others are clearly ‘bad actors’ or illegal forms of abuse. Attention is rightly focused on the risks of the latter such as child sexual abuse and grooming, cases of which have grown exponentially in recent years,¹⁴ but other ubiquitous and insipid risks that lead to anxiety, depression, body dysmorphia, insomnia, low self-esteem and addiction, are too often overlooked.

Whilst both parents and children worry about sexual and violent content, bullying and age-inappropriate material,¹⁵ research shows that children want more information about the technology they are using and would like fewer addictive or intrusive features¹⁶. They want systems designed to put them in control, more default protection from unpleasant content, and more autonomy over their digital behaviours. In workshops with children and young people, 5Rights repeatedly hears that they feel ‘bullied’ by services that make them lose time or call them back with notifications as soon as they find the strength to put their phone down.

“Services have priorities that aren’t child safety, like attracting more people, getting more users each day and making sure those users come back consistently. And probably ads and making revenue on that.”

-Liam, 14

“One thing I’d change is making it harder to access inappropriate content in the sense of really violent videos and other stuff. Because it’s just really easy to find that stuff.”

-Haydn, 16

¹³Livingstone, S. (2013). *Online risk, harm and vulnerability: reflections on the evidence base for child Internet safety policy*. ZER: Journal of Communication Studies, 18 (35). pp. 13-28. ISSN 1137-1102

¹⁴The Internet Watch Foundation reported a 1,000% increase between 2019 and 2022 in reports related of child sexual abuse imagery depicting children aged 7-10 years.

¹⁵More than seven in ten parents of children aged 3-17 are concerned about their child seeing age inappropriate content (75%) and or their child seeing ‘adult’ or sexual content online (73%) according to Ofcom’s 2023 [children and parents media use and attitudes report](#)

¹⁶Kidron, B. (2023). *Disrupted Childhood: The cost of persuasive design*, version 2. p. 11. 5Rights Foundation.

Digital literacy, often cited as the answer, is also a victim of mixed messages. The digital environment is often demonised, yet the lived experience of many children is that it is convenient and a core – beneficial - component of their lives. Indeed, many young people stress that without their phones, they do not know how to communicate, organise, map-read, make purchases, or play – it is the portal to all aspects of their lives.

These two strands do not reflect the multifaceted components necessary to be digitally literate. Some skills are technical – those who can programme and use open source tools have more ‘agency’ in the digital environment and more facility to use those design features that exist to support them. But skills such as collaborative working, an ‘iterative’ mindset, curiosity, critical thinking or non-technical subject knowledge that understands the purposes and practice of the technology children are using can be as important as technical skills¹⁷.

The provision of a sophisticated and holistic regime of digital literacy and critical thinking could offer significant support for a child’s evolving capacity in the digital world, but it does not make up for poor design, toxic environments or the untrammelled provision of adult services to children.

Moreover, the prevailing reflex to put in place parental controls or limit device use is far less effective than designing a safe, privacy-preserving digital environment by default and providing children with a broad framework of knowledge and autonomy. Parental controls may be effective for younger children who are closely supervised, but may create a false sense of security and overlook the many risks generated by repetitive, low-level interactions in which the design rather than the content is problematic. Parental controls are likely to be less desirable for older children who require greater autonomy, or those whose difficulties in digital environments arise more from social pressure and comparison, which parental controls do little to alleviate. In a meeting of the UK Bereaved Parents for Online Safety group, families of children who had come to harm warned against relying solely on parental controls and urged policymakers to put greater responsibility on the tech sector to provide safety by design and age appropriate products and services.

In most families, children's upbringing reflects the education parents have received. Parenting in the digital environment is a relatively new challenge without the benefit of generational wisdom being passed down. This is exacerbated by experienced practitioners (e.g., police, social workers, clinicians and teachers) feeling unconfident or ill-equipped to deal with the multiple and fast-changing challenges to children online. Many feel unsupported by limited training and lack of evidence-based information, so the ladder of support that traditionally exists in the caring professions operates less efficiently in the digital environment.

Almost all stakeholders agree that there should be education and training for children of all ages and adults in all settings. Parents, carers, children, teachers and frontline workers need high-quality information that promotes digital citizenship, literacy and agency at every stage, from preschool, through the primary years and into adolescence. They also need the technology to be designed and regulated so that it is responsive to the needs of children. It is necessary for childhood that digital services adapt to the needs and capacities of children of different ages, rather than demand that children, particularly in the youngest age groups, adapt to the structures of technology developed with adults in mind.

