NOVEMBER 2021

Playful by Design®

Free play in a digital world

DIGITAL FUTURES COMMISSION
Innovating in the interests of children and young people

5RIGHTS FOUNDATION

The Digital Futures Commission

The Digital Futures Commission is an exciting research collaboration of unique organisations that invites innovators, policy makers, regulators, academics and civil society to unlock digital innovation in the interests of children and young people.

Commissioners

Suggested citation:

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

Illustrations by Curtis Rosenthal

Contents

"When you're playing with other people, you have other people's perspectives. But when you're playing by yourself it's all your imagination." – Girl, 13 years old

Foreword

To change the world, you must first dream.

So often, the digital world of children is stated in binaries – on or offline, good or bad actors, opportunity or harm – but the lived reality of children is much more complicated. Where on and off can be seamless and simultaneous, too much of a good thing can be bad, or something meant for one purpose can be hacked for another: sometimes with harmful outcomes, and sometimes joyous.

It is with full understanding of this complicated context that Playful by Design® has been researched, developed and written. It is unlikely that it will be the last thing written about free play in the digital world, but it is certainly among the first. The subject of play has a rich academic history. It is intrinsic to development, learning, socialising and recreation. It comes in an infinite number of forms and changes throughout life. This richness has not been fully realised in childhoods increasingly dominated by digital technologies and where, in the imagination of many, play has simply come to mean gaming.

Playful by Design makes the case for taking a broader, and in many ways more optimistic, view. It concentrates its energy on identifying the qualities of free play that could and should be enriched and expanded to make play online more child-centred. It highlights acts of play such as Zoom hide-and-seek or tag. A vision of free play online necessarily involves identifying the features of the online world that routinely intrude on or jeopardise the possibility of free play. The authors of Playful by Design are clear that play online, just like play offline, can and probably should be a mixed economy – the spectre of play as a narrow range of pre-determined commercially driven outcomes is disheartening.

At the heart of the research is what children themselves say. They clearly identify their need to play in ways that perhaps adults don't understand or that some digital designs deny. But children and young people are consistent in their call: they want, need and love digital services and products, but these should be more respectful, private and safe.

Children and young people could not be clearer. They want digital products designed to enhance the qualities of play and at the same time want those aspects of design that are exploitative or invasive to be dialled down. Neither they nor we want a completely 'wholefood experience', nor to turn back the clock to an offline world. As the report shows, whether or not children can identify specific features such as autoplay, automated notifications, in-app purchases or nudges to share, they feel the pressure to stay on even when they want to stop and deplore that they cannot explore freely or experiment with diverse experiences without being subject to commercial pressures or the loss of personal safety.

As you will discover in the pages of this report, the joy and desire to play freely is essential to children and childhood and the prospect of making the digital world playful by design is within our grasp.

Thanks are due to the Digital Futures Commissioners for their extraordinary interest and insight into this work over many months, the team at 5Rights for their excellent support, the report's authors, Professor Sonia Livingstone OBE and Dr Kruakae Pothong, and the many experts who contributed to our thinking. But as always, our greatest thanks go to the many children and young people who engage with our work: your creativity and observations are our inspiration as we seek to build the digital world you deserve.

– Baroness Beeban Kidron OBE

> **"What the future's going to bring. It's going to be ridiculous. It's going to be crazy. If someone brings their kid up without any technology in their life, they're going to have a hard adulthood, I feel like. I feel like being a kid and exploring that mindset of being a kid helps you grow and helps you experience what you can actually do with your life."** – Young man, 18 years old

Imagine school break time. Released from lessons, the children rush outside. They run, jump, shriek. There's talking, laughter, whispered secrets. They group and re-group freely. Sudden bursts of activity are mysterious to outsiders. Benches become castles, corners are 'home', borders are chalked on the tarmac. The rules of the game are created and broken at will. It can be emotional, intense, absorbing, unpredictable.

In the unpromising space of grey tarmac and wire fences, and in the limited times allowed to them, children create their own worlds of meaning and belonging. Some children are excluded. Some seek a quiet spot all to themselves. What looks to adult onlookers like fighting is mostly play-fighting, though occasionally, the teacher on duty must step in. A swirl of sound rises from the playground, instantly recognisable to passers-by, resonant across the generations. This is free play.

Where are these opportunities in digital environments? Do the conditions that facilitate free play in the playground occur in similar or distinctly different forms online? How can we design digital opportunities for children to group and re-group as they choose, creating and breaking rules, with bursts of activity and swirls of sound, enabling creative worlds of meaning, risk taking and belonging? Where is the good practice we can learn from, and what challenges exist in this sphere?

Play is a vital way that children enjoy and express themselves, develop and learn, build relationships and participate in the world. When we tell people that the Digital Futures Commission began its work focusing on play, their eyes light up, suggesting widespread recognition of the value of play in childhood. Yet this recognition cuts little ice when setting the policy priorities that shape children's lives in education, social care, urban planning and, now, the design and management of the digital environment.

In developing our vision for children's play, we hope to change the narrative that shapes children's opportunities by inviting new imaginaries among digital providers, policy makers, professionals who work with children and the public. This is not to be idealistic: our vision is evidence-based, balanced, practical and, above all, responsive to the views of children and young people. They want and deserve better opportunities to play in a digital world.

– Professor Sonia Livingstone OBE

Executive summary

Playful by Design® looks specifically at the intersection of free play and the digital world. It takes the main qualities of free play and reveals where they occur and where they are undermined in the digital lives of children.

The purpose is to **understand what children value and enjoy about free play** and **to make evidence-based recommendations to the designers** of digital products and services to improve children's opportunities for free play and **overcome the inhibiting factors** that children report.

Children's play has a rich history and takes infinite forms, ranging from formal games and sporting competitions to informal play with cardboard boxes or in muddy streams, make-believe games or out and about with friends. **Children's play is vital** for their development, learning, self-expression and sense of belonging. It includes, but is also broader than, activities formally organised as games.

But not all is well in the world of play. Green spaces have been disappearing. Children are driven long distances to school. Free time has been sacrificed to the demands of the school curriculum. Parents fear letting children play by themselves. Commerce demands children

grow up earlier. Where play is supported, this is often to serve adult agendas, whether health, education or commercial. In short, what is generally understood as 'free play' – child-led, imaginative, voluntary, open-ended – is particularly under threat.

As children spend more time playing online, it is imperative to ask what this means for the quality of their play. Can they play freely in digital contexts? What do they especially enjoy about playing online and what frustrates them? Could the digital environment be better designed to enhance and not undermine children's free play?

Playful by Design takes a child-led approach. Two literature reviews, extensive expert consultation and public consultation with parents and carers underline the findings from workshops with children and a national representative survey of 6 to 17-year-olds across the UK.

This report is underpinned by **three assertions about free play**: Children have a right to play. The UN Convention on the Rights of the Child (UNCRC) defines play as "any behaviour, activity or process initiated, controlled and structured by children themselves."; Children want and need to be active participants in the digital world; The digital world can and should be designed to support children's agency and free play.

12 qualities of free play are identified: intrinsically motivated; voluntary; open-ended; imaginative; stimulating; emotionally resonant; social; diverse; risk-taking; safety; sense of achievement; immersive. These qualities of free play give us a language for what 'good' looks like in a digital world. They set out ambitious expectations for children's free play in all contexts.

Children, parents and professionals all told us that digital play allows them to get together with friends, and it can be imaginative and stimulating in ways that children really enjoy. But both children and adults also have real concerns, including about the lack of choices available to children and their safety in digital spaces, and about the presence of multiple features that inhibit their free play.

Fewer than half (45%) of the 6 to 17-year-olds surveyed agreed a lot that they had a great time playing online, while almost three quarters (73%) had a great time playing 'in real life' (i.e. in a non-digital context). 69% of 6 to 17-year-olds say they find it hard to stop playing even when they've had enough, and 45% say that their digital play can bother or upset them. 44% of 6 to 17-year-olds say they cannot be naughty or break any rules when playing.

This report focuses on the opportunities to improve the **design of digital products and services** used by children. To that end, it highlights 22 design features used in many digital products and services.

The top demands from children aged 10–17 are:

- 62% want more features that are easy to use.
- 58% want more creative opportunities.
- 58% want more age-appropriate features.
- 56% want more affordable products and services.
- 45% want more products and services without advertising.
- 44% want better control over who can contact them in the game or app.
- 42% want more products and services that are kind, enable intergenerational play, and where people feel included.
- 42% want products and services that do not share their data with other apps or businesses.

Commenting on the findings for **eight popular digital products and services, experts call for:**

- more effective filter and moderation mechanisms to detect hate speech and harmful contents and to prevent these reaching children
- specific safety-enhancing features for users rather than overarching mechanisms that restrict children's beneficial play
- adaptable settings so that users can choose notifications or alerts relevant to them, and set and adjust limits on their own digital engagement
- nudges that encourage creative and stimulating experiences rather than compulsive practices that keep players returning to the game and spending money on it.

To claim the label 'Playful by Design', digital products and services should adopt seven key recommendations:

Be welcoming: Prioritise digital features that are inclusive, sociable and welcoming to all, reducing hateful communication and forms of exclusion and reflecting multiple identities.

Enhance imagination: Prioritise creative resources and imaginative, open-ended play over pre-determined pathways built on popularity metrics or driven by advertising or other commercial pressures.

Enable open-ended play: Provide and enhance features that offer easy-to-use pathways, flexibility and variety as these support children's agency and encourage their imaginative, stimulating and open-ended play.

No commercial exploitation: Reduce compulsive features designed to prolong user engagement or cultivate dependency on games, apps or platforms, so children's immersive play is intrinsically motivated and freely chosen.

Ensure safety: Ensure children's play in online spaces is safe, including by giving them control over who can contact them and supplying help when needed.

Allow for experimentation: Recognise that exploration, invention and a degree of risk taking is important in children's play and that the burden should not fall on them always to be cautious or anxious, or to follow rules set by others.

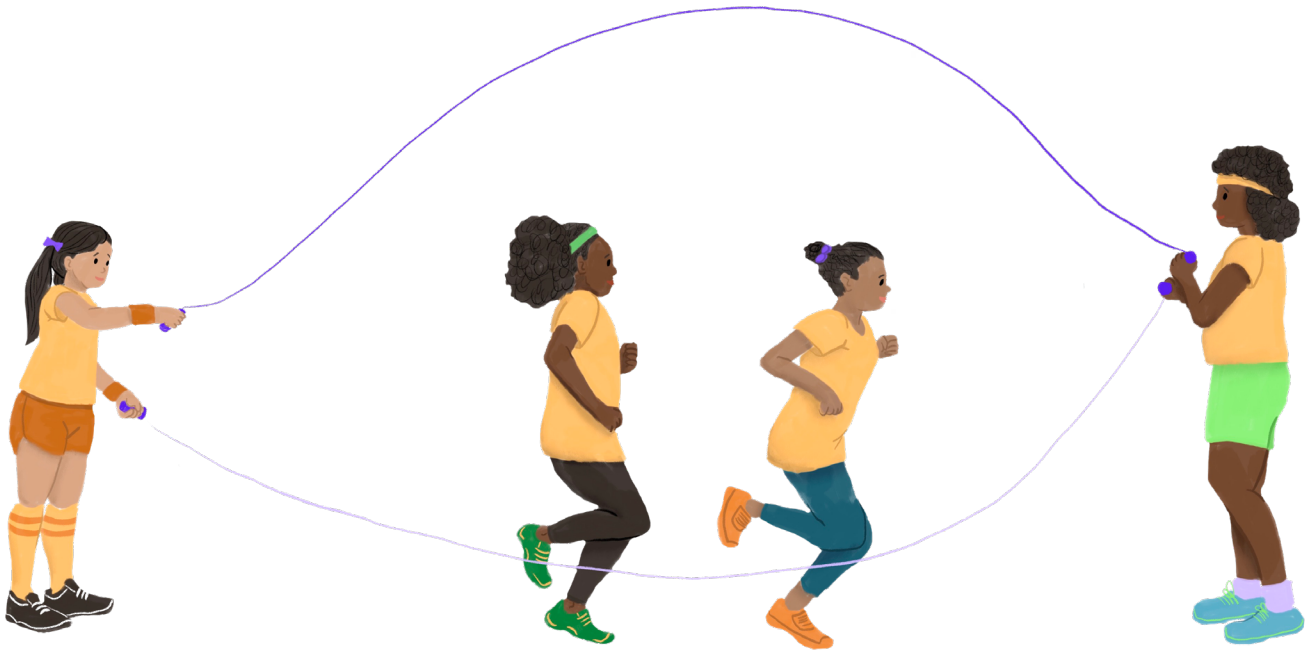
Be age-appropriate: Respect the needs of children of different ages by providing age-appropriate opportunities for play, while also allowing for safe intergenerational play.

These high-level principles of Playful by Design set out design objectives based on what children require to fully and freely enjoy play with digital products and services. We invite designers of digital products and services to work out the means to facilitate children to exercise their agency and grow and develop through play.

This report does not call for a nostalgic return to pre-digital days, nor do the authors wish to wrap children in cotton wool so nothing risky or immersive or unexpected can occur. Instead, it draws attention to the fact that the design of digital products and services for play sits within a wider context of products and services that may not be intended for children, provided by businesses that may not put children's best interests ahead of commercial interests or the demands of the 'attention economy'.

Children want, need and enjoy digital play of many kinds. They expect the digital world to give them meaningful and imaginative opportunities, to welcome their participation and support their agency, and not to channel them down highly orchestrated and overwhelmingly commercial pathways that undermine their creativity, sociability and intrinsic motivation to play in ways that they themselves decide.

Those who design and promote digital products and services have a responsibility and a wonderful opportunity to make childhood Playful by Design.



What is free play?

> **"Hide and seek – that game has just been around for so long, and children still love it. You can do it anywhere and just explore. Part of being playful is just being free and not having to be serious, I think."** – Girl, aged 15

Play manifests in various forms and changes according to the evolving capacities, interests and circumstances of the players, as well as the opportunities available to them. In one way or another, across history and geography, culture and class, children seek out playful moments within their daily lives whatever their circumstances. What's important is the opportunity

> **"to invent, improvise, adapt, be creative with the world around you and with the world inside your own head."** – Rosen, 2019

In the Digital Futures Commission's report, *A Panorama of Play*, Kate Cowan (2020, p. 8) explains that

> **"[although] play is often seen as a distinct activity, it can also be considered a disposition, attitude, mode of experience or state of mind... Play is not necessarily a singular or discrete activity but can be thought of as being interwoven throughout daily life."**

There is no 'hard-and-fast' dividing line between free play (also called child-initiated play or spontaneous play) and play designed by adults to achieve particular outcomes. The United Nations Committee on the Rights of the Child defines play as

> **"any behaviour, activity or process initiated, controlled and structured by children themselves."**

This prioritises the importance of free play for children and childhood, in contrast to children's play as harnessed and directed by adults for learning or health or, indeed, for commercial gain. As Cowan (2020, p. 11) observes, "children's own conception of play is what adults more often call 'free play' – activities where freedom and agency are high, and adult involvement is minimal."[1]

In focusing on free play, we draw on insights articulated by influential thinkers throughout history regarding its importance and its ability to facilitate children's social, emotional, physical and cognitive development. In ways shaped by their diverse cultures and contexts, these ideas have inspired child-centred interventions in education, urban planning, family policy and toy design to enhance opportunities for children's agency and fullest development. As Colvert (2021, pp. 34-35) sets forth in the review for the Digital Futures Commission:

> **"Playgrounds and streets have always offered children material resources that can be creatively integrated into games. In this, features of the landscape such as benches, signs and trees become highly significant, even mythologised, as children draw on their cultural understandings of the world."**

But design interventions for free play are yet to attract much attention or inspire sufficient interventions in the digital environment, where young internet users are typically conceived either as a profitable market or as an interloper in spaces designed for adults.[2]

We fully recognise the increasing overlap and connections between digital and non-digital contexts for play – hence our overriding emphasis on 'free play in a digital world'. Nonetheless, to invite fresh thinking specifically about the provision and design of digital products and services that either enable or undermine children's play, and to build on long-established knowledge and expertise concerned with play in physical (i.e. historically non-digital) contexts, we distinguish these contexts analytically.

[1] In this report, our focus is on 'free play', although we occasionally use the term 'play' for simplicity.

[2] We build on work that already fosters this agenda (Bulger et al, 2021; Burn, 2020; D4CR Association, 2021; Ito et al, 2010; Marsh et al, 2020; Salen Tekinbaş, 2020), also acknowledging research that shows how problematic the digital environment can be for children and young people: 5Rights Foundation (2021b), Chester et al (2021) and Lenhart & Owens (2021). See Colvert (2021) for a thorough review.

Playing with a cardboard box

This image of a girl playing with a cardboard box was the favourite out of seven illustrations of free play that we showed participants in our public consultation. It seemed to unlock overwhelmingly positive comments from children, parents and professionals who work with children across all ages and walks of life.

"I sat in the little box, just pretending to fly off into space... It becomes its own sandbox environment... It allows the imagination to go completely wild with it because it's not dealing with any constraints." – Boy, aged 17

"I always loved having a cardboard box because I could draw all over it, and it wouldn't matter." – Girl, aged 12

"That was actually my favourite image because... anything could be in that box, so it's quite exciting." – Youth worker

"My five-year-old, he takes everything out of the box. And he'll sit in the box and say, mama, I'm driving a car." – Mother

"I like the cardboard box thing as well... I used to just make my own world most of the time and just used to play role-play with my teddy bears and stuff." – Girl, aged 14

"If a cardboard box turns up in this house, it'll get turned into something. We've made some great castles and stuff like that." – Father of two children

"Each individual child will work out just exactly the potentiality of what that box could be." – Theatre professional

Why free play matters

Play matters to children:

> **"When you're playing, you kind of have a more creative side open up to you, and you have a goal that you're trying to do at the same time."** – Boy, aged 13

> **"When I play with my little sister... she's more carefree. So, I indulge in that, but I miss it, being just carefree and just playing however you want."** – Girl, aged 16

It matters to parents too:

> **"Play often feels chaotic when it's viewed from the outside... They're hunting a giant squid, or they're pharaohs. That's when they have their biggest moments of joy."** – A mother and drama educator

The nature of play has been theorised by diverse disciplines and as part of professional practice in theatre, psychology, social work, therapy, urban design, toy production, and more. Our report, *A Panorama of Play,* reviewed this literature from multiple perspectives and throughout history (Cowan, 2020). It identified a rich debate over why play matters, encompassing:

- play as necessary for child development
- play as a spontaneous mode of self-directed learning
- play as an effective means of teaching and guidance
- play as therapeutic
- play as a contribution to and enactment of wellbeing
- play as a child's right.

The importance of play for children's agency and fullest development is central to each of these. Yet precisely for this reason, children's agency and motivation to play is often harnessed to meet objectives formulated by adult society. These often concern children's learning, development or wellbeing, although play can also be co-opted to serve other institutional or commercial interests.[3]

We have no quarrel with adult-led or guided play in principle. Indeed, in calling for Playful by Design, we rely on design interventions from digital providers, just as those advocating for children's free play in the urban environment seek new designs for streets, playgrounds and traffic that enable rather than undermine child-led play. Still, it is significant that children themselves – and the UN Committee on the Rights of the Child – use the everyday term 'play' mainly to refer to play led by children and evaluated in their own terms. The question is, can we design opportunities for digital play that are child-led and that prioritise children's agency and choices?

To illustrate our question, consider that a cardboard box offers children accessible and open-ended opportunities to play in ways that they value and enjoy. What would it take for children to find such opportunities online? Do the opportunities that children have already found online need to be redesigned to respect, protect and fulfil their rights?