¹⁷ Livingstone, S., Mascheroni, G., & Stoilova, M. (2021). The outcomes of gaining digital skills for young people’s lives and wellbeing: A systematic evidence review. *New Media & Society*. DOI: <https://doi.org/10.1177/14614448211043189>

Loving the ‘likes’

The interaction between digital use and development stages is set out in greater detail in the next chapter. One of the challenges faced by designers is that young people use technology to practise and experiment with different social interactions at different times. This is all in the context of an unforgiving network of services that does not easily provide for forgetting and moving on – where mistakes and poor social judgement are hard to erase.

In responding to an invite, sharing a video or ‘liking’ a post, a young person may be doing his or her ‘developmental best’ by trying out a new social interaction. But in the digital world, these interactions are often not done within familial or social groups where the child is known and loved. Instead, they are sent into the ether, often with an ‘unknown’ audience, out of sight of adult care.

Undoubtedly it can be exciting. Indeed, it is designed to be exciting as the ‘likes’ pour in as a form of social affirmation. The dopamine ‘hit’ of getting a ‘like’ is reinforcing, making it more likely that the young person will behave in ways that are most ‘liked’. It can also be devastating if the young person misjudges the tone, content or timing.

Normally it is neither of the two extremes. A more common scenario is that there are just a few responses, leading to disappointment, or a few too many, leading to anxiety about overexposure or pressure to keep high levels of engagement to maintain this status¹⁸.

This is what is of most interest from a child development perspective. All digital interactions, social media particularly, are deliberately designed to make an individual want to undertake the cycle again, immediately and repeatedly, whatever the time of day or night. And it is this cycle, always being on, always performing, always looking for affirmation from a digital audience, both exciting and anxiety-provoking, that is a challenge to a child of 9, 11, 13 or 17.

Because at the very time that they should be rehearsing in social contexts and returning to ‘trusted circles’ of family, classmates, teachers or interest groups to define themselves, they are waiting for notifications to confirm how they compare to an increasingly exaggerated set of social norms. The attention economy is based on the greatest rewards of attention being given to the loudest, funniest, sexiest, most opinionated, outrageous, bravest or tragic content.

The need for attention is problematic for children who do not yet know how to judge the veracity of what they are attending to, and who are vulnerable to making long-term decisions for themselves about their digital identity without understanding the commercial purposes of the digital environments they are inhabiting, and without having sufficient access to the creative and participatory elements of the technology they are using. Testing limits when growing up is not new: what is new is the environment in which things are shared, copied, commented on and amplified.

¹⁸ *Life in Likes*. (n.d.). Children’s Commissioner for England. Retrieved August 31, 2023, from <https://www.childrenscommissioner.gov.uk/resource/life-in-likes/#:~:text=%27Life%20in%20Likes%27%20fills%20a>

Age groups

This chapter sets out key digital usage by age – it is indicative rather than comprehensive and each age band builds on the previous, building a ‘digital’ profile of digital interactions over time. As previously noted, children derive great benefits from their digital interactions, community, information, entertainment, learning and all out fun – but this chapter looks specifically at how their digital interactions can be out of kilter with their development – largely as a result of a failure of products and services to anticipate the presence of children and design with their development in mind.

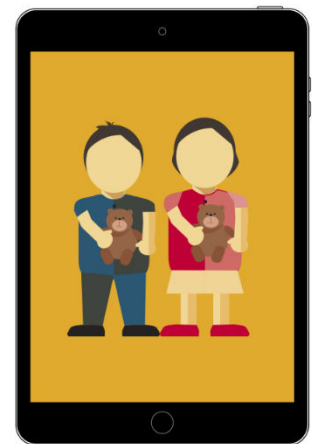
Birth to 2 years

Children are:

- Developing attachments to caregivers.
- Developing the abilities to walk and talk.
- Settling into their nocturnal and day rhythms allowing them to get the sleep they need to grow.
- Experiencing a range of emotions and using their behaviour to communicate these.
- Entirely reliant on their caregivers to feed, protect, comfort and soothe them.
- Rapidly developing neuronal connections because of their environment and experiences.