This research has been conducted at a time of decades-long transformation, owing to three complex, ongoing and interlinked societal shifts that have severe consequences for children's play:

- Children's free time and freedom of movement in the physical environment has been increasingly eroded. Children are spending less time outside and offline for multiple reasons to do with increased traffic, reduced public transport, cuts to community support for children's play, building over sports fields and green spaces, and actual or feared threats to children's safety outside the home.[4]
- Children are spending more time online, for multiple purposes, including play, in part driven by technological innovation and the huge expansion in networked infrastructures and digital businesses, notably fuelled by digital marketing and the data economy. Not only are the providers of digital services and products often extremely powerful, but the digital environment also includes few open or unattended spaces since everything is proprietary and 'enclosed'.[5]
- Online and offline are fusing, as children's lives are becoming systematically reliant on the digital environment. This is most obviously because of the ubiquity of mobile (mainly smartphone) technologies, but also because of public and private sector transformations in intelligent (AI-driven), datafied, surveillant and other kinds of 'smart' environments. The results include developments in persuasive design, the algorithmic maximisation of attention and the monetisation of personal data.[6]

Constraints on children's free play have been exacerbated by the COVID-19 pandemic, adding new urgency to our inquiry. But the imperative to enable children's free play in a digital world has longer roots and will surely extend far into the future.

This report focuses on child-led or 'free play' for three reasons. First, adult-defined play tends to occupy most of the attention and resources available for play, leaving little time or space for child-led play. Children are inevitably dependent on resources controlled by adults, who may seek to harness their play for particular purposes, or who misunderstand their activities or undervalue them as 'just playing' or 'only playing'.[7] This tendency to undervalue children's play applies just as much or even more online.

[3] See Buckingham et al (2010), Cowan (2020) and Sefton-Green (2020).

[4] See Mullan (2019)4, Shackell et al (2008) and Skeels (2021). In many parts of the world, opportunities for free play have long been scarce, constrained by poverty or other forms of disadvantage or difficulty. But even in wealthy countries, opportunities for free play are under threat from increased pressure on educational outcomes, reduced safety on the streets and the erosion of public and informal play spaces. The British Children's Play Survey found children enjoy less independent play, and play outside on average two years later than their parents did (Dodd et al, 2021). Since 1995, school break times have been cut by up to an hour per week to increase lesson time (Baines & Blatchford, 2019). Gill (2021) maps the principles and practice of child-friendly planning and design in cities.

[5] See Office of Communications (2020a) and Zuboff (2019).

[6] See Barassi (2020), Bengtsson et al (2021), Dinsmore & Pugh (2021), Dodd et al (2021), Mascheroni & Siibak (2021), Williamson (2019) and Zuboff (2019).

[7] See Cowan (2020), Third & Moody (2021) and Wall (2019).

> **"If the value of play was better understood, then we wouldn't be treating children as commodities and things that have to race to become adults."** – A mother of two children and early years support worker

Second, the risky dimension of children's free play attracts adult disapprobation and restriction in so far as it contradicts adult-defined values and purposes, even though this is important:

> **"Free play often involves making and breaking rules, playing with possible scenarios, and acting both creatively and destructively. Such qualities can mean play has an anarchic, chaotic, rebellious or purposeless appearance to adults. It may be rude, messy and noisy, and may challenge expectations or conventions."**[8]

In relation to the physical environment, the importance of both risk taking and safety have led to a growing consensus for risk-benefit analysis rather than blanket restrictions. This argument is less developed in relation to the digital environment. This is partly because the nature of online risks makes them difficult if not impossible for children, parents and carers to identify and manage. This in turn stems from the sheer pace of technological innovation, combined with the fact that efforts to regulate the digital environment are still at an early stage.[9]

Third, we observe the ways in which commercial interests, which may (but often do not) serve children's best interests, are especially powerful in influencing the provision of play opportunities in the digital environment. As required by General Comment 25 (para 12),

> **"States parties should ensure that, in all actions regarding the provision, regulation, design, management and use of the digital environment, the best interests of every child is a primary consideration."**

[8] See Cowan (2020, p. 11).

[9] See 5Rights Foundation (2021b), Livingstone & Blum-Ross (2020) and Livingstone & Stoilova (2021).

The child's right to play in a digital world

- UNCRC (Article 31) requires that "States Parties recognise the right of the child to rest and leisure, to engage in play and recreational activities appropriate to the age of the child and to participate freely in cultural life and the arts" (UNCRC, 1989, Article 31).[10]
- The UN Committee on the Rights of the Child calls on governments and businesses to "ensure that digital technologies and services intended for, accessed by or having impact on children in their leisure time are designed, distributed and used in ways that enhance children's opportunities for culture, recreation and play" (2021, para 108).

As with all Convention rights, the right to play must be understood holistically in relation to children's other rights.[11] The guiding principles of non-discrimination (Article 2), best interests (Article 3.1), and the rights to life, survival and development (Article 6), and to be heard (Article 12) apply as much to play as to children's civil rights and freedoms and their rights to privacy and protection from harm. Efforts to realise these and all other rights must take into account children's evolving capacity, balancing children's need for parental guidance and their growing independence (Article 5).

Children's right to play has previously been considered a 'forgotten right' (Hughes, 1990). Children often lack the time, space and resources to play as they wish or need. The United Nations Committee on the Rights of the Child (2013) has been "concerned by the poor recognition given by States to the rights contained in article 31 … [which] results in lack of investment in appropriate provisions, weak or non-existent protective legislation and the invisibility of children in national and local-level planning" (General Comment 17, para 2).

The right to play applies equally in the digital environment, where global businesses are often the primary actors, challenging the jurisdiction of states, and where users' ages and circumstances may be unknown to digital providers, challenging their provision of age-appropriate services. During the drafting of General Comment 25 on the digital environment, children told the United Nations Committee on the Rights of the Child (2021) that "adults may not understand the importance of digital play and how it can be shared with friends" (para 106), thus compounding neglect of the right to play in society's widespread misunderstanding of children's play in digital contexts.

General Comment 25 (United Nations Committee on the Rights of the Child, 2021) highlights six ways to promote children's play in the digital environment:

- Value the qualities of free play and children's own views of their play (para 106).
- Identify the benefits of free play in the digital environment (para 107).
- Develop guidance for professionals, parents/carers and digital providers (para 108).
- Ensure a balance between digital and non-digital play (para 109).
- Promote 'playful by design' and minimise 'risky by design' (para 110).
- Position digital play within a child rights framework (para 111).

Playful by Design addresses each point on this agenda and invites digital providers, designers and policy makers with the power to realise children's best interests and right to play to take it forward.

[10] General Comment 17 explicitly calls governments' attention to the qualities of play – creativity, imagination, experimentation, enjoyment, spontaneity, emotional balance and more. Governments must support play's vital role in learning, social interaction, cognitive and physical development, self-efficacy, and fullest development for all children without discrimination or exclusion (United Nations Committee on the Rights of the Child, 2013b; 2021)

[11] The UNCRC is binding for all governments worldwide, except the USA, which has not ratified it. It addresses governments as the primary duty bearer for children's rights, notably in relation to education, health, law enforcement and welfare, and it recognises further duty bearers including businesses and parents.

Our approach

Our starting point is the wealth of everyday play experiences that are important to childhood. This is not out of nostalgia nor technophobia, but rather to expand current horizons regarding 'digital play' by building on the rich history of knowledge about play across contexts. This allows an assessment of whether children enjoy and benefit from all the qualities of free play when they play online.

We ask:

1. What are the qualities of free play, and how do they manifest in a digital world?
2. Which features of the digital environment enable or impede free play?
3. How can the digital environment be redesigned for children to play freely?

Our primary audience is the designers and providers of digital products and services.[12] We hope to inspire them to find new ways for children's free play to thrive, by showing which levers designers can push to improve and enrich children's opportunities through Playful by Design. We also hope to inform and inspire the public, policy makers, educators and professionals who work with children to create and resource better conditions for children's play in a digital world.[13]

[12] Many of the digital products and services that children use are highly profitable. For example, six of the eleven gaming apps in the top 20 digital products and services used by children (Dubit Trends, 2021) are flagship products of the ten largest video game companies in the world, based on their revenues. These include Minecraft (Microsoft), Fortnite (Epic Games), Call of Duty (Activision Blizzard), FIFA (Electronic Arts), Mario Games (Nintendo) and PlayStation (Sony). Of these companies, Sony, a Japanese electronics developer and supplier, raises the biggest revenue: USD 25 billion in 2021. Following in descending order are: Nintendo (USD 12.1 billion), Microsoft (USD 11.6 billion), Activision Blizzard (USD 8.1 billion), Electronic Arts (USD 5.5 billion) and Epic Games (USD 4.2 billion). For companies' revenue in 2021, see All Top Everything (2021).

[13] For more, see our research agenda (Digital Futures Commission – 5Rights Foundation, 2020).

Our methods

In each step of the research, our logic was to imagine free play broadly, including in non-digital contexts, and then to examine eight popular and diverse digital products and services with which children engage playfully. We held a public consultation with children and young people, parents and carers, and professionals working with children.[14] Quotations in the report are from the consultation.

- In spring 2021, we heard from 126 participants around the UK, half of them children (aged 3 to 18 years old), the rest parents, carers and professionals who work with children, all selected to maximise the diversity of voices and experiences.
- They told us the barriers they face, what is important to them, and what changes they want. Their views of play in digital and non-digital contexts provide a mandate for this report.

In parallel, we interviewed experts and advocates concerned with children's play across contexts.

- We learned from advocates of free play about the design of the physical environment, including urban planning, domestic architecture, adventure playgrounds and child-friendly cities.
- We learned from designers of digital games about ongoing efforts to transform children's play by redesigning the architecture of the digital environment and the barriers they face.

We also commissioned two multidisciplinary academic literature reviews to reveal what is known or not known, agreed or contested, established or uncertain (Colvert, 2021; Cowan, 2020):

- *A Panorama of Play* reviewed the history of thinking about free play to understand its importance in children's lives. This report identified the qualities of free play.
- *The Kaleidoscope of Play in a Digital World* reviewed research on how the qualities of free play manifest in the digital environment. This identified the design features shaping children's play.

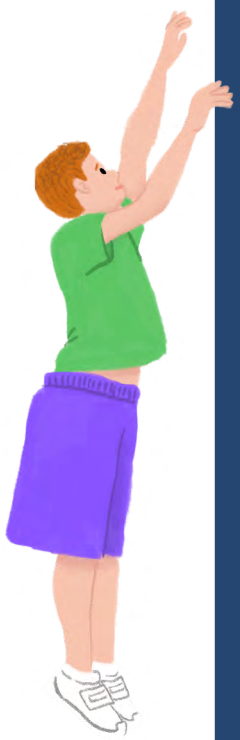
We then formulated and tested a provisional analysis by commissioning a national survey:

- In summer 2021, we surveyed 1000+ children aged 6 to 17 years old, using a nationally representative online panel survey. This provided quantitative findings of how children judge digital products and services ('apps') for their qualities of free play and the digital features that enable or undermine these.

Finally, we returned to the experts to check that our conclusions were robust.

Note that following the UNCRC, we define 'a child' as those aged 0–17. 'Parents' includes parents, carers and those responsible for a child's care. Knowing that older children use the word 'play' less, we talked to them also of being playful and playing around, to recognise its continued importance in their lives. We focus on children's play in the UK to keep our work practical and situated, although we hope those elsewhere will find it valuable.

For more on our methods, see the annexes to this report.



[14] See Livingstone & Pothong (2021). This was informed by our review of prior public consultations which revealed children's concern at their lack of agency in a digital environment rarely designed for their best interests (Mukherjee & Livingstone, 2020).

The qualities of free play

The Digital Futures Commission report, *A Panorama of Play*, identified eight qualities of free play from existing play literature, intending "that these can be put at the top of an agenda for providing and nurturing play, including play in a digital world" (Cowan, 2020, p. 31).

Accordingly, free play is:

1. **Intrinsically motivated:** I play like that because I want to.
2. **Voluntary:** I can start and stop playing when I want to.
3. **Open-ended:** When I play like that, I have the power to make up what will happen next.
4. **Imaginative:** I use my imagination when I play like that.
5. **Stimulating:** Playing like that can be an exciting or challenging experience.
6. **Emotionally resonant:** I have a lot of different feelings when playing like that.
7. **Social:** I like talking with other people about playing like that.
8. **Diverse**: People can be playful in different ways that are important to them.

Children told us in the public consultation how they seek these eight qualities when they play in digital and non-digital contexts, but they also identified four further qualities. The first two were **risk taking** and **feeling safe** in their environment. These qualities are not contradictory – one needs a degree of safety to be able to take risks, and a degree

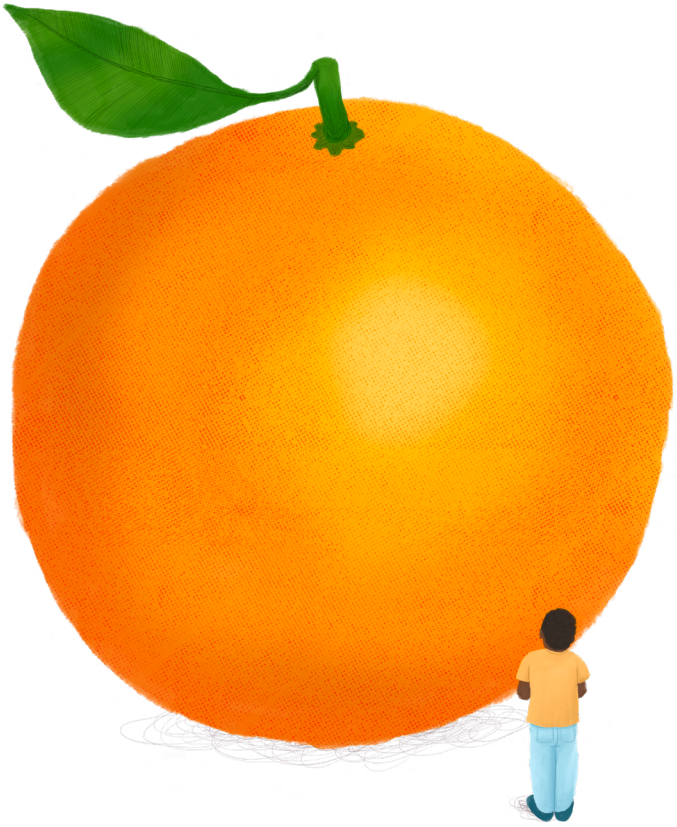
of risk taking is vital for growth. We also heard from children how they relish a **sense of achievement** in their play and how they **love to be immersed** in another world, whether alone or with others.

9. **Risk taking:** When playing, I can be naughty or break some rules without being told off.
10. **Safety:** I feel safe when I play like that.
11. **Sense of achievement:** After playing like that I feel really happy that I've achieved something.
12. **Immersive:** When playing like that, I feel like I'm in a different world

These four additional qualities are not entirely new to the play literature (Csikszentmihalyi, 1996; Gordon & Esbjörn-Hargens, 2007; National Playing Fields Association & Children's Play Council, 2000; Sandseter, 2009; Stephenson, 2003) and, in one way or another, each was discussed in *A Panorama of Play* (Cowan, 2020). For example, Cowan (2020, p. 30) observed that "each of these qualities affords possibilities of play which adults may regard as transgressive or risky, and that negotiating established norms and constraints is an important dimension of children's free play."

Combining these sources generates 12 qualities of free play, as documented in Annex 2. These prototypical qualities of free play encompass vital dimensions of children's play experiences, although they may not be exhaustive, absolute or universal.

The twelve qualities of free play



How do the qualities of free play manifest in a digital world?

In principle, the qualities of play apply across digital and non-digital contexts. But it is important to acknowledge that children do not always find it meaningful even to assert a boundary between contexts. Parents and professionals, on the other hand, still distinguish where play happens – in digital or non-digital contexts – and tend to attach greater value to play in a non-digital context over play in a digital environment.

Findings from the public consultation

The cardboard box conjures many of the qualities of free play – imagination, freedom, immersion and more. But when we asked participants in our consultation about the online equivalent of the cardboard box, most couldn't think of anything. That seems significant in and of itself. Does the digital environment really lack such open-ended and imaginative opportunities for free play? One exception was a 17-year-old boy who told us:

> **"I can see the comparison [of] the box with Minecraft. That's very much a mix. I said it was a sandbox, it opens your imagination. You can build whatever you**

want. If you wanted to build a ten-foot replica of an orange, you could do." – Boy, aged 17

Some other analogies hold too – for instance, between 'hide and seek' in traditional and digital play:

"You can play hide and seek on Roblox, and I do it regularly. I actually feel the same level of, oh my God, they've just run past me." – Girl, aged 18

"You might be playing a first-person shooter... then your friends would hide around the map, and then you'd try and find them and kill them... It's just the anticipation of finding them in some stupid spot or just scaring them when you do find them." – Boy, aged 16

In addition to seeing parallels across digital and non-digital contexts, children often wove together talk of play across these contexts without clearly distinguishing them. What was clear was how, across contexts, the 12 qualities of play were meaningful and important for children and for the adults who care for or work with them.[15]

Indeed, we uncovered a 'hidden life' of play: parents who love to play with their children, though they talk little about it outside the home; professionals who find inspirational ways to enable children's expressive play during lockdown; teenagers who have fun with their younger siblings, albeit under the radar of their critical peers; and children's enthusiasm for play online, offline and both mixed together. But we also learned of a litany of problems with the digital environment's architecture, design and business models, as people reflect on children's play in everyday life. These make the freedom of play with a cardboard box hard to conjure in the digital world.

Participants – particularly children and young people – talked especially about the **social**, **imaginative, stimulating, risk-taking, open-ended** and **diverse** qualities of play, with the other qualities also referenced and, often, interlinked. To children, play is especially meaningful because it allows players – both children and adults – to stay socially connected and build relationships with others in both physical and digital environments.

Indeed, the **social quality of play** was by far the most discussed.

"Marco Polo, where someone closes their eyes and tries to get somebody without looking... It's [my favourite] because I get to enjoy play[ing] with my friend." – Girl, aged 8

"That's something that makes the game a lot better, seeing people's reactions, hearing people's reactions... it brings more life to the game." – Girl, aged 17

"They talk about the online games that they play together... Among Us is our [students'] new thing." – Year 6 teacher

The COVID-19 pandemic accelerated the importance of **social** play in the digital environment at a time when social distancing was the new normal. Talking of life during lockdown, participants told us that:

"My eight-year-old was playing on Zoom... All the kids [...] they're sort of playing hide and seek or catch, tag, so someone has to draw, and someone has to be the eraser." – A mother and youth worker

[15] Of course, we did not put these words into their mouths, instead asking them to describe their play experiences in their own words. But it was not hard to organise their contributions according to the qualities.

"There's something about the game because you all play together, you all have to talk to each other and interact. Especially in lockdown, that's been a big thing." – Girl, aged 16

"I feel like I've always got opportunities to talk to people with video games. That's the main point of online, playing with friends while talking to them." Boy, aged 17

Children and young people's playful activities are not limited to games. With limited face-to-face opportunities, they have invented new ways to have fun and stay socially connected.

"Over lockdown, I've been baking a lot... sometimes with my sister... over a call. We'll try and bake the same thing, and that was really fun and it was a way we could connect [using] WhatsApp." – Girl, aged 14

"On the weekend, me and my mum made this parody music video about our Christmas jumpers... My mum wants to post it on YouTube." – Girl, aged 13

Adults also recognised the significance of digital technologies in supporting children's **social** connections:

"I'm all for games and how that helps individuals develop, and I think it's vital in this day and age, with COVID." – Secondary school teacher

"I've sent [my nieces and nephews] Harry Potter Trivial Pursuit... We play the same board game, but we moved each other's pieces while we interacted on the screen, so we're still able to replicate what we would do in real life." – Anti-bullying training manager

"The most successful computer games that young people are into are ones where they can communicate live with their friends and have a group task [and gain] the feedback of a shared experience in the digital realm." – A theatre-maker working with vulnerable children

Imaginative play was the second most discussed quality of play. This manifests in absorbing make-believe, creative activities and improvisation, and is often found in world-building and sandboxing games.

"Minecraft... gives you the opportunity to do things that you wouldn't be able to do in real life. Obviously, flying's one of them, using potions, that kind of thing." – Girl, aged 18

"I even made a little castle with boxes, didn't I?" – Boy, aged 5

"[In The Sims[16]] you can also play with the avatars, and you can build houses for them... You can do anything you like." – Girl, aged 13

"I think it's the fact that we can build almost a different world for ourselves... I can do whatever I want... That was what I quite liked... being able to tell my own story." – Girl, aged 15

"I do a lot of script writing and creating worlds in that way and living in that and feeling excited." – Girl, aged 18

Immersive play captures the joy players experience in being wholly absorbed in the flow of their playful activities. In the consultation, both children and adults described immersive play as feeling like they are in a different world, escaping the here and now.

[16] The Sims is a series of life simulation, sandbox video games published by Electronic Arts, allowing players to create and control their Sims characters and their living environments, and to make their own rules about how their characters live.

"Once I got a big box that was only big enough that I was all scrunched up in it, I used that as my little house, and I sat in there for hours." – Girl, aged 12

"I found Red Dead Redemption... There are so many little things that just made the game... interesting and fun, and it just makes the game more immersive." – Boy, aged 13

"I think it's fun because when she's in the box, she's pretending that it's her own corner and... she's making up more stories about it." – Mother of 2 children

Children talked of play being **stimulating** when it is notably competitive or challenging – for instance, when children are drawn into the flow of solving a puzzle or meeting a challenge.

"There's a game we play called Manhunt... it's multiple people. One's the seeker, but you don't hide... You have to run away, and they have to hunt you down. [It was fun] because of the excitement and you can see how they can do it and how you do it." – Boy, aged 10

"I like to learn all my new dances and film them... I was teaching my Nana a TikTok dance." – Girl, aged 12

"Something like hide and seek or building blocks and jump rope... They show a lot of action in each of them, which... means your brain just goes places. It takes you out of the norm." – Boy, aged 18

The importance of a **sense of achievement** is palpable in several of the above quotations and especially clear among boys.

"I do like to occasionally make my own games... I got my friends to make their own games... It gives me a sense of accomplishment, and I feel fulfilled and proud of what I've done." – Boy, aged 17

"I like to outsmart my enemies [in Knack II[17]], because every time I know what action they do before they do a type of move, so I outsmart them." – Boy, aged 7

Intrinsically motivated and **voluntary** are distinct qualities of play, according to *A Panorama of Play*, with the former emphasising the child's agency over social or instrumental expectations on the nature and purpose of the play and the latter focusing on the child's freedom to start or stop playing whenever they choose. But in the consultation, participants made little such distinction, although they certainly valued both qualities.

"It was actually when the water spilt on the paper... There was a light bulb moment in my head, which was... what would that look like on my door? So, I just started [painting on the door], and I started to like it, so I did more and more." – Girl, aged 9

"Well, I've always loved flying, so, you'd, maybe, get a flight simulator or you'd play a superhero game, or there's something that means that you could actually accomplish what you were dreaming you could once do." – Boy, aged 17

Parents and professionals talked of keeping out of the way precisely to enable children's agency and intrinsic satisfaction in their freedom to play as they choose. However, this intention was stronger for play in non-digital contexts.

[17] Knack II is an action-platform game, developed by Sony Interactive Entertainment for PlayStation 4.

> **"[Play] is about a lot of the time me not being involved, is the children entirely leading their own play... I have to stay on that path, and they meander off through the trees."** – Childminder

> **"Leave them alone for 20 minutes, and when I go back in... they're hunting a giant squid or they're pharaohs. That's when they have their biggest moments of joy."** – Mother and theatre professional

Several of the qualities of play are linked to pushing boundaries, whether internal (e.g. personal capabilities or limits) or external (e.g. rules and restrictions, or challenges set by others or deriving from the nature or design of the environment).

> **"They have [an escape room] which is really difficult, and you have to try and crawl under mats and... then there's bells, and if you bump them, they'll start singing a song. You have to try and dodge them."** – Girl, aged 12

Facing boundaries or resolving puzzles and other uncertainties can involve

> **"skirting around the rules or avoiding rules"** – Girl, aged 13

or outright transgression and **risk taking.**

> **"Slime Rancher[18] [is] a world where you have infinite possibilities to do whatever you want... though there are rules and limits to what you can do, it's a feeling of you have the freedom and independence to... do what you like within the restrictions."** – Girl, aged 14

> **"A game that I played a bit ago all the way through was Red Dead Redemption 2... There was always anticipation that there was going to be some... random thing that would happen. Bandits could find out where all our stuff is..."** – Boy, aged 16

Parents also observed their children taking risks in the games they play. A mother of two daughters reported that one daughter kept adding "lots of baddies" into the game, having been playing a game called Disney Infinity. Asked whether she kept adding the baddies into the game because she just wanted to be "a bit naughty", the daughter said:

> **"Yes, you'd add so many baddies. And if you were in our created world, some of them would just get to the edge and walk off the edge of the terrain. And then, you'd just try and kill them."** – Girl, aged 13

Risk taking can be pleasurable but for children to play freely in this way also leads children (and certainly adults) to appreciate the rules or to call for more **safety** to mitigate content, contact, conduct and contract risks online (Livingstone & Stoilova, 2021).

> **"On a lot of... social media there is a lot of creepy people and because of that, parents get very controlling of the social media. And that makes the experience for the child less fun."** – Girl, aged 13

> **"Some rules, sometimes they're good... Safety regulations and stuff. But then there are other rules that you feel like are stopping yourself from having fun."** – Girl, aged 16

[18] Slime Rancher is a first-person live simulation adventure game on Steam.

> **"Animal Crossing is pretty good... It is aimed at young children, mostly, but it's played by a lot of adults, as well... There's a lot of moderation in place to make sure that people aren't hurting each other."** – Girl, aged 18

> **"Well, they could just make filters. So, if someone says something, it gets flagged, and then someone looks over it [to] see if what they've said is okay or not okay."** – Boy, aged 17

> **"You don't want to censor everything, but you don't want all of this horrible, hateful stuff on the internet."** – Girl, aged 16

The **open-ended** and **diverse** qualities of free play are linked, particularly as consultation participants saw it, with open-ended play facilitating intrinsically motivated and imaginative play, with the results tending to be diverse in form and experience. This is because children can incorporate more from their own imagination as well as any materials to hand – 'loose parts', in the language of play theory (Casey & Robertson, 2019; Gaskins et al, 2007; Play England, 2012; Russell, 2013), creating their own meanings and at times countering the influence of normative play cultures.

> **"In [Minecraft], you can basically do whatever you want because you just download the mods... You can build whatever you want... It's a sandbox game, so you're not really following a script."** – Boy, aged 16

> **"Instead of reading a book yesterday, I invented a story where [my daughter] was the main character. And then I gave her choices, and then she has to decide what to do and then it changes depending what she decides."** – Mother of 2 children

Here the play turns out differently depending on decisions made by the young player, being determined neither by the adult nor the environment. Indeed, it looks different depending on the child and the circumstances, each child enjoying a somewhat distinct and context-specific experience. Children can, however, also enjoy diverse play opportunities provided by others.

> **"I watched quite a lot of, and make my own, YouTube videos. And I think you watch things from literally all over the world, and they're things you wouldn't get to see otherwise."** – Girl, aged 13

In line with the literature on digital and non-digital contexts that facilitate open-ended play (De Valk et al, 2013; Marsh et al, 2018; Vygotsky, 2004), children and young people in our consultation showed great appreciation for adaptable materials and digital features that enabled them to construct their own play. They enjoy the freedom to direct their play and modify it on their own terms, resulting in a considerable diversity of playful experiences.

Last but not least, children and young people in our consultation talked about how their play affords them a way of making sense of the world around them and testing out ideas. Their accounts of this quality of play resonate with what researchers recognise as one of the benefits of play, as a way for children to process their experiences and emotions by playfully acting out scenarios relevant to, yet at a safe distance from, their everyday lives (Anable, 2018).

> **"I had a lot of family members who were nurses or doctors... I remember one scenario, [my aunt] said she was giving a jab to a baby and it was the most horrendous scream she had ever heard. Then me playing with the teddies, it would be pretending this teddy was the worst patient in the world and I'd be doing everything to calm it down."** – Girl, aged 18

> **"I used to really like to feel grown up and to feel like, yes, aren't I being so grown up? I think… doing Google Forms… gives you that weird, inverted feeling of… you're, say, 12, 13, thinking you're acting older."** – Girl, aged 18

Parents and professionals also recognise the benefits of emotional resonance in children's play.

> **"It's something with teenagers… They're constantly playing an imitation game and they're playing it being adults or they're trying to play what their identity is. I think they're in… a constant state of flux."** – Theatre director and youth worker

Professionals working with children also noted that play can be therapeutic and that emotional resonance, as a quality of play, can be enjoyed by everyone irrespective of age, gender, abilities (or disabilities) or one's state of health.

> **"Often we'd have to go from ward to ward or care home to care home. And it doesn't matter the age of the person or what condition they are… I would say, nine times out of ten, the stop motion animation people want to make is either a person being brutally murdered or a fart joke. And they all scream with laughter… That's just effectively people playing to feel better."** – Mother of 2 children who uses exploratory technologies to support individuals

> **"It used to be us deaf friends playing it… We used to laugh about how we're supposed to play and what we're supposed to say, why we're poorly. Look around and pretend to give the injection. And think we're very strong, and it doesn't hurt. And that's what we used to make ourselves confident in… in a real-life scenario."** – Young football coach with hearing loss

Findings from the national survey of children

We commissioned a national survey of children aged 6–17 to examine how children perceive the qualities of play across digital contexts, by asking about a range of digital products and services. We were able to pay attention to any differences by age and gender. In the survey:

- We chose eight digital products and services to encompass the diversity of children's play in digital contexts. These were: Fortnite; Minecraft; Nintendo Wii (and Nintendo Switch); Roblox; TikTok; WhatsApp; YouTube (not YouTube Kids); and Zoom (for fun only, not school). Four are clearly games; four are interactive services where children can engage playfully.[19] In addressing children in the survey, we generally referred to 'apps'.
- We turned children's accounts of the qualities of free play into short statements, also drawing on Cowan (2020). Children were then asked which of the eight digital products and services they play or use in a playful way. We selected two of those that they said they play and asked them to rate each on the 12 qualities of play, using a four-point scale (where 1 = disagree a lot and 4 = agree a lot). We analysed the findings for each digital product and service as well as the average rating across all eight digital products and services.

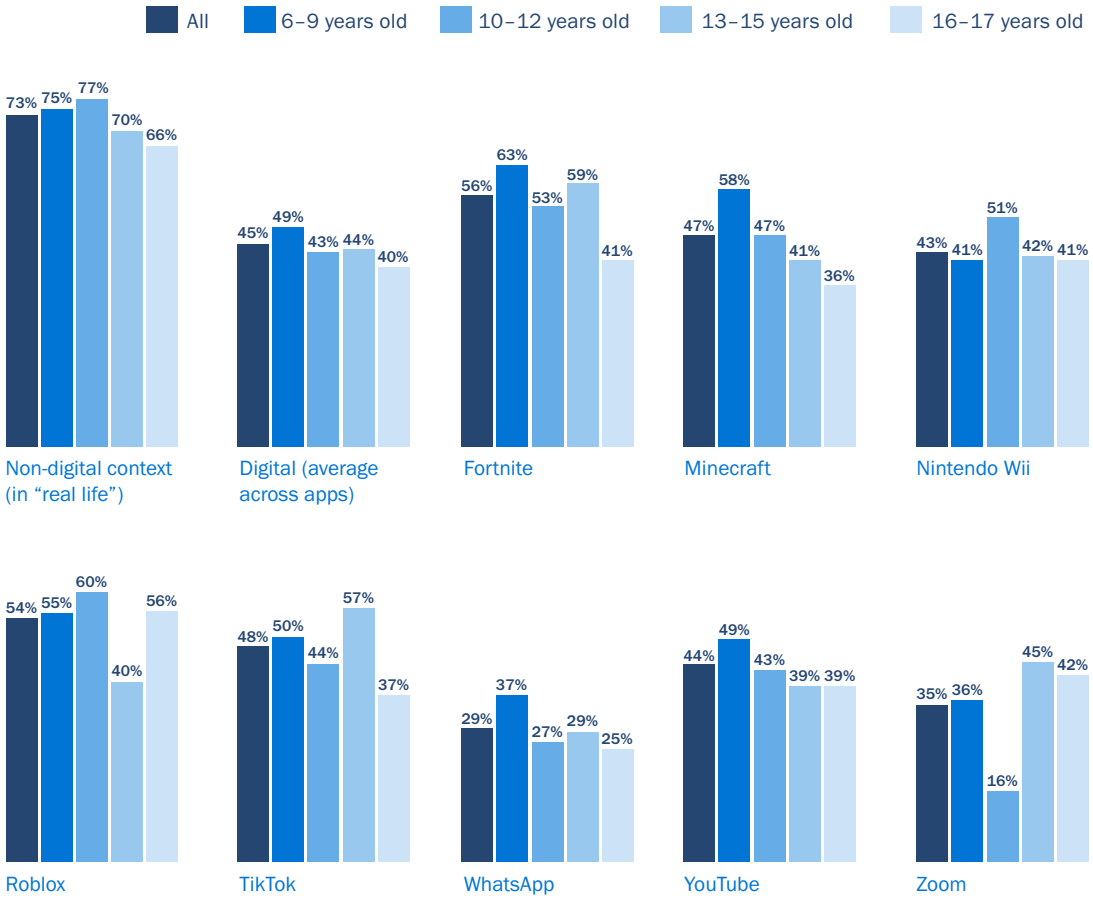
The results showed that around 9 in 10 children agreed that they have a great time playing on the different digital products and services, with the exception of Zoom, enjoyed by just 7 in 10 children. These different experiences of play are more visible when we compare percentages of children who agreed 'a lot' that they had a great time.

As shown in Figure 1, on average, just under half of 6 to 17-year-olds say they agree 'a lot' that they had a great time playing with digital products and services, and the proportion of children who said this ranged from around one third (WhatsApp) to over half (Fortnite, Roblox).

[19] Six of these are included in the top 20 most popular digital products and services for 2 to 17-year-olds (WhatsApp, Minecraft, TikTok, Roblox, Fortnite and Mario Game [Wii]). Zoom is the seventh highest app 'normally used' (22% of children aged 7-16), according to CHILDWISE (2021) The Monitor Report 2021: Section 2 – Websites and apps. We did not find user data for Nintendo Wii, Ring Fit Adventure or similar games, but selected this as enthusiasm for hybrid games (played with the whole body) was a strong theme in the consultation, and to broaden the types of app included. Overall, our selection spans four categories of digital products and services used by children for fun: games (Minecraft, Roblox and Fortnite), console games (Nintendo Wii and Switch – treated together in the survey), communication platforms or social apps (WhatsApp and Zoom) and video sharing platforms (YouTube and TikTok). They are not all designed specifically for children, although their popularity clearly shows that, irrespective of their producers' intentions, they all impact on children's lives. See Dubit (2021) and Annex 4.

Figure 1: "I had a great time" (% agree 'a lot')

Base: 1033 6 to 17-year-olds



To provide a point of comparison with children's play using digital products and services, the survey asked children to recall a situation when "you recently had a good time playing or being playful in real life, without a digital device." As Figure 1 shows, 7 in 10 children in the survey agreed 'a lot' that they had a great time playing 'in real life' (see also Annex 5).[20]

Recognising that children spend a considerable amount of time playing online, from a mix of necessity and choice, we now examine the qualities of play that children experience online.

The 'spider diagram' in Figure 2 shows the 12 qualities of play on the digital products and services that they engage with playfully.[21] This shows that children report enjoying **diverse** ways to play that are important to them, including **social, imaginative, immersive** and **open-ended** play, and **stimulating** play that provides a **sense of achievement** and which, to a lesser degree, is **emotionally resonant**. While ratings for these qualities are broadly positive, we can ask the question: could design enhance these qualities of play further?

Problematically, children report low scores for some qualities of play. Fewer than half said that their play in digital contexts is **intrinsically motivated** (45%) or **voluntary** (31%), two qualities highlighted by our literature review as crucial for free play (Cowan, 2020).

Also noteworthy from the spider diagram is that play is seen as not very **safe** by nearly half of children: 45% agreed that playing with the app "can sometimes bother or upset me."[22] Those in their late teens (16–17 years old) feel significantly safer (60% disagreed that playing with the app "can sometimes bother or upset me") when playing online than children aged 13–15 (57%), those aged 10–12 (56%) and, especially, those aged 6–9 (49%).

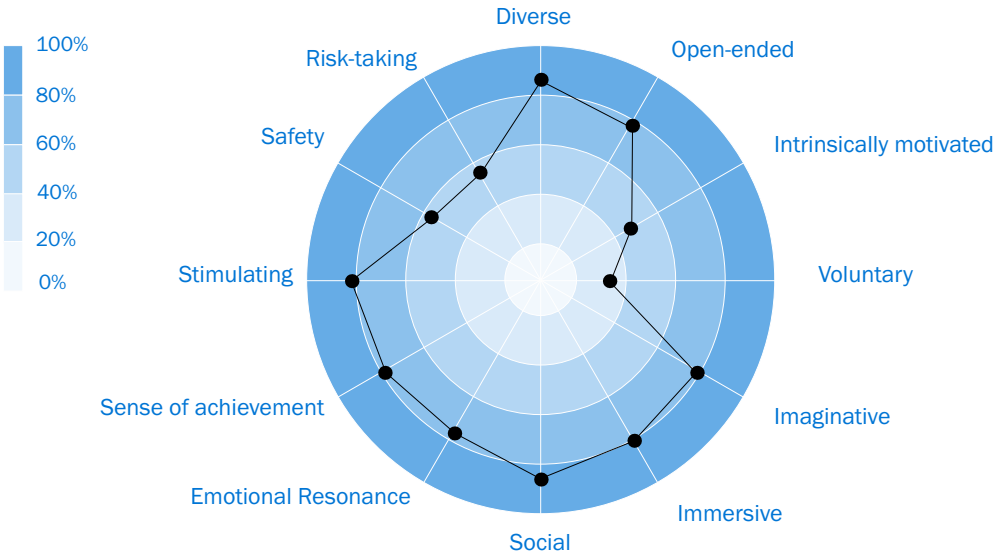
[20] This contrast is particularly striking since Fortnite is played by 37% of 2 to 17-year-olds and is most popular among 10 to 12-year-olds (54% play); see Annex 4. Minecraft is played overall by 41% of 2 to 17-year-olds and is popular across a wide age span (played by around half of the UK's 6 to 15-year-olds). Roblox is played by 37% of 2 to 17-year-olds, including half of 6 to 12-year-olds. It is beyond our present scope to examine the contextual factors that may account for children's pleasure in non-digital play, including in-person access to friends or parental rules, and these are worth exploring in future.

[21] Each child rated two of the digital products and services that they actually play/play with, and the results are then averaged across children (and products) in the diagram.

[22] This was the survey indicator for feeling safe, reverse coded in the analysis (see Annex 2). The phrasing of the question encompasses a broad range of experiences that children may consider upsetting.