Digital use:

- Expectant and new parents may use growth/development tracking apps from pregnancy into early infancy.
- Caregivers may use TV, online video or digital music streaming platforms with algorithmically generated content and autoplay functions (e.g., Spotify or YouTube Kids).
- Adult-supervised activities, for example, from 18 – 24 months they may:
 - Interact with touch screens (e.g., tablets).
 - Engage with smart technology (e.g., voice assistants and smart speakers).
- Most of a child’s digital footprint will be generated by their parents, through their sharing of photos and videos on social media (‘sharenting’).



Risks and challenges:

- Parents may not be aware of or understand the data collection and sharing practices of pregnancy or baby health tracking services.
- Photographs are increasingly at risk of being used in generative AI systems as illustration or altered image-making.
- Autoplay functions on video or music streaming services can lead to passive or involuntary engagement with algorithmically curated content rather than self-selected or chosen by caregivers.

Impact:

- Infant and parental data, including sensitive health data, may be processed or shared by commercial companies for product development or targeted advertising.
- Due to the developmental sensitivity of this period, infants and toddlers can quickly develop habits such as trying to ‘zoom’ into books with two fingers like they would on a touch screen.

- Autoplay and content recommendation functions can, in combination, lead to unintentional or extended use.

3-5 Years

Children are:

- Developing a ‘theory of mind’ meaning they can begin to understand alternative perspectives by putting themselves in others’ shoes.
- Fooled by appearances and will tend to believe what they see.
- Beginning to learn that there are social rules and norms to follow, and they will get praise and reinforcement for following these rules.
- Starting to build up friendships with playmates, although there is little peer pressure and the main source of influence on behaviour is the family.
- Playing, which is an essential part of development, with opportunities for a range of play (role play, messy play, structured play, free play etc.) contributing to social, emotional, physical and cognitive development.

Digital use:

- Adult-guided activities (e.g., video-calling grandparents/playing) or in walled-garden environments.¹⁹
- Apps on tablets, parent or sibling smartphones (e.g., games, music) and video-sharing and TV on-demand platforms.²⁰
- Phones widely used by parents as video recorders and cameras.
- Information about very young children posted by parents online in social spaces.
- Playing online through apps, quizzes and games.²¹ This play tends to be single-player and on a caregiver’s device.



Risks & challenges:

- Excessive engaging with online content leads children to be stationary, unaware of their surroundings and not talking.
- Children and adults are not fully aware of the full range of risks, such as information sharing, digital footprint or formation of digital habits (priming).
- Parents believe their children are engaging with child content only.
- Devices can be overused for ‘babysitting’ or keeping children distracted
- Voice-activated services can lead quickly to adult or age-inappropriate services.
- Privacy risks of smart/connected devices with microphones and cameras (e.g., baby monitors, connected toys, smart household appliances).
- Due to rapid neuropsychological development, this is a stage where children are particularly susceptible to habit-forming behaviours.

¹⁹ According to their parents, 25% of UK children aged 3-4 use WhatsApp (Ofcom, Children and Parents: Media Use and Attitudes Report 2023)

²⁰ 92% of UK 3 and 4-year-olds watch videos online. Cartoons, animations, mini-movies or songs are the most watched types of videos among this age group. (Ofcom, Children and Parents: Media Use and Attitudes Report 2023)

²¹ Seven in ten UK 3-4 year-olds played video games in 2022. The top game categories were puzzles or quizzes (35%), creative and building (34%) and action/adventure (23%). (Ofcom, Children and Parents: Media Use and Attitudes Report 2023)

Impact:

- Lack of clarity for both children and parents regarding the different benefits and risks in digital spaces (e.g., games, entertainment, communication, walled gardens/closed platforms, unmediated spaces).
- At this very young age, children take their first steps towards independent use of devices but are not yet ready to independently self-manage time.
- Difficulty transitioning from screenplay to analogue play. Potential impact on speech development and attentional abilities
- Loops of harmful experiences created in unsupervised spaces.

6-9 Years

Children are:

- Developing a greater understanding and strategies for managing their thinking and emotions.
- Undergoing a cognitive shift associated with more logical and ordered thinking.
- Building up an understanding of the complexities of relationships and how personal disclosures impact these relationships.
- Moving towards greater rule-based reality play rather than pretend play.
- Becoming socially more sophisticated; the need to fit in and be accepted by the peer group becomes more important.
- Aware that their social status can be influenced by their skills and also their acquisitions. Collecting (e.g., cards, figures) becomes a powerful way of demonstrating this status and can also be a source of comfort.