Figure 2: Children rated the qualities of play on the digital products and services they play (% agree)

Base: 1033 6 to 17-year-olds



Reflecting on the survey results for intrinsically motivated and voluntary play, combined with insights from the public consultation, we suggest that children may play online more to meet social expectations from their friends and peers than because they find the digital products and services they use **intrinsically motivating**.[23] As for the low rating given to the quality of **voluntarily** chosen, what is crucial is that the majority of children agreed that "It's hard to stop playing like that even when I've had enough." Colvert (2021, p. 24) notes that

> **"[games] and social media platforms include features and content that are intended to increase the likelihood of children choosing to return and play over extended periods... There are many inappropriate and harmful uses of such incentives. These are amplified in the increasing intersections between online gambling and gaming practices."[24]**

We examine in the next section whether such features of digital design contribute to making play more compulsive and less voluntary. We also build on the sizeable body of research and policy on safety in children's play to consider how design can make children's digital play safe. 54% of children reported experiencing something upsetting in Fortnite, while a smaller proportion of children reported experiencing something upsetting in Minecraft (36%), Roblox (46%), Nintendo Wii (48%), WhatsApp (48%), TikTok (43%), Zoom (47%) and YouTube (39%).[25]

Possibly connected to this relatively low level of safety, children's freedom to **take risks** in their play is constrained. Again, risk taking has long been seen as crucial by free play advocates and child development experts because it is vital for children's play and fullest development that they are free to explore, experiment, challenge boundaries, stretch their capacities and exercise their rights and freedoms. But only 56% feel that they can take risks in their digital play (agreeing that "when playing like that, I can be naughty or break some rules without being told off").

How can these efforts be undertaken? In the digital environment, attention to design features and what they afford the user is vital. These design features lie at the heart of our conception of Playful by Design.[26]

[23] The survey asked children to respond to the statement "I play like that because other people want me to" and found that most agreed (55%).

[24] See also Grimes (2021), Macey & Hamari (2018a, 2018b) and Wardle (1997).

[25] The findings show that these safety design features are also more needed for some apps and particular groups of children (see Family Kids & Youth, 2021).

[26] We examine the design and policy improvements needed for different digital products and services in our case studies.

Playful by Design

All play occurs in contexts partly structured by adults, and the importance of the environment – its nature, features, norms and culture – has long been recognised.[27] Attention to features of the physical environment has informed the design of adventure playgrounds, traffic management and child-friendly cities so as to enable rather than impede children's play.[28] In relation to the digital environment, the technological architecture, automated systems, data ecology and other design features of the digital environment matter greatly.

Our review of a wide range of academic literature, *The Kaleidoscope of Play in a Digital World*, recognises that "although all of the qualities of free play can be experienced by children across physical and virtual spaces, the qualities merge and intersect with the digital environment in complex ways" (Colvert, 2021, p. 51). It unpacks how play in any context is influenced by three crucial factors:

- people (whether parents, strangers, teachers, other players; and also policy makers, marketers, businesses and service providers)
- products (such as toys, objects, apps, cultural artefacts, platforms and other commercial and networked infrastructures in the digital environment)

[27] This is often theorised as 'affordances' by ecological theories, recognising the interdependence between the nature of the environment and the interests or motivations of the person (Arlinkasari & Cushings, 2018; Evans et al, 2017). For instance, to a child, a park bench affords the possibility of climbing high to see further or squeezing under to create a den, while to their weary parent, it affords the opportunity to rest.

[28] Gill, 2021; Thivant, 2018; UNICEF, 2021. Research shows how children are sensitive to context, responding to the different possibilities afforded them, reflecting on which contexts enable (or impede) their play (Berriman & Mascheroni, 2019; Deterding, 2011). Parents, carers and professionals who work with children are also often conscious of their power to shape the context of play and guide or influence the child's activities within that context.

- places (where the play occurs, including physical and virtual spaces, at home, school, the mall, in Minecraft, on Zoom).

The idea of the 'kaleidoscope' captures how the interaction among people, products and places reconfigures children's free play possibilities, as every shake of the kaleidoscope remixes these factors in ways that shift and intersect, generating new patterns and possibilities.[29]

What is meant by 'by design'

Design and (human) values are inseparable; together, they shape human possibilities and people's life outcomes.

- "Design is the human power of conceiving, planning, and making products that serve human beings in the accomplishment of their individual and collective purposes." (Buchanan, 2001, p. 9)
- "Human values are what is important to people in their lives, with a focus on ethics and morality." (Friedman & Hendry, 2019, p. 4)

The idea of 'by design' harnesses the generative power of providers, designers and policy makers to shape technological innovation in ways that prioritise values promoting human wellbeing: privacy, safety, security, ethics, equality, inclusion and, encompassing all these, human rights – including children's rights. Indeed, safety by design (eSafety Commissioner [Australian Government], 2019), security by design (Department for Digital Culture Media & Sport, 2018), privacy by design (Cavoukian, 2009; Hartung, 2020) and others are already advocated by United Nations Committee on the Rights of the Child (2021) General Comment 25, so that digital products and services respect, protect and remedy children's rights.[30]

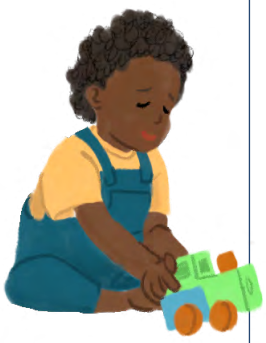
Since design is never value-free, alternatives to building rights-respecting digital products and services may, however unintentionally, fuel the litany of biases, risks and other rights violations that fill the media headlines and undermine public trust in technology (Edelman, 2021). Arguably, business values centred on profit can result in technology that is, in effect, risky by design for children (5Rights Foundation, 2021b, 2021c).

Human values are most effectively embedded in technology during the design process, with further iteration in response to user experiences and outcome evaluation throughout product development. Retrofitting values into products and services already in the market is both difficult and expensive. Innovation in relation to the physical environment may be instructive when intervening in relation to the digital environment – as in promoting sustainability (Liedtke, 2016), or in relation to urban design such as the child-friendly cities movement (UNICEF, n.d.)

It may seem paradoxical to propose a 'by design' approach when our focus is on children's free play rather than adult-guided play serving adult-set goals. But since all aspects of the digital environment are, of necessity, designed in one way or another, we aim to set out a vision of Playful by Design that facilitates child-initiated play, strongly informed by children's views and experiences. We also aim to encourage businesses with the power to design digital environments to take on this task from the outset, rather than burdening children and their parents with the task of overcoming barriers and finding or creating opportunities unsupported.

[29] As Colvert (2021, p. 7) explains, "playful possibilities are shaped by a range of factors: material-functional (products), social-cultural (people) and contextual-situational (places). These factors are analysed at micro, meso and macro levels to encompass children's (digital) experiences from the individual to the societal." For example, a digital product that treats the child as an adult, inconsistent with their evolving capacity, could undermine their perception of safety or their intrinsic motivation to play (Cunningham, 2006; Danks & Schofield, 2007; Finney & Atkinson, 2020; Greenberg et al, 2010; National Playing Fields Association & Children's Play Council, 2000).

[30] The 'respect, protect and remedy' framework lies at the heart of the UN Guiding Principles on Business and Human Rights, and the Global Compact on Children's Rights and Business Principles (United Nations, 2011); see also D4CR Association (2021).



Key features designed into digital products and services

In the survey, we asked children aged 10–17 to judge two of the digital products and services they play for each one of 22 digital features that could enable or undermine their play. These were drawn from features of the digital environment identified in *The Kaleidoscope of Play* as well as those discussed in the public consultation (see Annex 3).[31] Each can, in principle, be classed as an enabler (e.g. affordable for a child to use) or a barrier (e.g. expensive for a child to use), so we chose the language that was most straightforward for a child to understand.[32]

Likely enablers of free play designed into digital products and services, as also operationalised in our national survey:

- **Onboarding:** is easy for new users to understand how to play or use.
- **Pathways:** gives me clues or instructions on how to get better at playing.
- **Age-appropriate:** is good for people my age.
- **Transparent:** gives me information so I can understand how it works.
- **Privacy:** gives me control over what other people see about me.
- **Contact:** gives me control over who can contact me through the app.
- **Creative:** gives me ways to be creative.
- **Flexible design:** gives me plenty of ways to change how it can be used.
- **Hybrid:** can be used to get me to move my body about or do exercise.
- **Intergenerational:** can be played or used together by people of different ages.
- **Transmedia:** can be played or used along with objects in my home (such as toys, games, or devices).
- **Communication:** lets me chat or message people in the app.
- **Provides help:** can help me if something upsetting happens.
- **Variety:** offers different kinds of activities when using the app.

Likely barriers or inhibitors to free play designed into digital products and services, as also operationalised in our national survey:

- **Expensive:** is too expensive for me to use fully.
- **Needs high tech:** needs a fast computer or internet connection to play or use.
- **Excludes people:** some people can feel excluded when playing or using it.
- **Shares data:** shares my information with other apps or businesses.
- **Advertising:** includes adverts for things to buy or do.
- **Commercial:** shows me things to spend real money on in the app.
- **Compulsive:** it can be hard to stop playing or using it.
- **Hateful:** sometimes I see people saying nasty things on it.

[31] We focus on features which children can report on in a survey, describing them in ways that apply to multiple digital products and services, in a language that users understand. This omits design features of which users are less aware, such as 'dark patterns', and a range of surveillant and exploitative business models for digital products and services, all of which should be addressed as Playful by Design is developed (5Rights Foundation, 2021a; Chester et al, 2021; McNealy et al, 2021; Norwegian Consumer Council [Forbrukerradet], 2018).

[32] We say 'likely' enablers and barriers because the purpose of the analysis was to discover how these digital features are related to the qualities of play in practice, as experienced by children. For the actual questions asked of children aged 10–17 in the survey, see Annex 3.

Findings from the survey of children

The findings show many ways in which the features of digital design either enable or undermine children's play, although their answers vary because their particular experiences are always contextual, depending on the many factors (including the people, products and places) that shape their life circumstances. Figure 3 shows the findings averaged across all eight digital products and services:[33]

- Children judge that the digital products and services they play or engage playfully with are designed in ways that they consider **age-appropriate** (90% say they are good for people their age), good for **intergenerational** play (88%), **easy for new users to understand** (86%), give them **control over who can contact them** (83%), and give them **ways to be creative** (78%).
- However, 35% find the digital products and services they play **too expensive** for them to engage with fully, 49% report that the app **shares their information with other apps or businesses**, 56% see **hateful interactions** during play, 59% are aware that some people can feel **excluded from the play**, 60% report their play **exposes them to advertising**, and 67% that it can be **hard to disengage**.

There are few significant differences in children's perceptions of these digital features by age or gender. Exceptions include how, compared to their younger counterparts, children aged 16–17 are more sensitive to how an app **onboards** new users (23% agree); they are also more sensitive to **transparency** (22% agree).

Beyond asking children how they perceive the digital features, we also asked them which features they want to see more of in the future.[34] Figure 4 shows what children aged 10–17 call for.[35]

- Digital products and services that promote free play by including more features that are **easy to use** (62% want more of these), provide **creative opportunities** (58%), are **age-appropriate** (58%), **affordable** (56%) and **kind** (42%), and that enable **intergenerational** play (42%) and where **people feel included** (42%).
- As for the features that potentially undermine children's free play, we note that they want more digital products and services **without advertising** (45%), that offer **better control over who can contact them** (44%), and that **do not share their data with other apps or businesses** (42%).
- Fewer children want more **transmedia** (27%) or **hybrid** (33%) features that link content and activities across digital products and services or the offline/online boundary: since half of them have encountered transmedia (54%) and hybrid (52%) features, they may feel that they already have enough such opportunities. In the consultation, children who enjoy the transmedia and hybrid mix, and transfer content and play across platforms and spaces, do so voluntarily and in an intrinsically motivated manner rather than being encouraged or funnelled through a purpose-built design pathway to do so, for example through a 'metaverse'.[36] These findings from the survey and the more contextualised accounts of play from the consultation highlight the tension between players' interests in voluntary and intrinsically motivated play and digital providers' commercial interests (people) that are reflected in the products and their usage in the digital space (places).

[33] We discuss the findings for each app in the next section (see also Annex 4), where the children's perceptions of the apps' features are integrated with the experts' commentary.

[34] In the survey, the inhibiting features were rephrased in positive terms, as enablers, so that children could be asked to choose as many as they want more of in the future.

[35] There is no necessary relation between the features children identify in the digital products and services they use and those they wish to see more of. For instance, 86% of children said the digital products and services they use are easy for new users to understand and yet this was their top demand for more – 62% want future improvements in this regard. Similarly, 78% see the digital products and services they use as enabling their creativity and yet 58% want more ways to be creative designed into digital products and services in the future. On the other hand, while 60% say that the digital products and services they use include advertising, only 45% say they wish for no advertising in future. Half (52%) see their digital play as encouraging them to move their body around, though fewer (33%) wish that more digital products and services would do this.

[36] We acknowledge that the idea of the metaverse is tricky to ask children about in a survey (Kleeman, 2021).

SCORE 100

Figure 3: Children's perceptions of the design features of digital products and services they play with (% agree, averaged across digital products and services)

Base: 687 10 to 17-year-olds

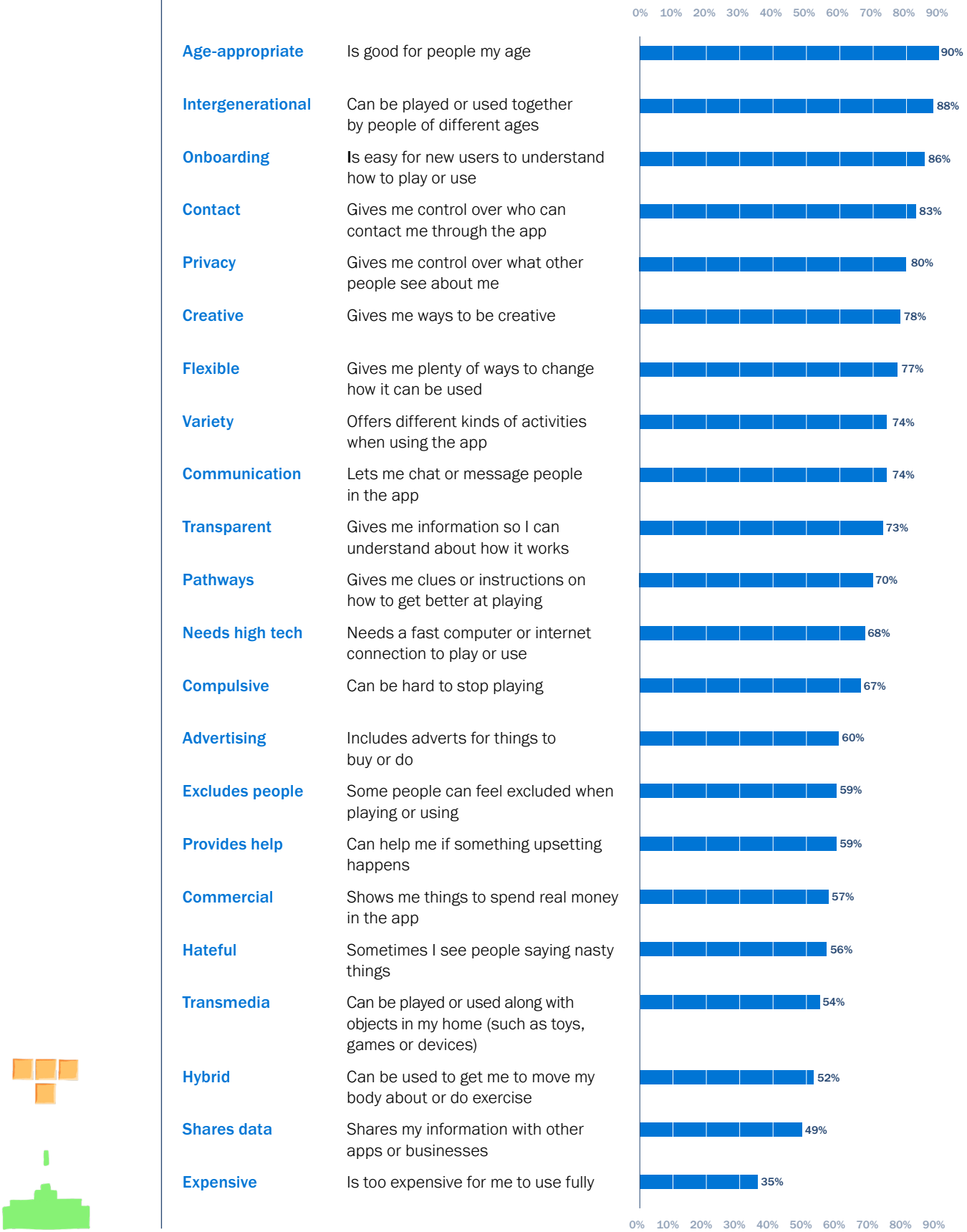
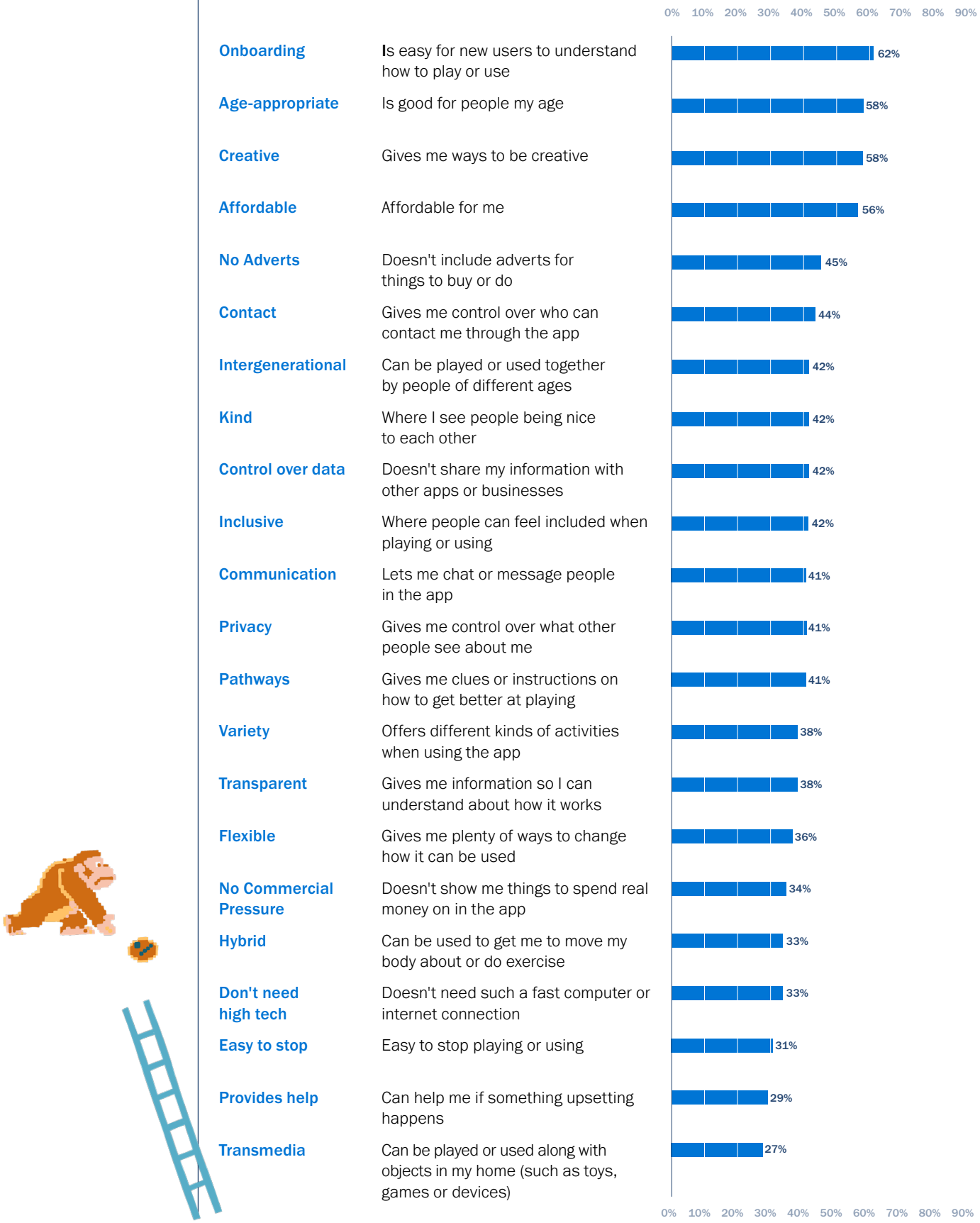


Figure 4: Thinking about the apps or games you use for fun, in the future, which of the following would you like more of? Choose as many as you want

Base: 687 10 to 17-year-olds



What works and what needs to change?

We now bring together our analysis of the qualities of free play with our analysis of the features of the digital environment that enable or undermine them. Linking these to identify what works to children's benefit and what needs to change is not easy. Here we take a straightforward approach based on statistical correlations between the qualities and the features children reported in the national survey, framed by insights from the public consultation and the experts.[37]

Table 1 summarises the main correlations between features and qualities to highlight features that may facilitate or constrain particular qualities of children's play. It is meant to be suggestive, not definitive, and to identify plausible levers for change. Specifically, the analysis pinpoints key ways in which digital products and services could be redesigned to support the qualities of free play which children experienced the least in digital contexts.

- The **intrinsic motivation** that children experience in their play appears particularly undermined in digital environments that exclude certain groups. It seems that more inclusive (welcoming, tolerant) digital environments – called for by 42% of children – would enhance their intrinsic motivation.
- It seems that the **voluntary** nature of children's play is undermined when the digital environment is designed with compulsive features that make it hard to stop playing "even when I've had enough." This draws attention to the considerable concern by researchers, experts and policy makers that the digital environment is designed to cultivate dependency, extend or prolong engagement to satisfy the attention economy, at the expense of children's freedom to decide how to play and when to start or stop. As many have argued, it would seem advisable to design safety 'cut-outs' and other mechanisms to help children disengage or wind down from their play.
- Since reliable safety features are more often associated with expensive digital products and services, children's **safety** when playing is undermined by digital products and services that are expensive, that exclude certain groups, that allow hateful communication, that are compulsive and that provide help if and when something upsetting happens (possibly because less safe digital products and services are more likely to offer help, or children are more likely to have noticed the help feature). Providing digital products and services that are more inclusive, affordable, and with more targeted support for children when they encounter upsetting experiences will likely make children feel safer in play. Clearly, there is scope for redesign, and this is crucial given that children gave most digital products and services fairly low ratings for safety (see the next section for product results).
- Further, children's **risk-taking** or boundary-pushing play appears enhanced by digital products and services that feature engaging design but offer safe spaces. Provision of more pathways to engage, and hybrid play features, is also linked to positive risk taking because they avail more resources for children to push boundaries.

[37] This reveals whether there is a statistically significant association between an app's features and the qualities of play children experience when playing it, and if so, the direction of the association (i.e. is the feature likely to facilitate or constrain the quality of play, bearing in mind that correlations cannot establish causation). The findings are calculated across the eight digital products and services, using a conservative significance threshold to highlight the strongest findings. The full correlation matrix is available in Family Kids & Youth (2021).

Table 1: Which design features facilitate or constrain qualities of play in the digital environment? Note: Based on observed correlations between children's ratings of play qualities and design features for apps they play with

Base: 687 10 to 17-year-olds

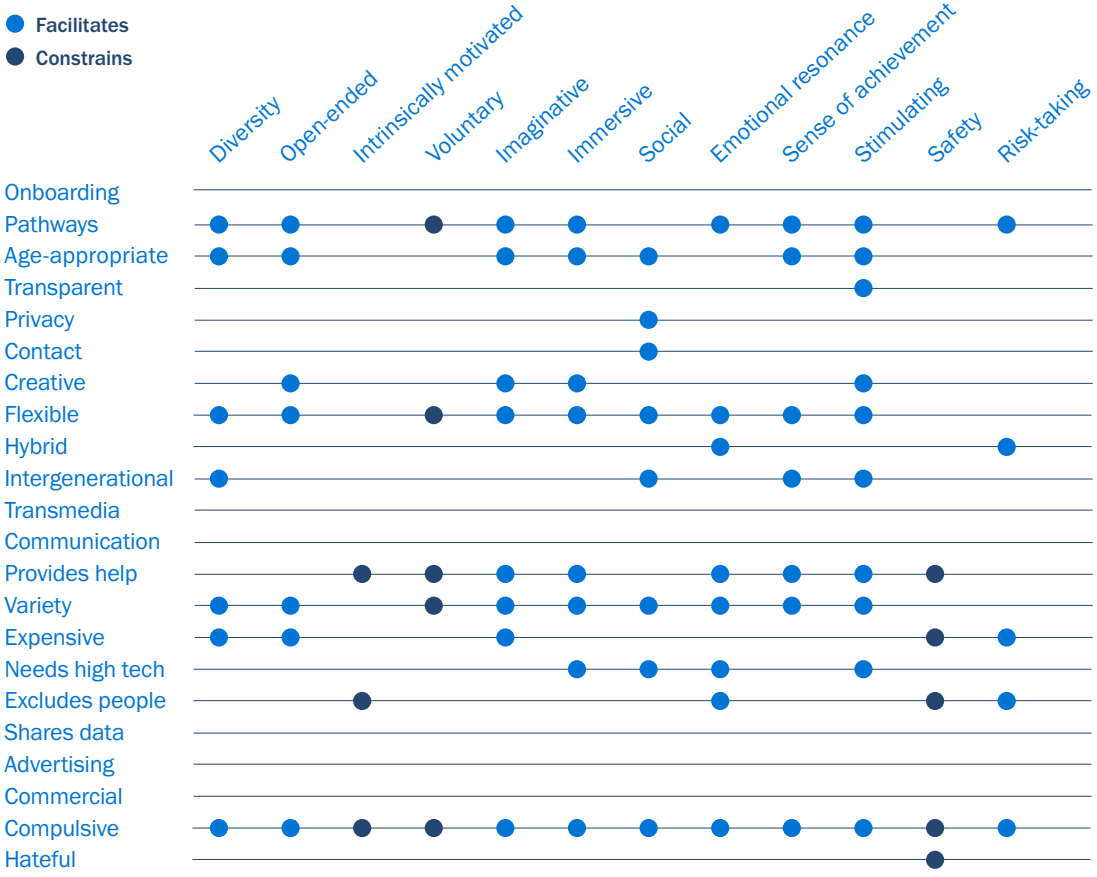


Table 1 also suggests particular design features that enhance or inhibit children's play experiences:

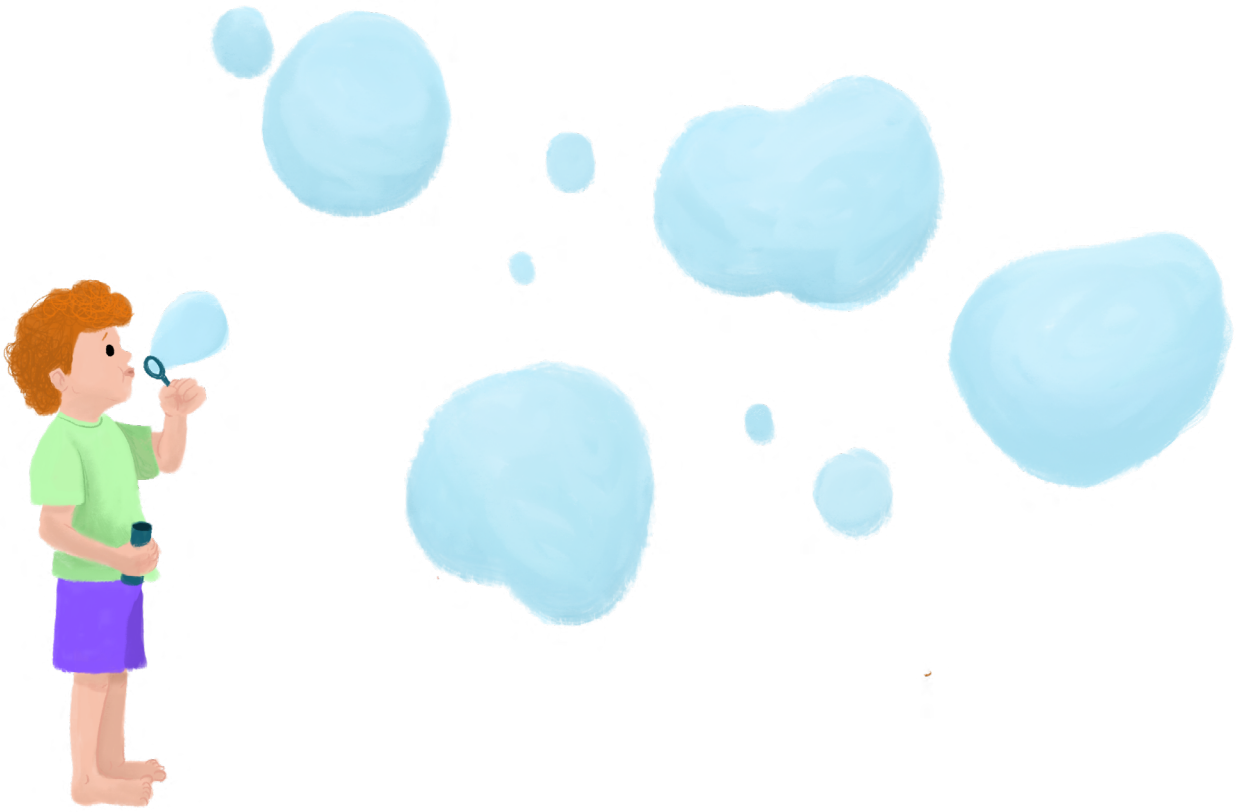
- **Pathways, flexibility for users** and **variety of activities** are three crucial digital features that support seven out of 12 free play qualities: diverse, open-ended, imaginative, immersive, emotionally resonant, sense of achievement and stimulating. Supporting free play in this way appears to reduce children's sense of their play as voluntary, however, making it harder to stop playing even when the player wants to stop.
- **Age-appropriate** is also an important digital feature that enables diverse, immersive, social, and stimulating play, while giving children a sense of achievement. Although already seen by children as applicable to the digital products and services they play, it was also one of their top calls for what they want more of.
- Providing more **creative** resources within digital play contexts is linked to more open-ended, imaginative, immersive and stimulating play. However, while children already saw digital play as offering positive experiences in these ways, there is certainly scope for improvement.
- Features that undermine free play include making some people **feel excluded**, undermining children's intrinsic motivation to play and their safety, and enabling risk taking.

- **Compulsive** features that make it hard to stop playing are present in many products and services that support some of the qualities of free play (e.g. open-ended, social, stimulating), but it matters that these features are linked to reduced safety and voluntary play.
- Products perceived by children to support **intergenerational** play are associated with more stimulating and social play that is both diverse and offers a sense of achievement.
- **Providing help** when children encounter upsetting experiences in their play also goes a long way. If an app is seen to **provide help** when something upsetting happens, this has positive associations (more imaginative and immersive play, for instance). The association with safety is probably because less safe digital products and services are more likely to offer help, or because with less safe digital products and services, children are more likely to have noticed the help feature.

Although 45% of children called for **no advertisements** in the digital products and services they use for play, and 34% don't want features that encourage them to spend real money (such as loot boxes), this did not appear to impact on how they judged the qualities of play, according to the correlation analysis. This could be because it genuinely makes no difference or because children have no choice but to be subjected to advertising and commercial pressures if they wish to use digital products and services.

Other digital features that children want more of (such as **control over data sharing** or more **communication** channels) were also not strongly related to the qualities of play. In the case of communication, this may be because children can find alternative forms of communication such as Discord or WhatsApp. In the case of data, this may be because children reject data sharing when asked about it but are less aware or feel they have no choice when it occurs in particular products or services.

Some of these findings are more actionable than others, although all design interventions rest upon the interplay among people (particularly businesses), products and places. Some are also more urgent than others – notably, designing digital environments where children feel safe. Some are particularly challenging – for instance, enabling children to engage in risk-taking or intergenerational play without putting them in age-inappropriate environments or in the way of harm. The experts commenting on our findings called for greater efforts from businesses in implementing safety features, including safety by design, and for a radical rethinking of business models that currently put profitability ahead of children's best interests. They also acknowledged the complexity of the design challenges that may arise and, like us, hope this report can stimulate new and refreshed efforts to enhance children's play opportunities in a digital world.



Playful by Design in practice: eight case studies

> **"Digital technology connects… physical and virtual spaces, creating both local and global digital playgrounds. Some of these spaces are designed with play in mind, and others are not."** – Colvert, 2021, p. 18

How do the design features of the digital environment enable or undermine the qualities of play that children experience when it comes to specific digital products and services? Having asked children each to judge two of these in terms of the qualities of play and their digital features, we can now show how Playful by Design works in practice, by identifying the digital features that enable or undermine the qualities of play for each app in turn.

In each case, we consulted our experts about the results and have included their commentary on each app below.

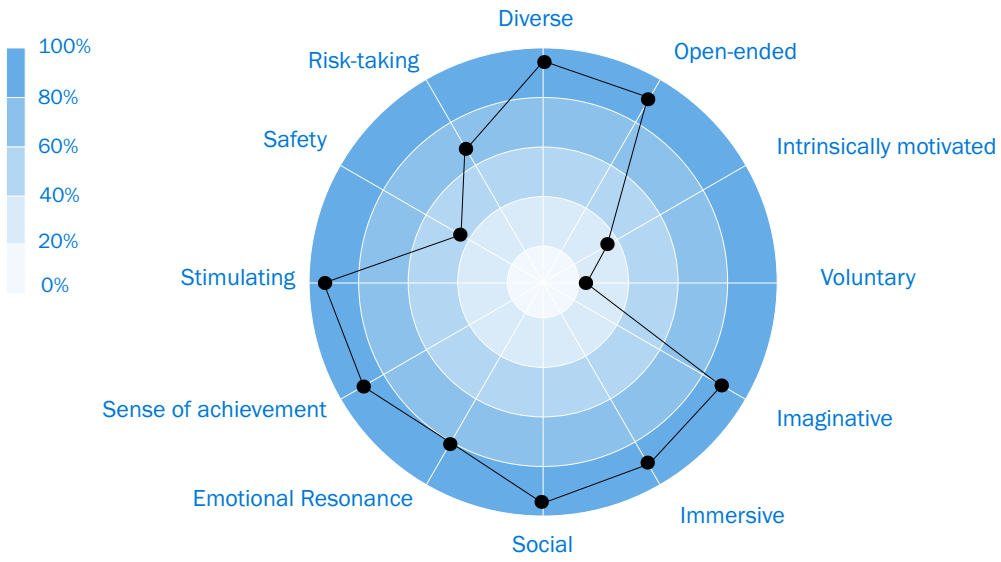
FORTNITE

Fortnite

Fortnite is a free online action-packed video game, most popular among children aged 10–12 (Dubit Trends, 2021) and known for its variety of game modes (e.g. Battle Royale, Creative, Save the World) and in-game items (e.g. weapons, vehicles, submodes, etc) (The Fortnite Team, 2020).

Offered by Epic Games, Fortnite operates on multiple operating systems and platforms, including Windows, iOS, PlayStation 4, Xbox and Nintendo Switch. The game generates income through in-game purchases to enhance player experience and unlocking access to reward items and other aspects of the game (Robertson et al, 2021).

Figure 5: Children's views of the qualities of free play in Fortnite (% agree)
Fortnite base: 241 6 to 17-year-olds



Children who responded to our survey portrayed the qualities of their play on Fortnite as predominantly **social** (93% agree) and **stimulating** (92%), but that the game offered somewhat limited **voluntary** play (21%) and **safety** (46%). That said, a significant proportion (37%) of younger girls (6–12 years old) found play on Fortnite voluntary while girls aged 13–17 (14%), boys aged 6–12 (21%) and boys aged 13–17 (13%) found the game less voluntary.

According to our survey, children saw Fortnite's design features as '**good for people their age**', **intergenerational, creative** and **communicative**. Corresponding with the survey,

children and young people in our consultation valued the **communication** tools in and around Fortnite, the **team-based game mechanic** and **variety** of in-game virtual items, which they said afforded them the **social, stimulating, immersive, diverse** and some **imaginative** qualities of play.

> **"I play with my cousin. So, we video call and then we just play together on that… we video call [and] we talk on the phone, not on Fortnite."** – Girl, aged 12

A 14-year-old boy told us that he enjoyed Fortnite because it allowed him to play with his friends and '**compete**' against another group which makes the game **stimulating**, keeping him engaged.

> **"There're loads of different packets that you can buy for a different amount of money. And Fortnite money is V-Bucks. And you can buy the Battle Pass with V-Bucks."** – Girl, aged 15

However, both children and professionals working with them noted that these free play enabling features could inadvertently undermine not only children's **voluntary** and **intrinsic motivation** to play but also **safety** – exposing them to contact risk and cultivating **compulsion**.

> **"If you're in a Fortnite chat, and your party's not on private, if someone knows your name and searches it up… And when you're in-game chat, if you've got a mic on, anyone can speak. So, I'll be in a party, and then someone'll join if I've not put it on private. And there'll just be this random person going, hello… I think it should be a bit more private."** – Girl, aged 13

> **"So, when Fortnite went to… the zero event or something, where Fortnite switched off for two weeks. I know my neighbours, the 10 and the 12-year-old, they lost their minds. They'd become almost physically addicted to this game… It's like they had a withdrawal."** – A theatre-maker working with vulnerable children

> **"Fortnite is not for a child to play. So, I think what needs to be done is develop a framework perhaps that can create a better experience for parents and kids to engage online. And I feel like that's what's missing."** – Father of a 10-year-old boy

Our analysis of the features that can transform children's play experience, based on the correlation matrix, indicates that:

- making Fortnite less **expensive** and less **exclusive** could afford children greater **safety** in their play
- toning down the **high-tech** demands and increasing **age-appropriate** features could afford children greater voluntary experience in their play with **Fortnite**
- curbing **compulsive** features, such as crossover events,[38] could improve safety, but too many cutbacks on compulsive features could inadvertently undermine open-ended and immersive experiences
- making **age-appropriate** features more available could leverage even greater **social** play.

[38] This refers to events in Fortnite that coincide with a major event in 'real life', like the National Basketball Association.

Experts recognised Fortnite's social and team-based play appeal, which children value. However, they raised concerns over the very features that are key to Fortnite's success – the cosmetic items which are tied to limited time events or popular licensing tie-ins and meme-worthy dance moves that are made available as in-game purchases. These in-game purchases are also known as 'loot boxes'. The experts warned that without appropriate and adequate control, such in-game spending could get out of hand. This warning appears to coincide with our finding that correlates expensive features – in this case 'loot boxes' – with children feeling 'unsafe'.