**Digital use:**

- Screen-based play and entertainment via TV content streaming, video-sharing platforms and games.
- Games and walled gardens (closed platforms – i.e., specialist services such as CBBC).
- Increasing independent use of devices without as much adult supervision.
- Independent communication with family and, as they get older, increasingly with friends and third parties.
- Number of children in this age group having smartphones or tablets increasing rapidly.²²
- Accessing the internet through game consoles.²³
- Growing set of images – including but not limited to photographs - which can include highly personal information.

Risks & challenges:

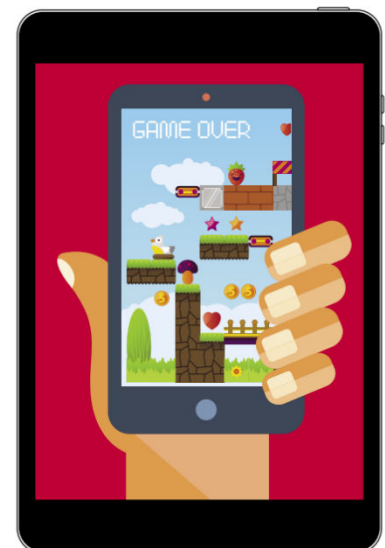
- Frequent users of the internet but have limited knowledge of online agencies.
- Children are predisposed to be compliant with safety messages from school/home, but if the risks aren't explained clearly, they create their own explanations.
- Children are unaware their web use is tracked and used for suggestions and ads.

²³ Games consoles are more widely used by 5-7-year-olds for going online and playing video games than 3-4-year-olds (Ofcom, Children and Parents: Media Use and Attitudes Report 2023)

- Limited critical understanding can mean that neither veracity of information, nor its purpose, is questioned and properly understood.
- Presence of ads presents a confusing proposition of a consumerist message, but one which is vetted by reputable platforms/providers.
- ‘Tech tantrums,’ reward loops and auto-plays make it difficult for children and adults to manage use because their evolutionary biology (need to react) is exploited by random rewards and interventions.
- Parents are uncertain of the best way to manage the dilemma of management vs autonomy, leading to family tensions around digital use.
- Internet filtering may be effective.
- Parents may overestimate their child’s ability to safely navigate online and consequently decrease their supervision and support around digital use.
- Unsanctioned use of images of children by third parties and/or AI.

Impact:

- There is no common culture of introducing children to having independent devices.
- Gaming is becoming a frequent topic of conversation for boys and girls.
- Because of a child’s in-built need to seek rewards, the ‘priming’ that is a precursor to gaming, betting and gambling is highly affecting. The ability to know when and how to stop and turn off may be compromised.
- Social norms and habits are being developed that may have future repercussions (sharing personal information, checking devices at night, posting pictures without privacy settings), with these more established habits harder to break in the future.
- Accessing unwanted or unsuitable content or contact can be frightening or, in certain cases, harmful.



10-12 Years

Children are:

- Generally trusting the information they’re given. Even though they are more likely to question what they see, they are still developing the ability to critically analyse information.
- Spending more time with friends, even though family are still an important source of influence. They are aware of social pressures and expectations and may change aspects of themselves to fit in and be accepted by peers.
- Experiencing more complex feelings about themselves and showing a dip in self-esteem as social comparisons increase.
- More aware of what’s ‘cool’ or not, and increased awareness of brands.
- Aware of the importance of an image and how to curate this.



Digital use:

- Having a personal device is a norm for this age group.
- Watching TV/films, playing games online.
- Open communication, including sharing messages and content with friends across a range of sites, including games, social media and private messages.
- Schoolwork and communications from the school.
- Starting to use the online environment to explore and develop their self-identity.

Risks & challenges:

- Unaware that searches may be visible to others and that preferences are being used for profiling.
- Limited understanding that most services are deliberately designed to extend their use.
- Find it hard to think of the longer-term consequences and instead seek immediate rewards e.g., impulsive use (sending photos, posting personal information), especially when these rewards are social, such as acceptance and approval from a peer group.
- Perception that their image falls short of those that inhabit their digital environment, so optimise/falsify their own profile to compete with them.
- Increase in family tensions around digital use as children want more autonomy.
- Personal privacy is not a priority compared to being connected.
- Misinformation, commercially driven information, and the ‘echo’ of personalised content feeds influence a young person’s understanding of global issues.
- Pornographic images impacting behaviours and expectations of sex for young people.
- Activity in private spaces out of sight of parents or community can lead to bullying or inappropriate content or contact.
- Digital products and services designed to extend use exploit the young person’s need to constantly react and respond (FOMO – fear of missing out).

Impact:

- Online groups (messaging or social media groups), notifications, and volume of content can become overwhelming.
- Children of this age may understand the cost of overuse, including interrupted sleep and offline activities, but may consider themselves to be the exception.
- Feelings of shame and embarrassment when unable to live up to expectations or agreed rules to moderate use.
- More tolerant of crude behaviour than older adolescents or younger children.
- ‘Testing’ social media to see what ‘image,’ ‘popularity,’ or impact one can have can lead to risky behaviours, such as sending nude images or giving out personal data.
- ‘Doom-scrolling’ or spending time looking at the social media profiles of others can reinforce isolation for the less socially confident.
- Lasting impact of cyberbullying or witnessing cyberbullying including anxiety and low mood.
- Pressure of matching online norms (self-image and/or behaviour).
- Online social media and gaming are used to ‘connecting’ to new people and interests.



13-15 Years

Young people are:

- Undergoing significant neuropsychological development impacting the way they perceive emotions and make decisions.
- Starting to show more sensitivity to risk, with some developing a more risk-averse preference and some developing a more risk-seeking preference.²⁴
- Characterised by idealism, with a tendency towards polarised thinking.
- More likely to experience mental health difficulties such as low mood or anxiety and will explore different ways to cope with these emotions, e.g., self-injurious behaviours.
- Still developing their awareness of others' perspectives, so may struggle to manage and resolve interpersonal difficulties.
- Highly dependent on peers for a sense of well-being. They need to feel as if they are part of a group – yet also want to be viewed as unique.
- Increasingly testing boundaries set by parents and other adults.
- Preoccupied by social comparison, which can affect their self-esteem.
- Thinking about sexuality, gender and identity.



Digital use:

- Phone is an essential tool for identity development, social information and education.
- Communications with friends, games, social information, TV/films, shopping, photos, music.
- Main source of news and factual information.
- Use social media for self-expression and to find inspiration, information and support.
- Self-generated images are routinely shared. The 'currency' of likes and ratings is very important.
- Schoolwork – homework and revision mainly hosted through apps.
- Using public Wi-Fi.
- Multiple accounts and identities.



Risks & challenges:

- Risk-taking – not accepting that risks apply to them.
- Limited understanding of 'ownership' of platform and app data retained by advertisers, platform owners and other digital services.
- Lack of critical thinking/knowledge about the quality and veracity of information.
- Unaware that digital profiles may be accessed by future education and workplaces.
- Choosing to access adult content yet unprepared for what they may see.

²⁴ 'Neural Correlates of Expected Risks and Returns in Risky Choice Across Development' by Anna C.K. van Duijvenvoorde, Hilde M. Huizenga, Leah H. Somerville, Mauricio R. Delgado, Alisa Powers, Wouter D. Weeda, B.J. Casey, Elke U. Weber and Bernd Figner
Journal of Neuroscience 28 January 2015, 35 (4) 1549-1560; DOI: <https://doi.org/10.1523/JNEUROSCI.1924-14.2015>

- Content filtering may be ineffective at this age.
- Family tensions about extended digital use.²⁵
- Access software/music etc., on illegal/unregulated sites to “get stuff for free.”
- Increased risk of bullying and increased pressure to consider body image and self-identity.
- Easy access to material which encourages inappropriate emotional regulation patterns, such as self-harm or disordered eating.

Impact:

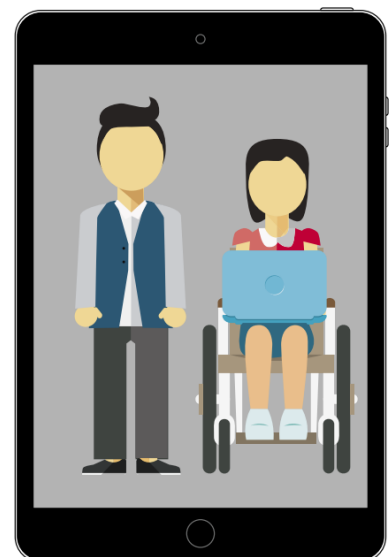
- Issue of parental control vs building autonomy. Parents think their adolescent child can manage their digital use themselves but then alternate this laidback approach with ‘authoritarian’ interventions to take back control, creating confusion about boundaries.
- Impulsivity/compulsion to seek rewards is still high.
- Strong focus on personal ‘brand’ – concentration on time spent curating an online presence.
- Public image can be discordant with sense of own identity, and this can lead to self-esteem difficulties.
- Vulnerable to excessive use, often aware when ‘over-using,’ but sometimes unable to stop.
- Producing excessive personal data/profiling.
- Potential for emotional contagion (positive and negative), including spirals of filtered information that may or may not be of high quality.
- Self-esteem can be affected by feedback from others online, including, but not limited to, cyberbullying.
- Withdrawal from face-to-face contact by less confident young people.
- Body image issues – increasingly aware of discrepancy between the ‘ideal’ and their own reality.
- Growing digital history, including unwanted or intimate images.