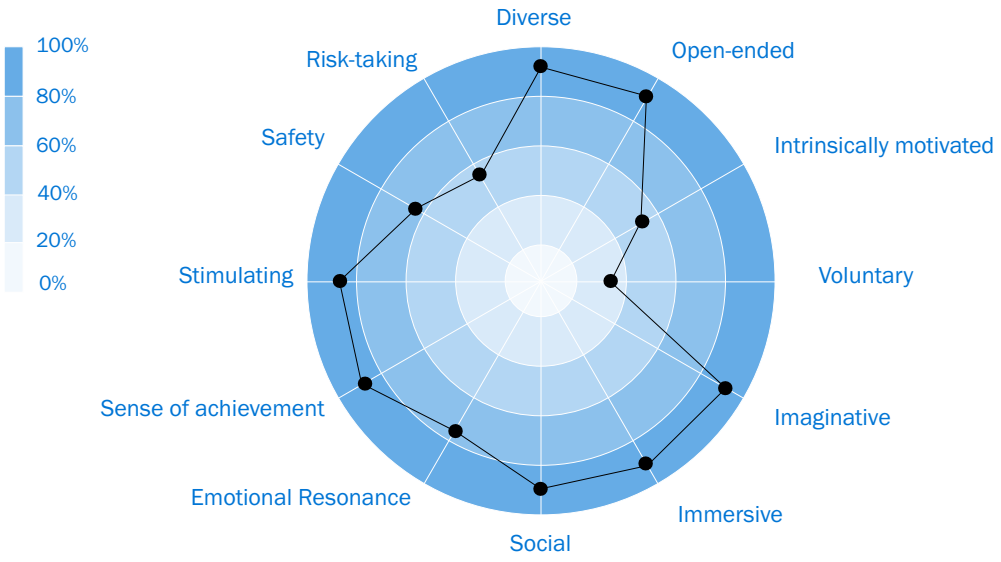
Experts also noted that, combined with high-profile streamers showcasing new aspects of the game, these cosmetic items that are tied in to special timed events create a 'must-have' culture that propagates microtransactions and normalises perpetual spending. The experts noted that the crossover events in Fortnite cultivate compulsive attitudes among players and that these design techniques encourage players to keep returning to the game and become recurrent spenders; these are also being standardised through industry events (e.g. the Game Developer Conference). One expert suggested that clearer lines are needed between games whose customer base comprises mainly young players and games for adult players, with compulsive practices not used in games that children play in significant numbers. Another agreed, adding that such boundaries are also relevant to the Age-Appropriate Design Code (Information Commissioner's Office, 2020a).

Minecraft

Minecraft is an award-winning, sandboxing, world-building video game owned by Microsoft. It operates on various devices and operating systems, including Windows, iOS, Fire TV, game consoles (e.g. Xbox, Nintendo Switch, PlayStation). It offers blocky tools that players can use in an infinite number of ways and various gaming experiences through various game modes (e.g. Creative, Survival, Hardcore, Story and Adventure modes), with built-in text-based communication features (Microsoft, n.d.)

Players can choose to play on a stand-alone Minecraft (e.g. Story Mode) or join up with a small group of players in its new extension – Minecraft Dungeons – or join even bigger groups on multiplayer servers (Robertson, Boers, et al, 2021)

Figure 6: Children's views of the qualities of free play in Minecraft (% agree)
Minecraft base: 245 6 to 17-year-olds



Children who responded to our survey described the qualities of their play with Minecraft as **diverse** (93% agree), **imaginative** (92%), **open-ended** (91%) and **immersive** (90%). They saw play with Minecraft as less intrinsically motivated (50%), involving risk taking (54%) and voluntary (29%); they did not see play with Minecraft as being very safe either. Overall, there

is no significant difference in how children of any particular age group or gender perceive Minecraft. However, children aged 6–12 reported enjoying significantly more emotional resonance (79%) in Minecraft than their older counterparts aged 13–15 (69%).

As for its digital features, children generally see Minecraft as being '**good for people their age**', **intergenerational, creative** and **flexible** to use. In the consultation, children and young people gravitated towards the **flexible (open-ended) design** of the sandboxing game mechanics and the **creative** world-building **tools** in Minecraft, which afford them **imaginative, immersive, open-ended** and **diverse** play, with a glimpse of opportunity to **take risks** by pushing some boundaries.

> **"When I'm playing Minecraft, time might as well not exist. And it allows you to push the boundaries… You're not constrained by those rules, and it's almost like you try to be a kid again."** – Boy, aged 17)

> **"It's… building Lego isn't it, because… Lego blocks look like Minecraft blocks."** – Boy, aged 5

While many children and young people appreciate the imaginative quality of play in Minecraft, some still think that 'real life' offers more **diverse** and **imaginative** experiences.

> **"With Minecraft, which I used to play, you can have more input into what the outcome's going to be. Overall, I think it's still less imagination than making stuff up in real life."** – Boy, aged 14

Despite their praise, in our consultation, both children and young people found the commercial pressure of in-game microtransactions frustrating: they explicitly called for this to change.

> **"One thing I don't like is in Minecraft, you have to pay in-game coins to get maps and things and skins. The really annoying thing about that is that you're paying in-game money, but the in-game money, you have to pay for with real-life money. So, I wish there was a way that you could earn things in games from just playing them, rather than having to pay."** – Girl, aged 12

Children who responded to our survey also reported forms of **commercial pressure** (57% agree).

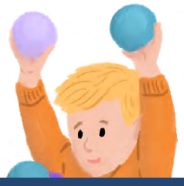
Parents and teachers expressed concerns about design features that **cultivate children's dependency** on the game, or feelings of **compulsion**.

> **"Taking [my 6-year-old son] away from Minecraft… [it] is quite difficult for him to acknowledge the end of the time."** – A father of 2 children

> **"In Minecraft… you have to repetitively do the same procedure over and over again to get certain items. Maybe the little rewards in between is what motivates the children."** – Year 5 teacher, London

Our analysis of the features with transformative effects on children's play experience, the correlation matrix, shows that:

- **hybrid** and **exclusive** features could be reduced to make children feel safer in their play with Minecraft
- the **compulsive** features, such as the 'grinding' aspect to collect resources and a design strategy to 'lengthen' play time of the game could also be reduced to give children more autonomy to start and stop playing at will (**voluntary**); however, care is needed in fine-tuning these compulsive features because they also facilitate immersive play in Minecraft, offering children emotional resonance and a sense of achievement
- more **flexible** (open-ended) **design** could also make play with Minecraft even more diverse and **open-ended**.



Experts were not surprised to see Minecraft scoring highly on diverse and imaginative qualities. They agreed that the key to Minecraft's popularity lies in its 'mastery' and the 'depth' of the game in terms of the extent of what players can achieve with the flexible tool set. The 'drip-feed of capabilities' (the unfolding and evolving gaming experience according to players' input) keep players engaged in the game. Our experts also agreed with the high score (90%) for a sense of achievement that children gave to Minecraft in the survey. They observed that children create problems and challenges for each other to overcome or overcome the challenges they set themselves together with the flexible tools given in Minecraft. However, these same experts noted that the very features that further players' engagement in the game inadvertently foster compulsion. This observation coincides with the concerns raised by parents and teachers in our public consultation about the compulsive features of Minecraft and the ensuing strain on the child's ability to disengage at will and on the child-parent relationship.

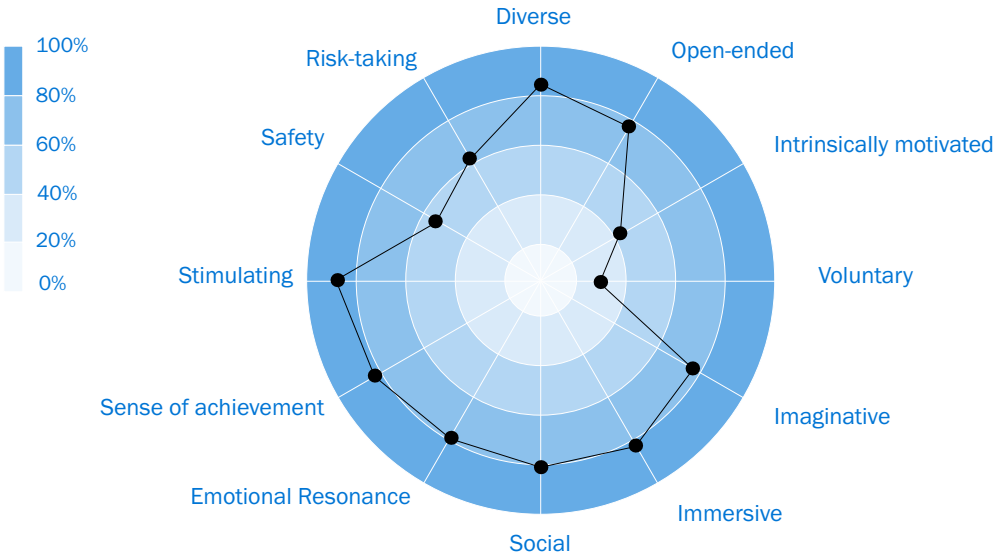
Adding to the compulsive features in Minecraft, one expert raised a concern about the 'grinding' aspect to collect resources in Minecraft as a design strategy to 'lengthen' play time and encourage players to pay for 'boosts' to minimise the grind aspect, normalising commercial pressure among children. The concerns about compulsive features and the normalisation of commercial pressures, including the compulsion to pay, concur with our findings that correlate compulsive features of the game with the dwindling voluntary quality of play that children experience. At the same time, their recognition of the positive effects of these features reinforces our recommendation that care is required in adjusting them, because they also facilitate other qualities of play that children enjoy. To address the negative effects of compulsive features without compromising the positive effect these features have on some free play qualities, one expert proposed introducing a time limit for play into the game. Another feared this in itself could undermine children's autonomy. All things considered, reducing features that compel play is preferable to retaining such features while also adding others that limit a child's play.

Nintendo Wii and Ring Fit Adventure

Wii is the early generation of Nintendo's game console and was the first Nintendo console to support internet connectivity. Wii packs a variety of games, ranging from the classic Mario series to Wii Fit and Wii Sports. The critical feature that distinguishes Nintendo Wii from its competitors is the motion-sensing capability in Wii remote controllers, which afford players a broader range of movements and sensory engagement. In 2017, Nintendo released a new console – Nintendo Switch.

Our game experts noted that the motion controls in Switch serve more as an option to augment more traditional game play, except for Nintendo Ring Fit Adventure which requires additional peripheral to incorporate physical exercise into the game. Ring Fit Adventure was released in 2019 and became very popular during the COVID-19 pandemic. Children in our public consultation talked about Nintendo Ring Fit in the same vein as both children and adults did with Wii.

Figure 7: Children's views of the qualities of free play in Nintendo Wii (% agree)
Nintendo base: 236 6 to 17-year-olds



To children in our survey, playing on Wii is **stimulating** (87% agree), **diverse** (86%), **immersive** (84%) and offers a **sense of achievement (**83%). Although the qualities of play with Wii are generally similar across age and gender, more boys find play on Wii imaginative (83% agree) than girls do (70%). Children reported enjoying less voluntary (29%) and intrinsically motivated (42%) play with Wii.

With good **age-appropriate** and **intergenerational** features, our survey shows that children found Wii to be good with **onboarding** new players, showcasing a **variety** of games and particularly **hybrid** features. In line with the survey findings, children and young people in our consultation favoured Wii's **hybrid** feature, enabled by **motion-sensing** technology, which continues in Nintendo Ring Fit Adventure. Our youth participants saw the hybrid feature as affording them **stimulating** and **immersive** play, as well as a **sense of achievement**. To these young participants, this same hybrid feature also makes their play **intergenerational** and more **social**.

When talking about the games on Nintendo consoles, our youth participants focused more on Mario Kart[39] and Ring Fit Adventure[40]. They loved the **variety** of games on Wii and the activities on the Ring Fit Adventure, as such variety afforded them **diverse** playful experiences.

> **"On the Wii, I play Mario Kart and stuff like that."** – Boy, aged 11

> **"You play it on a Nintendo Switch... It's basically exercise, but you kind of do a game-themed adventure. So, you've still got to kill monsters, but in order to do that, you've got to do 50 squats. It's really tiring, but I think to do more things like that would be kind of a good idea because you're still doing the same thing, reaching a goal. I don't think, as far as I know, there's a way to do it with other people. So, it may be a good idea to try and encourage things like that with others because then it might feel a bit more like a normal video game."** – Girl, aged 13

Elder sister (aged 12):

> **"I have a game on my Nintendo Switch that I got for Christmas. I have a couple of games on it now. But it's a sports game that I've been playing for the last couple of days. [My younger sister] does it too, and you have a ring, and you have a little thing that you attach to your leg, and you put a controller in each. You can do different activities to defeat the monsters."**

Younger sister (aged 6):

> **"I get a purse to put on my leg. You tie it around, and then I have a cushion."**

Elder sister (aged 12):

> **"That was because we were trying to get [our younger sister] to try... She was doing it with us..."**

Adults talked more about Nintendo Wii, possibly because Wii had been in the market longer, but shared the same appreciation as the children for the **hybrid, motion-sensing features** and **intergenerational** features of the console that is also seen in Nintendo Ring Fit Adventure.

> **"The best device we've got is the Wii, I like to watch Chris on the Wii, it's not online, it's physical, it's enjoyable, they can play together... because the children were at home in the first lockdown, so we used it as PE. The children were absolutely amazing at setting up, in the summer, they set up numerous assault courses in the back garden with all kinds of things from the garden, chairs, watering cans, you name it... "** – Foster parent

[39] Mario Kart is a go-kart racing video game series published by Nintendo as a spin-off from the Super Mario series.

[40] Ring Fit Adventure is an exercise-based role-playing game that operates on Nintendo Switch, a newer version of Wii. The exercise-based feature of Ring Fit Adventure is comparable to the Wii Fit game on Nintendo Wii.

"My older two boys aged 11 and 10, for their birthday, their dad got them Nintendo Wii. They play on that, usually Friday night, Saturday and Sunday… [and] when the cousins are over. They're very much enjoying it… They get to learn various technology, getting to take various challenges on playing the game." – Mother and school governor

"I think the Wii does definitely like that sort of interactive; it also mixes the physical. So, you're playing, but you're moving your limbs, or you have to do something quite physical." – Mother of a 10-year-old boy

Our analysis of the features that can transform children's play experience with Nintendo Wii indicates that:

- reducing **high-tech** demands and **compulsive** features could improve children's **safety, voluntary** play and **intrinsic motivation** to play with Wii and Switch
- careful consideration is nonetheless required in managing the **compulsive** feature, because the same feature also facilitates **imaginative, emotionally resonant** and **stimulating** play
- more **flexible** (open-ended) design, **age-appropriate** features and **variety** of games can also make play with Nintendo consoles even more **diverse, imaginative** and **stimulating**.

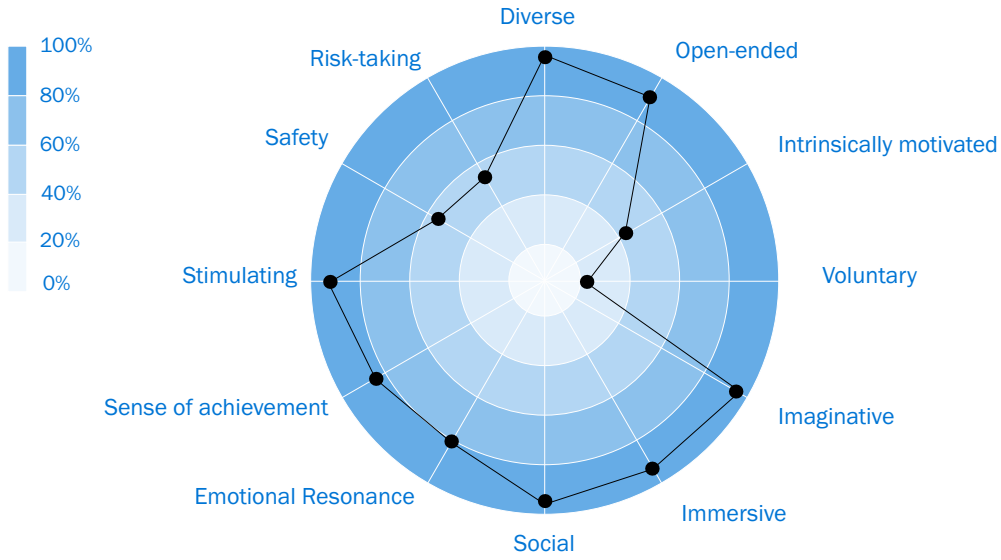
Experts unanimously depicted Nintendo Wii as a game console built around motion controls that offer family-friendly and social gaming experiences with physical movements and an intergenerational appeal. They noted that Nintendo Wii and Switch are 'different beasts', due mainly to the range of motion controls and their function in the games available on the consoles, except for the Ring Fit Adventure that only exists on Nintendo Switch. One expert observed the social and multigenerational nature of Nintendo consoles, noting that the consoles often live in a living room, possibly 'reducing' children's intrinsic motivation and voluntary play and replacing it with play shaped by social expectation and the preferences of other people.

Another expert observed that part of children's reasons for liking the physical exercises in Nintendo Ring Fit Adventure (see quotations above) seems to echo their parents' and carers' favouring of the mix of physical movements in games on Nintendo Wii. This observation begs the question about the extent of children's intrinsic motivation to play games on Nintendo consoles. Another expert remarked that although Nintendo has always prided itself on safety, even to the detriment of their games (for example, the lack of in-game voice chat that protects players from strangers), these protective measures often struggle to keep up with new features and new games accessible in Nintendo Store. Last but not least, seemingly contradictory is the experts' observation that Nintendo consoles require lower processing powers to achieve the gaming aesthetic offered and children's perception that the consoles demand high processing power. However, our experts offered an explanation that children's perception of the consoles' high-tech demands may have been influenced by gaming streamers' high-tech settings that they see on platforms such as Twitch.

Roblox

Roblox is an online game platform with an extensive collection of multi-player and social games created by its community of players, supported by a team of professionals. It operates on various platforms and generates income through in-game purchases to adjust cosmetic aspects of the game with its currency, Robux (Dubit, 2020).

Figure 8: Children's views of the qualities of free play in Roblox (% agree)
Roblox base: 245 6 to 17-year-olds



Children see play with Roblox as **imaginative** (94%), **diverse** (93% agree), **immersive** (92%) and **social** (93%), according to our survey. However, they found the quality of play to be less voluntary (23%), intrinsically motivated (41%) and a risk-taking experience (52%). Boys aged 13–17 reported significantly more sense of **voluntary** play (39%) than other groups (27% or under).

In our public consultation, children, parents and professionals praised Roblox for **onboarding** new players, providing **creative opportunities**, **communicative features** and **varied** games and 'worlds', which were seen as enablers for children to enjoy **diverse, imaginative, immersive** play and **social** interactions in and about the game (Colvert, 2021).

"I found [my 10-year-old son] got really into the Roblox idea. He knew through watching YouTube that you could learn [from] other people playing it and see

how to pick up tips and how to get better at the game." – A mother and professional working with children

"[In Roblox, my 9-year-old daughter] builds houses and interacts with [friends] in whatever world they've generated... They're also always doing it with a House Party, Zoom call type thing going on in the background so that at the moment." – Father of two children

"On Roblox, there are thousands of different worlds and games to play on. Some of them, you can't play together if someone's on a computer and someone's on an iPad." – Girl, aged 9

But these positive views are qualified by concerns about features that impede children's **intrinsic motivation** and **safe, voluntary** and **social** play. These concerns include **in-game commercial pressures** such as loot boxes, **limited platform inter-operability**, and **insufficient safety features**.

"If you get Roblox... there are loads of games, and you can make friends, and it is pretty safe because there are parental controls if your parent has to block anything. My mum... blocked the chat... just in case some people say any mean things... [But] there are Robux... It's not good because they're kind of tempting you to buy... [Also] there are scammers in Adopt Me!... It's when you trade, for example. A scammer could trade their best pets, take them back to their inventory and just steal the other person's pets." – Girl, aged 9

"There was a recent thing shared quite a bit about Roblox where a little seven-year-old girl was playing and had then said to her daddy she wasn't sure about this person messaging. And he took over. And according to [the story shared on] social media, that was a groomer." – A mother and professional working with children

Some of these problematic features, particularly the in-game commercial pressures, result from a design intention to maximise and monetise user engagement (Reid Chassiakos et al, 2016).