16-18 Years

Young people are:

- Presenting in a more adult way but have not yet fully developed longer sense of consequence as adults, and brain is still maturing into the mid-20s.
- Managing close partnerships in relationships.
- Taking risks fuelled by a sense of invulnerability.
- Strongly influenced by peers, with intense, intimate relations being prioritised. The family and family values are, however, still an important influence on behaviour.
- More likely to have found their social niche.



²⁵ A survey carried out in the US by Common Sense Media found that 36% of parents and 32% of teenagers reported that family arguments about devices occurred on a daily basis:
https://www.commonsensemedia.org/sites/default/files/uploads/research/2016_csm_technology_addiction_executive_summary.pdf

- More challenging of conventional wisdom and more trusting of peers.
- Experiencing emotional liability, with 16% of 17-year-olds reporting high levels of psychological distress and 24% having self-harmed in the previous year.

Digital use:

- Independence – parents give adolescents almost complete authority over screen use.
- Communications with friends, entertainment (games, news, TV/films), shopping.
- Learning/educational resources and information are largely accessed from a digital environment.
- Visual communication remains vital, and the ‘currency’ of popularity metrics is very important.
- Self-expression and identity-forming (e.g., networks and groups, civic engagement and online movements).
- Use social media to gain and maintain social support.
- Digital is a primary source of news, information and opinions.
- Avid users but a small percentage of maker contributions – particularly girls.
- Multiplayer gaming and gambling take up time and resources.
- Online gambling or gambling-style behaviours in gaming.²⁶



Risks & challenges:

- Risk-taking remains a feature influenced by a heightened sensitivity to social and environmental cues.
- May be unaware those who control apps own their public and private social media content.
- Adolescents unaware of universities and potential employers may search for their social media profiles as part of the admissions or recruitment process.²⁷
- Adolescents and parents may be unaware their web history is not private (IP law) and is stored for 12 months and searchable by councils and charities.
- Identity fraud risk increases as adolescents purchase more online and may have their own bank accounts or cash cards.
- Fear of ‘lack of privacy’ when accessing online support or information services can stop young people from getting the help they need, especially as more and more services go online.
- Content filtering and age gating may be ineffective at this age and may not be required in all jurisdictions.
- Overexposure to pornography, often depicting violence or aggression against women which, can instil or normalise problematic attitudes and behaviours.
- Family tensions about digital use as teens continue to exert growing independence and autonomy.

²⁶ Gambling Commission. (2018, November 21). *Gambling Commission publishes new report on children and gambling trends*. Gambling Commission; Gambling Commission.
<https://www.gamblingcommission.gov.uk/news/article/gambling-commission-publishes-new-report-on-children-and-gambling-trends>

²⁷ 40% of admissions staff said they look at applicants’ social media pages to learn about them. Kaplan Test Survey 2015 published January 2016.
<https://www.kaptest.com/blog/press/2016/01/13/kaplan-test-prep-survey-percentage-of-college-admissions-officers-who-check-out-applicants-social-media-profiles-hits-new-high-triggers-include-special-talents-competitive-sabotage/>

Impact:

- Continuing issues of parental control vs building autonomy.
- Impulsivity/compulsion to seek rewards remains high.
- Strong focus on personal ‘brand’ – concentration on time spent curating an online presence.
- Public image can be discordant with sense of own identity, and this can lead to self-esteem difficulties.
- Vulnerable to excessive use, often aware when ‘over-using,’ but sometimes unable to stop.
- Producing excessive personal data/profiling.
- Potential for emotional contagion (positive and negative), including spirals of filtered information that may or may not be of high quality.
- Self-esteem can be affected by feedback from others online, including, but not limited to, cyberbullying.
- Withdrawal from face-to-face contact by less confident young people.
- Body image issues – increasingly aware of discrepancy between the ‘ideal’ and their own reality.
- Growing digital history, including unwanted or intimate images.
- Require much more sophisticated age-appropriate information regarding the way that digital services operate and orchestrate their feelings regarding:
 - Self-esteem.
 - Cyberbullying.
 - Body image.
 - Impulsivity/compulsion.
 - Excessive use.
 - Identity, including gender and sexuality.
 - Removing oneself from social context.
 - Self-regulating made difficult by design.
 - Personal ‘brand’.
 - Producing excessive personal data/profiling.
 - Potential for emotional contagion.
 - Pressure to be performative or match online norms.
 - Shame for previous activities.
- In addition, there are anxieties about impending requirements of adulthood. This transition is not defined in the digital environment, with very few services (among exceptions for gambling, commercial pornography and financial services) distinguishing between a child and adult user.



Conclusion

Although the digital environment is now ubiquitous in children's and young people's lives, services are rarely designed specifically with their development needs in mind. This means that digital environments, though much loved by children and young people, can be confusing and sometimes hostile or overwhelming. The very public anxieties centred around pornography and grooming – shared by adults and children alike – leaves many of children's other anxieties unnoticed or belittled. These 'small' and 'unseen' demands and experiences can leave children battling with feelings they do not have the development capacity to tackle.

Excluding children and young people from the digital environment is neither desirable nor really an option. A 21st-century child needs to access and benefit from the opportunities it offers. To do so, they must have the skills and knowledge to navigate this environment but, more importantly, it must be responsive to their needs at all ages and stages of their development.

Nor should children's access to the digital environment be predicated on the basis of adult maturity to manage the impact of what they do or see. The responsibilities of children must be age-appropriate and weighed against the contexts in which they find themselves. Similarly, while parents and teachers have responsibilities to help children make good choices in their lives, both on and offline, they cannot fulfil those responsibilities in an environment that is entirely designed to engage adults.

Ultimately it is the responsibility of all who provide digital services and products to design them with children in mind, by design and default and the responsibility of governments to ensure that children and young people can manage the journey in the digital environment and with the same privileges, protections and rights as they enjoy in the offline world.

Recommendations:

- 1. Policymakers use childhood development milestones when developing and drafting policy.** They must look beyond the 'harms' and safety agenda and align legislative and regulatory interventions to childhood development needs.²⁸ This means taking a rights-based approach, which considers a child's evolving capacities and participation rights as set out in *General comment 25 on children's rights in relation to the digital environment*.²⁹
- 2. Industry uses its creativity and innovation to put the well-being of children at the heart of the design of services.**³⁰ It must consider the age of users in all product development and service design. This should include giving children a high level of privacy by default and using positive nudges to enhance their well-being. Services must uphold their own age restrictions and be designed to be responsive to the needs and capacities of different age groups.³¹

²⁸ The UK's [Age Appropriate Design Code](#) was the first Code of Practice of its kind (applying to Internet Society Services likely to be accessed by children) to reference childhood development milestones. It specifies "the different needs of children at different ages and stages of development should be at the heart of how you design your service and apply this code."

²⁹ UN Committee on the Rights of the Child, [General Comment No. 25 on children's rights in relation to the digital environment](#) (2021).

³⁰ Livingstone, S. & Pothong, K. (2023). *Child Rights by Design: Guidance for Innovators of Digital Products and Services Used by Children*. Digital Futures Commission, 5Rights Foundation

³¹ In 2021, the Institute of Electric and Electronic Engineers (IEEE) published [standard 2089 for an Age Appropriate Digital Services Framework](#), which introduces practical steps that companies can follow to design digital products and services that are age appropriate.

3. Children’s experiences and views inform policy development and innovation.

Policymakers, legislators, regulators, as well as designers and innovators, should actively engage and involve children, listen to their views and give them due weight when developing legislation, policies, programmes, services and training.³²

The responsibility we have to meet and encourage the developmental needs of children in the digital space is the price of doing business. It is the responsibility of national and devolved governments. It is a cultural and economic necessity because the future is digital, and the next generation must be able to navigate that environment creatively, knowledgeably and fearlessly.

³² Third, A and Moody, L (2021). Our rights in the digital world: A report on the children’s consultations to inform UNCRC General Comment 25. (London and Sydney: 5Rights Foundation and Western Sydney University).

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