Our analysis of the features that can transform children's play experience, the correlation matrix, indicates that:

- **hybrid** features and **data sharing** could be reduced to improve children's intrinsic motivation to play
- the **compulsive** nature of the game could be curbed to improve children's voluntary play, but we note that the compulsive features are also associated with positive qualities of play, so care is needed
- more **age-appropriate** features can be leveraged to make Roblox even more **immersive** and **stimulating,** offering children a greater **sense of achievement:** as our experts suggest (below), these age-appropriate features could include ones that encourage 'digital growth' and creativity.

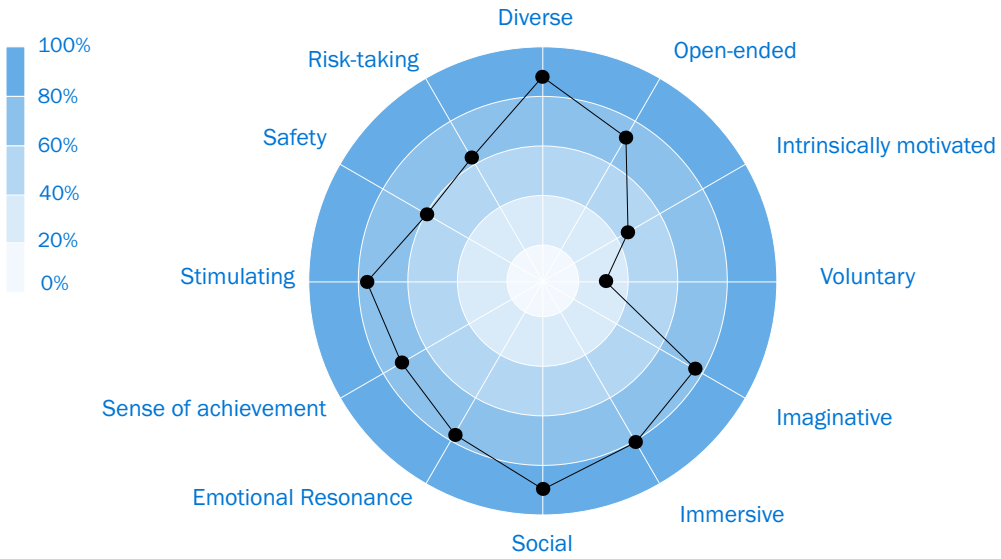
Experts are unanimously concerned about commercial exploitation in Roblox, particularly in relation to rather young players (mainly 6 to 9 years old) that make up the majority of its customer base according to Dubit Trends (2021). Such commercial exploitation, they said, largely manifests in two forms: 1) in-game purchases to progress in the game, and 2) unfair commercial exploitation of child game developers. An expert noted that in-game purchases are observed particularly in the most popular Roblox games produced by software houses or experts where little or no explanation is given to the goal or intended activity, yet with an expectation for young players to make 'uninformed' decisions to spend a significant amount on their 'Robux'. As for Roblox's profiting from young players' game development, another expert cited a report showing that the revenue split between the platform (Roblox) and a child game developer is "just one third of the industry standard" (D'Anastasio, 2021).

To address this unfair commercial relationship between child game developers and the platform, the same expert suggested that "proper independent governance" is required. In addition to the commercial exploitation of young talents, the expert who raised the problem of in-game purchases also questioned the quality of game developer that this business model is encouraging children to become, noting that "there doesn't seem to be much of a push to encourage players to become creators" and that "in Roblox, the aesthetics clash." To address the issue of quality and young players' progression into game developers, this expert proposed using nudge techniques and promotional mechanics to encourage "more digital growth", and creative and stimulating experiences in the games on Roblox, rather than amplifying monetisation through gaming.

Tiktok

TikTok is a video-sharing and social networking application offered by ByteDance. The app is most popular among girls aged 13–17 (Office of Communications, 2021). Like YouTube, TikTok allows users to create, upload, share and watch videos, but of a much shorter length – 15 seconds. The app features video editing tools, including video effects and filters, stickers, animations, slow-motion effects and masks, live streaming, reactions (e.g. likes), cross-platform social sharing (for example to Facebook), custom search, using usernames and hashtags, and direct messaging (BBC, 2020).

Figure 9: Children's views of the qualities of free play in TikTok (% agree)
TikTok base: 210 6 to 17-year-olds



Children depicted their play on TikTok as mainly **social** (90% agree), **diverse** (88%) and **emotionally resonant** (78%) in qualities, according to our survey. They deemed that TikTok offers rather limiting voluntary (28%) and intrinsically motivated (42%) play experience. While children generally experienced similar qualities of play on TikTok, irrespective of their age and gender, older children aged 16–17 reported experiencing significantly more **voluntary** play (44%) than those aged 6–9 (19%), 10–12 (22%) or 13–15 (27%).

Our survey results show that children see TikTok's features as being '**good for people their age**', **intergenerational,** offering **creative** tools, and easy for new users to join (**onboarding**). They also recognise the app's **contact control** and **communication** features.

Consistent with the survey findings, children and young people told us in our public consultation that they valued TikTok's **creative tools**, **personalisation** and **contact control features** that afforded them **diverse** playful experiences and social interactions with people of different ages (**intergenerational**). Furthermore, our youth participants gravitated mainly towards TikTok's social sharing function, a **communication** feature, because the feature appeals to their most-loved quality of free play: **social**.

> **"It's just because there's this thing called your For-You-Page... It basically picks up the videos that you like."** – Girl, aged 13

> **"We went to this slideshow, and I was teaching my nana a TikTok dance."** – Girl, aged 12

> **"Yes, but with TikTok, you don't have to post. You can just be there to watch. And people also have the option to make their videos private."** – Girl, aged 16

> **"Because even when I'm on TikTok, I will send videos to my friends and then we'll laugh about it together. So, there's a wide variety of different content on the app."** – Girl, aged 16

Professionals working with children also recognised the social benefit of TikTok for children. They also appreciated the **hybrid** opportunity offered by the app.

> **"I see them really playing or enjoying each other's company through that shared rehearsal of the TikTok dance."** – Year 6 Teacher 1

> **"I think TikTok is the new skipping... Instead of singing games, what they've seen on TikTok they will do and teach each other on the playground."** – Year 6 Teacher 2

These teachers' observations highlight the strength of TikTok's movement-based content creation, a **hybrid** feature, in facilitating **diverse** and **social** play that is also **stimulating** and offers children a **sense of achievement**.

Yet children found TikTok's slow response to any reported inappropriate content problematic. Some children also questioned TikTok's **personalisation** impact on **voluntary** play, while parents were anxious about the **safety** and **privacy** control mechanisms on TikTok.

> **"I think you should get two [...] or three warnings on a social app like TikTok. Because you'll get someone that could be showing their body parts, and they'll often get reported, but because there are so many people on TikTok, TikTok doesn't see immediately."** – Girl, aged 12

> **"On social media, such as say TikTok, I'm pretty sure it runs off algorithms... All it takes is somebody to like a video... When you next go on the app, everything is based around that thing, which in some cases is good... [But] all it needs is them to like a video that could be quite distressing."** – Girl, aged 15

> **"I think because of the line of work I'm in, you get to hear horror stories about young people being taken advantage of... and also mental health impact with digital things, such as TikTok."** – Mother, theatre professional and youth facilitator

> **"We have a problem in our house with TikTok because that is seen as play, creating videos, doing filters... So, I set it up in my name... But it's all her making videos... She's just made a video of me... feeding the baby and put music to it!"** – Mother and freelance artist

Our analysis of the features that can meaningfully reshape children's play experience, the correlation matrix, indicates that:

- **compulsive** features, particularly **personalisation** designed to extend or prolong user engagement on the platform, could be curbed to improve children's **voluntary** play and **safety**
- features and practices that **exclude people** could also be reduced, for example through filters or moderation systems to address discriminatory behaviours among players or users, to make children's play on this platform **safer**
- **providing help** in a more responsive and targeted way when children encounter something upsetting during their play on TikTok would address safety concerns and give children a greater **sense of achievement** and make their play more **immersive**
- better instructions on how to get better at using TikTok (**pathways**) could level up **immersive, emotionally resonant** and **stimulating** experiences and give children a greater **sense of achievement** when playing on TikTok
- making TikTok content and features more **age-appropriate** could make **social** play on TikTok even more satisfying.

TikTok is recognised for its support for creativity by children who responded to our survey as well as experts. However, our experts questioned the value of content shared on this platform. One expert raised a concern about the lack of transparency of TikTok's algorithm, noting that the quality of content does not seem to factor into TikTok's algorithm, making it difficult for quality content to reach audiences and for such content creators to feel excluded. This perceived exclusion, the expert said, could be troubling for young users in so far as the algorithm would appear to amplify human practices, preferences or behaviours that result in perceived exclusion.

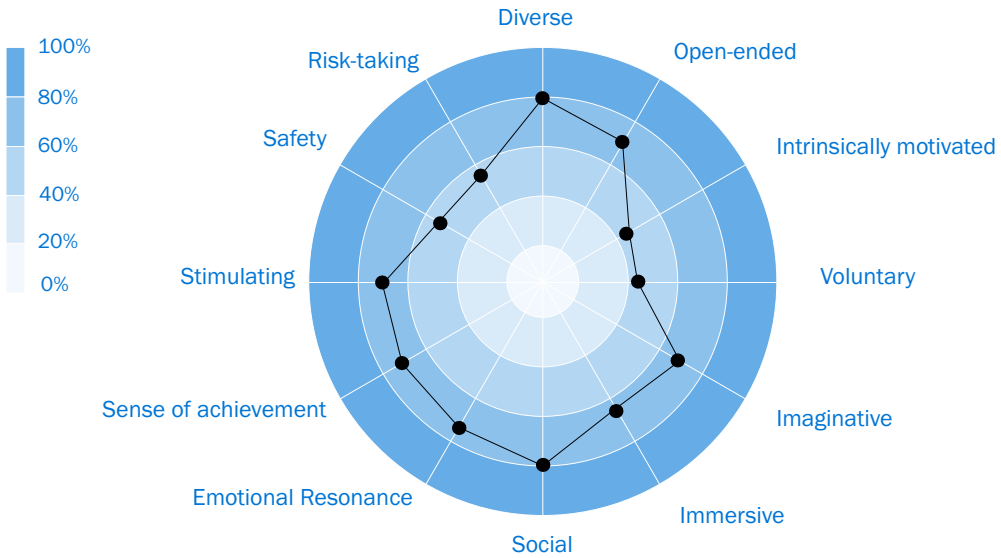
In the consultation, children also talked about exclusive practices in their digital engagement, particularly in games and more frequently experienced by girls. These, too, are enabled by particular design features (e.g. a chat channel, the lack of effective filtering or moderation systems). It is plausible that with increased algorithmic transparency, children could understand better why they receive the content that they do, instead of concluding that their content did not find an audience because it was not good enough. Another expert added that the platform's commercial structure needs to be made clearer and more explicit, particularly in relation to children's role in generating income for the company through content creation.

WhatsApp

WhatsApp is a free-to-use cross-platform messaging, video and voice-over-IP service operated by Facebook, Inc. The service allows users to exchange images, emoticons (emojis), text and voice messages, and make voice and video calls. WhatsApp is also known for its end-to-end encryption technology, intended to offer users privacy in their communications.

In addition, the provider sets the minimum age for using WhatsApp at 16 for users in the European Economic Area (EEA), including the European Union. Still, those as young as 13 living outside the EEA can use WhatsApp (WhatsApp, 2021).

Figure 10: Children's views of the qualities of free play in WhatsApp (% agree)
WhatsApp base: 214 6 to 17-year-olds



Children moderately enjoy **social** (80% agree), **diverse** (78%), **open-ended** (70%), **emotionally resonant** (73%), **stimulating** (72%) and **imaginative** (67%) play, plus **a sense of achievement** (69%), when they play on WhatsApp, according to our survey. On the other hand, children found WhatsApp rather limited in affording them risk-taking (54%), voluntary (44%) and intrinsically motivated (45%) play. There is no significant difference in the qualities of play that children experience, irrespective of their age groups and gender.

Our youth survey respondents recognised WhatsApp mainly for its **communication, age-appropriate, intergenerational** and **contact control** features. However, children in our consultation only explicitly valued WhatsApp's **communication** feature and its support for **social** interaction.

> **"I have... joined friends and family playing video games over lockdown... not just [doing] calls through WhatsApp or Zoom, but it's just fun at the end of the day to play a game and kind of have something to do that's a bit productive between us."** – Boy, aged 13

Some found ways to integrate this **communication tool** into their leisure activities, such as baking or playing online games, to simulate the joy of doing these activities together in the same physical space before the COVID-19 pandemic, and subsequent lockdowns. To these young participants, WhatsApp is one of children's **social** lifelines during lockdown, and their parents recognised that.

> **"At the moment, the best thing is just [...] Fortnite or having a chat on the phones or WhatsApp-ing."** – Mother of two teenage girls

> **"I communicate through WhatsApp, Instagram, Facebook, Snapchat and Live... "** – Young football coach with hearing loss

Parents and carers in our consultation were less optimistic about WhatsApp and raised concerns over the ability of digitally mediated communications to affect how children and young people develop their social and communication skills and etiquette.

> **"For me, the whole thing with this social media and WhatsApp... I think the art of talking is slowly eroding away if we're not careful."** – Father of 2 children

Others were concerned about the unintended negative consequences of WhatsApp's encrypted communication, which highlights the tensions between technical efforts to protect user privacy and social efforts to protect children.

> **"It's like everyone assumes they can go on WhatsApp, but actually, it's for 16-plus. And... because it's encrypted, no-one can check what's going on in it. The rule is that at night the children put their phones here, and we have their login details, and if ever we've got any concerns, we would go in and have a look at anything that had been going on, on the phones... That's the only way we can practically protect them."** – Foster parent

The concerns about the challenge that end-to-end encryption poses to child protection are also clear from research (Endeley, 2018). These concerns highlight that the technical aspect (end-to-end encryption) of WhatsApp's communication feature could also undermine **safety** in free play.

Our analysis of the features that can transform children's play experience, the correlation matrix, indicates that:

- by curbing the **compulsive** features (notably, notifications), **voluntary** and **intrinsically motivated** play on WhatsApp could be enhanced; however, care is needed when adjusting the **compulsive** features, because these same features also support **immersive** and **risk-taking** play
- adjusting WhatsApp's **hybrid** features also requires careful consideration to avoid undermining these features' support for **imaginative, immersive** and **risk-taking** play
- more **pathways** could be added to make play with WhatsApp more **imaginative, immersive, stimulating** and **risk-taking**.

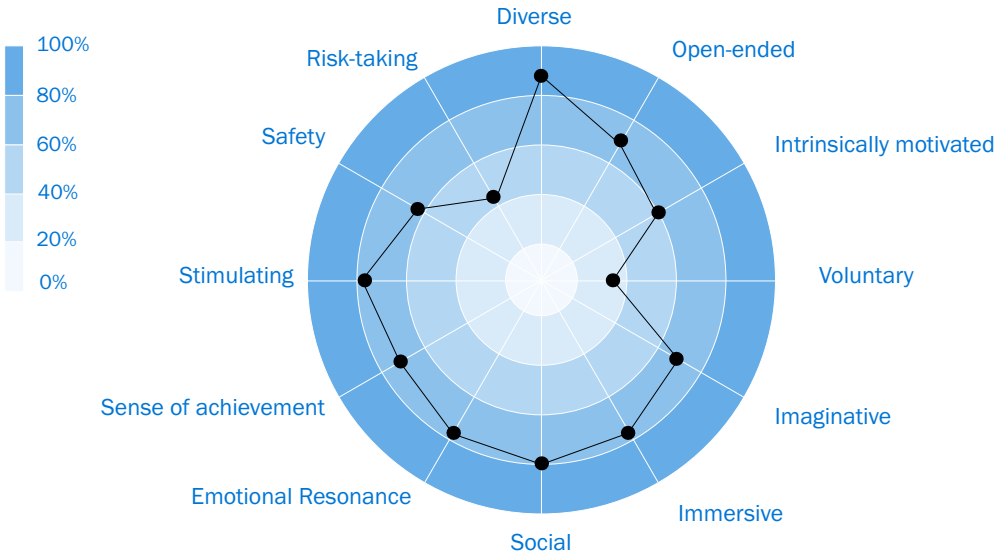
Experts noted that, like Zoom, WhatsApp's core function is not in fact to facilitate play, but it is being used for play nonetheless. They noted that WhatsApp is currently under-utilised as a mode of communication that could help children develop conversational skills, echoing the concerns of parents raised in our public consultation. One expert observed that the under-exploited potential of WhatsApp may have resulted from young people's communicative practices on this particular platform, favouring texting rather than voice calls.

Another expert noted that WhatsApp has the potential to engage young people in conversations and creativity through clever word play, emoji representations or even curation of users' favourite playlists. However, this same expert raised an even bigger problem inherent in the attention economy, manifesting mainly in the notification settings of messaging apps like WhatsApp, which are designed to 'cry out for attention'. This attention economy behind the design coincides with children's perception that their intrinsic motivation and voluntary play in WhatsApp is rather low. The same expert suggested that WhatsApp could improve the offer to children by setting notifications to 'off' by default, or by making the user journey to adjust the notification settings so that users could choose to be alerted only to things that are relevant to them.

YouTube

YouTube is an interactive free-to-use video sharing platform operated by Google. The platform affords users opportunities to create their own profile, upload videos, watch available videos, 'like' and comment on the available content. YouTube relies mainly on advertising revenue to operate, with some subscription fees (Burgess & Green, 2018). The platform also allows highly popular content creators (those with over 4000 public views) to share its advertising and subscription revenues through the YouTube Partner Programme (YouTube, 2021).

Figure 11: Children's views of the qualities of free play in YouTube (% agree)
YouTube base: 387 6 to 17-year-olds



Children described their play on YouTube as **diverse** (87% agree), **social** (84%), **immersive** (79%) and **stimulating** (77%) in qualities, according to our survey. However, they found their play on YouTube to be less voluntary (31%) and involving limited risk-taking opportunities (43%). YouTube's constraint on voluntary play is experienced mainly by younger children (aged 6–9). On the other hand, a significant proportion of older girls aged 13–17 (46%) described their play experience on YouTube as **voluntary**.

Children who responded to our survey found YouTube features to be **'good for people their age'**, **intergenerational**, **easy to use for new users**, and **creative**. However, they also noticed a lot of **advertising** on YouTube. Children who participated in our public consultation praised YouTube more on the platform's **variety** of audio-visual contents and the **flexible**,

creative tools that afford children **diverse, open-ended, immersive, social** and **emotionally resonant** playful experiences.

> **"Back when we used to play like those dress-up games, it was us wanting to be someone else and wanting to be that older figure. And now... we watch YouTubers and follow people on Instagram who have these lives that maybe we look [at] and idolise... Maybe we reflect it in a way that we don't want to live."** – Girl, aged 17

The **variety** of content on YouTube can also inspire children's **creative** outputs and offer them a **sense of achievement**.

> **"I saw someone... on YouTube... And I was like, I love the Sims... There's these videos, and it tells you... everything... On YouTube, you can have a Sims 4 CC shopping or something, and you could press on a video. And then in the description someone could write stuff, they'd put links or something."** – Girl, aged 13

However, children and parents found **inappropriate content** and **advertisements** intrusive and undermining of their **voluntary** and **intrinsically motivated** play.

> **"I have a sister who's ten and who just got her first phone and [...] can access all of this stuff that I potentially am watching. I do think people always say that you can have parent controls. Like on YouTube, you can introduce that where you can regulate what your child is seeing, but the internet is so big that you can't regulate everything."** – Girl, aged 17

> **"With YouTube, what we encountered was that there were some inappropriate videos with children's characters... There's no proper filter... It was a cartoon of a baby throwing up, but then, in the end, it was a witch coming over and taking them and [my child] had bad dreams... I couldn't work out what it was... until I sat with him one day and realised that that's the same sound... We aren't using YouTube Kids anymore."** – Mother of two young children

Research (Burgess & Green, 2018; Radesky, Schaller, et al, 2020a) shows that children are exposed to these **age-sensitive** contents, including inappropriate **advertisements**, on YouTube due to the combination of a business model centred on monetising audience attention and the algorithm that determines recommendations (Lomas, 2021; Mozilla, 2021). That said, some parents seemed happy with the parental control features from other safety tech providers and YouTube's own content restriction mode.

> **"We have the Microsoft, and also we have the restriction modes on YouTube and things like that so it's quite easy to monitor the activities on Google or off that."** – Mother

In response to these child safety concerns and to meet the requirements of the UK Age-Appropriate Design Code, Google has recently rolled out new features to prevent **age-sensitive content**, **advertisements** and **targeted marketing** from being shown to users under 18, as well as additional wellbeing tools to help children navigate YouTube's **compulsive** features (Brooks, 2021).

Our analysis of the features that can improve children's play experience, the correlation matrix, indicates that:

- reducing **hateful** content, **expensive** and **exclusive** features on YouTube could improve **safety** in children's play
- providing more responsive and targeted help when children experience something upsetting could make children's experiences with YouTube even more **emotionally resonant, stimulating, imaginative** and **immersive**
- offering more **flexible** features and a greater **variety** of content could make play on YouTube even more **open-ended** and **stimulating**
- Google's introduction of new 'digital wellbeing tools' (Brooks, 2021) to help children navigate YouTube's **compulsive features** is a step in the right direction to improve children's **voluntary** play.

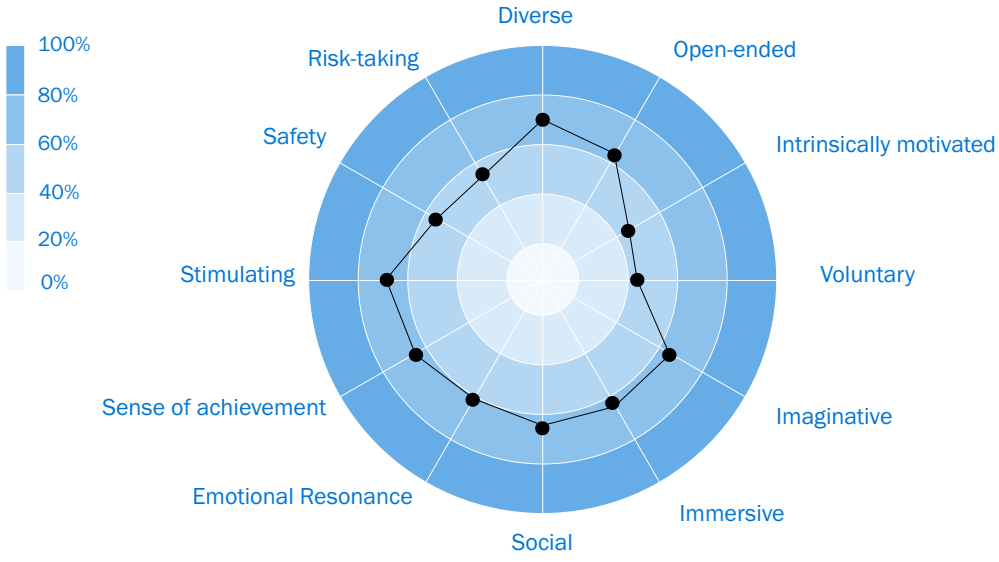
One of the experts we consulted recognised YouTube's 'outstanding' score on intrinsic motivation to play (60%), compared to the lower scores of other digital products and services (50% or lower), explaining that visits to YouTube are often driven by users' search for information or entertainment of their choice (and interests). However, aside from facilitating children's intrinsic motivation to play, this expert, as well as the other experts we consulted, raised serious concerns about harmful content, which also includes age-inappropriate content; YouTube's monetisation of viewers' attention; and the algorithm that selects and suggests content or advertisements for children to see.

The experts unanimously agreed that more effective methods are required to identify and address hateful speech, harmful content and other safeguarding issues, because existing measures appear inadequate to withstand children's as well as malicious actors' workarounds. The experts' comments also suggested that more effective policing and enforcement measures are required to ensure that service providers such as YouTube offer their services and process information about their young users for that purpose in a fair and rights-respecting manner.

Zoom

Designed for remote business meetings, Zoom, a video communication service, has enjoyed a pandemic-related explosion in everyday use at home (Koetsier, 2021). Users can join the call with their camera and microphone turned on or off, choose personalised virtual backgrounds, and join in with text chat and emoticons. Paid-for accounts allow more than the standard free 40 minutes, plus such functionality as breakout rooms and integration with other apps like the annotation tool 'Whiteboard'.

Figure 12: Children's views of the qualities of free play in Zoom (% agree)
Zoom base: 146 6 to 17-year-olds



According to our survey, children described their experiences on Zoom as moderately **diverse** (70% agree), **stimulating** (68%), **social** (67%), **open-ended** (63%), **imaginative** (66%) and offering a **sense of achievement** (64%) in nature. However, children found Zoom somewhat restrictive in supporting voluntary (44%) and intrinsically motivated (43%) play. Generally, the qualities of play on Zoom are similar for children across all age groups and gender. However, boys aged 13–17 tend to find play on Zoom more diverse (86%) than girls and younger children (64% or above).

Our survey highlights **communication, age-appropriate** and **intergenerational** features as being among Zoom's strengths that afford the qualities of play mentioned above. However, Zoom attracted mixed feelings and divergent perceptions from participants in

our consultation. Some creative professionals, parents, children and young people praised Zoom's **communication** feature for enabling **social** play with family and friends. However, using free accounts limits how **open-ended** play can be. During the pandemic, parents made real efforts to facilitate playful interactions with and through Zoom (Colvert, 2021). Children's accounts of this were appreciative but a bit more dutiful, and they felt the restrictions of the format.

> **"My eight-year-old was playing on Zoom… All the kids, they all have access to the screen, and they're sort of playing hide and seek or catch, tag, so someone has to draw, and someone has to be the eraser."** – A mother and creative professional

> **"I was annotating, and my cousin wanted to know how you do that… So, my aunty put a whiteboard on the Zoom for us to annotate on."** – Girl, aged 9, on playing family Scattergories on Zoom

> **"During the first lockdown, we had Zoom nights, so we'd all get around… Mum and Dad would have a glass of wine, have a glass of Coke, and we'd all sit down and play quizzes and stuff."** – Boy, aged 15

But people also found the platform restrictive, constraining their social and emotional experiences and undermining their possibilities for immersion and intrinsically motivated play.

> **"It's kind of different because we don't go to friends' houses any more and we don't… knock at the door… And we can't go into [families'] houses, and it's just different."** – Girl, aged 8

> **"My child often gets quite hurt by things that happen on Zoom… I find it really problematic mainly because the kids aren't moving their bodies; they're not experiencing enough of the 360-degree experience."** – A mother and artist

Some children have found ways to counteract these limitations – for example, by developing a new social etiquette or treating it as a stage, **imaginatively** harnessing the available control functions (e.g. virtual background) or diversifying the experience by bringing a teddy or a pet into view from 'off-stage'. Professionals who work with children are keen to support this type of playful creativity:

> **"I've really struggled with Zoom in the beginning… I've been telling people to write in the chat and turn your screen upside down… It was at that point that I've realised that we can still listen, just the same way… It actually enabled them to listen more… and get engaged and get more motivated."** – Teacher and performer

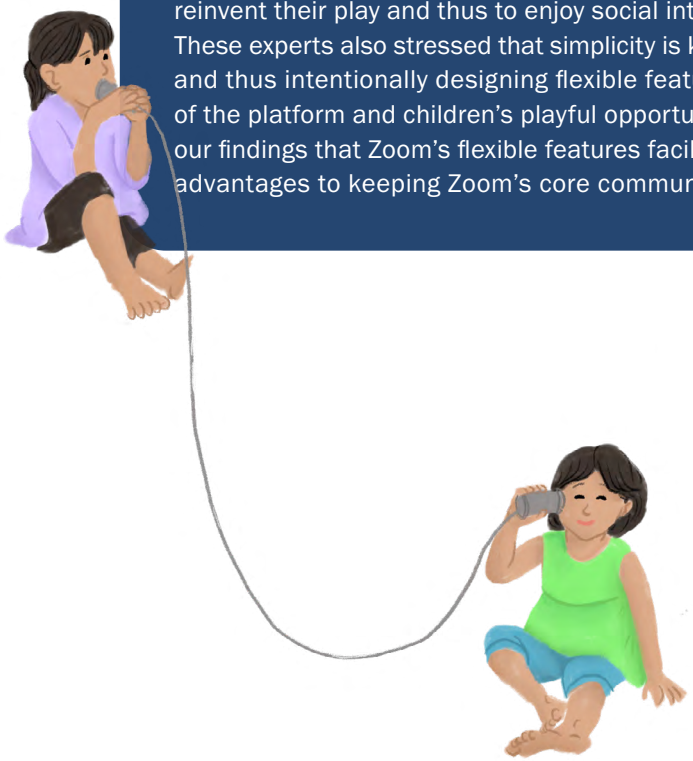
So, while in some ways Zoom resembles the open-ended (or adaptable) feature and quality of a cardboard box, especially for adults seeking to promote children's **social, imaginative, diverse** and **open-ended** play, we heard little of its potential for being emotionally resonant, immersive, or enabling risk taking or a sense of achievement. It also has limitations in terms of enabling intrinsically motivated play and safety.

Our analysis of the features that can transform children's play experience, the correlation matrix, indicates that:

- provision of more targeted and responsive **help** could also improve both **voluntary** and **intrinsic motivation** to play while making play on Zoom even more **immersive** and allowing children to enjoy a greater **sense of achievement**
- maintaining Zoom's **flexibility**, which is rooted in its simple function as a communication tool as the experts suggested (below), could further the platform's facilitation of **immersive** and **social** play.

The experts we consulted unanimously recognised the COVID-19 pandemic as an unintended factor for Zoom in successfully facilitating children's play. On its own technical and functional merits, the experts highlighted Zoom's simple function as a communication tool as its key factor for success in facilitating play. As a communication tool, initially for work, Zoom neatly fulfils the requirement for virtual interactions during the periods of COVID-19 lockdown. As one of our experts put it: "Kids have hacked the platform, manipulated it in a clever, emergent way, to adapt to their needs."

The way these experts described Zoom resonates well with how children who joined our consultation and those who responded to our survey perceived Zoom: namely, that Zoom offered ample opportunities for children to exercise their imagination, to reinvent their play and thus to enjoy social interactions in diverse and open-ended ways. These experts also stressed that simplicity is key to Zoom's success, as well as flexibility, and thus intentionally designing flexible features may risk stifling the open-endedness of the platform and children's playful opportunities. This emphasis on simplicity clarifies our findings that Zoom's flexible features facilitate immersive and social play, suggesting advantages to keeping Zoom's core communication functions simple.



Conclusions

Our vision is that society should hold high expectations for the quality of children's play across all environments. To that end, this report has examined how children's right to play freely could be supported in a digital world by improving the design of digital products and services.

We have listened carefully to the perspectives of children, parents, carers, educators and professionals as we formulated our vision of the changes that are needed. From this we learned that while children love much about the digital world, they also want the digital environment to better support their agency and participation.

For digital providers and designers to enable children's free play in ways that respect, protect and fulfil their rights, a holistic approach is needed. This should embrace the range of children's needs and rights, rather than fall into simplistic binaries of protection vs participation, 'good' vs 'bad' tech or child vs adult spaces. Child-led play increasingly integrates online and offline experiences, and we advocate enhancing the qualities of free play wherever they occur. Avoiding nostalgic imaginaries of children running wild in the fields, we recognise that **children's play always takes place in environments shaped by adults**, as individuals and organisations, for better or for worse. In digital contexts, play is still mainly concentrated on commercially produced games, raising questions about whether opportunities exist for children to play in less-determined digital spaces.

This report has prioritised the qualities of free play as revealed by children's statements and decades of research to understand how these can be better designed into the very infrastructure of digital products and services. In design terms, we have built on approaches to Privacy by Design and Safety by Design, also noting the pitfalls of Risky by Design.[41] But

[41] See 5Rights Foundation (2021c), eSafety Commissioner (Australian Government, 2019) and Cavoukian (2009).

we have also argued that more is needed. **Safety, privacy, security and ethics are 'hygiene factors' – necessary but not sufficient for a beneficial outcome** (Kurt, 2021). Removing the barriers and inhibitors that undermine children's free play, while vitally needed, would do little to facilitate the benefits that the digital world could and should afford children. What is needed is to redesign the digital environment by *both* removing features that undermine free play *and* enhancing features that enable the qualities of free play.

Practically speaking, we developed our work across four steps:

1. We articulated **12 qualities of free play** that research shows are important to children and the adults responsible for them. These qualities of free play provide a language for what 'good' looks like in a digital world, that can be used in policy and design circles.
2. We then showed how eight popular digital products and services that children engage with playfully, including but not restricted to 'games', only partially support children's play – **falling short on safety, risk taking, intrinsic motivation and voluntary play**. This pinpoints the improvements needed and establishes a baseline against which to evaluate them.
3. By surveying children's views of 22 features of digital products and services, we revealed both enablers and inhibitors of free play.
4. **Our 'what works' analysis identified the levers to enhance the qualities of children's free play by dialling up certain digital features and dialling down others.** This shows the way forward for Playful by Design, as then illustrated in eight case studies.

In sum, the specific effects of the digital features on particular free play qualities in particular contexts highlight the intricate configuration of people, products, and places that shape children's digital free play possibilities (Colvert, 2021). To make digital products and services Playful by Design, providers and designers must carefully consider which levers to pull to strike a good balance across the 12 qualities of free play for particular audiences.

We have a few final reflections in concluding this report.

Firstly, thinking of our main audience – digital providers and designers – consider that our purpose was to *demonstrate* that design features shape the qualities of children's play; to provide *starting points* to explore how these apply to popular products and services; and to articulate *as a goal* that children have a right to enjoy the qualities of free play in the digital environment. This still leaves a gap between the generic digital features we have examined here and the specificities of implementing these for different products and services. In the next steps of the Digital Futures Commission, **we – and we hope others, too – will work to translate these findings into actionable proposals relevant to specific digital products and services.**

Some changes are straightforward. The experts, children, parents, carers and professionals working with children consulted asked for more and regular updates to safety features, and trustworthy ratings of safety features, games, apps and platforms that children use. **Others are more complex.** The changes required to realise Playful by Design must be adjusted to suit specific contexts of use related to particular products and services. Just as in music composition or sound production, you cannot tune all the notes up or down, or keep all the elements at the same level: **mixing the qualities of play appropriate to particular combinations of people, products and places is hardly a 'tick box' exercise, and will require care.**

For instance, children love immersive play, yet to adults this can look very much like compulsive play until one also takes into account the importance of open-ended and voluntary play. Or consider how children love social and emotionally resonant play that

reinforces their sense of belonging to an exclusive group, and how this must be balanced with their concerns over exclusionary play that is hostile to others. Also challenging is the fact that we have found that **the digital environment is not yet a place in which children can be encouraged to take risks.** Since play experts believe play should be both safe and enable risk taking, and since we learned from the public consultation that children and adults believe that safety is needed precisely in order to take risks, we still need to figure out how designers can make digital products and services that are safe for children to use and yet allow them to stretch their capacities, push boundaries, navigate uncertainty and take risks.

Whichever combinations of play qualities are supported, this should not come at the expense of children's safety, their voluntary and intrinsic motivation to play, nor their opportunities to take risks and push boundaries within safe parameters. In practice, this may mean digital communication services such as Zoom prioritising the simplicity and safety of communication over innovating the use of flexible features for more creative engagement. Or it could mean that producers of games like Fortnite could reduce the number of crossover events and create a user journey for children and their parents to jointly set time and spending limits for children's engagement in the game, rather than a blanket removal of all compulsive features.

Not only do digital products and services differ in their purpose, design, business model and implementation, but children and young people also differ in their interests, needs and circumstances. In both the children's workshops and the national survey, we were careful to include a wide range of children, recruiting for diversity in the workshops and matching to the demographics of the UK population. Survey findings showed that the proportions of children who played (with) the digital products and services varied by age. YouTube was the most popular for all age groups from 6–17. Minecraft came second, its popularity dropping for older teens. Roblox was most popular among younger children, especially girls, and TikTok and WhatsApp among teens, again especially girls. Meanwhile, more boys were found to play Minecraft and, especially, Fortnite. But when it came to the qualities of play, and the perceived design features, we found few statistically significant differences. In other words, **although children of different ages tend to play different games, they report similar qualities of play and similar problems too.**[42]

Finally, we observe that a considerable body of literature has documented the constraints on children's freedom to play at home, at school and in their neighbourhood. In response, **free play advocates draw on child rights frameworks to develop new thinking and practical tools to change social norms and to support governments and other actors.**[43] We applaud and support these efforts. But we are concerned that these rarely acknowledge that "children are also at the forefront in using digital platforms and virtual worlds to establish new means of communication and social networks, through which different cultural environments and artistic forms are being forged" (United Nations Committee on the Rights of the Child, 2013, para 12). Yet design interventions can overcome the ways in which the digital environment impedes children's freedom to explore, experiment, make new friends, take risks or make mistakes online. We hope that in future, those concerned with designing opportunities for children's free play in physical and digital environments can join forces.

Despite its playful name, Playful by Design is seriously intended to inspire changes to the design of digital products and services that children use, and the way these products and services operate. The aim is to pave the way for digital products and services that are more compatible with children's evolving capacities, so that children can enjoy a full spectrum of play benefits. **We advocate Playful by Design as part of wider educational and regulatory efforts to make the digital environment respectful of children's rights and needs**. As the experts told us, design is vital, but so are changes to business models and governance

[42] These are documented in Family Kids & Youth (2021). In future, we will explore these and other factors in more depth.

[43] European Network of Ombudspersons for Children (2020), Livingstone et al (2021), Play Scotland (2020) and UNICEF (2016).

mechanisms. They called for an overhaul of business models driven by advertising revenue as part of the attention economy, and for a clearer demarcation between the responsibilities of businesses and regulators.

We invite businesses to push their own boundaries to do better as part of a mixed economy that recognises and respects children's rights, thus providing children with developmentally appropriate means and options to exercise their rights and agency when they play using digital products and services. This means addressing both the hygiene factors, such as digital features and design techniques that undermine safety, prolong user engagement or cultivate dependency on games, apps or platforms, as well as enhancing opportunities for open-ended, imaginative, risk-taking and diverse play that promotes digital growth.

We call on designers and digital providers to make the digital world Playful by Design.

Who can benefit from Playful by Design?

Our ultimate purpose is to benefit children's lives as they seek opportunities for free play using digital products and services generally not designed with their needs and best interests in mind. To further this purpose, this report is primarily written for providers and designers of digital products and services used by children. Recognising that these are part of a complex economy and an extended value chain, we can imagine several beneficiaries of this report:

- A tech start-up is excited about its new game. What design considerations might they not have thought of, and how can they optimise children's free play in the game?
- A major platform has not set out to include children among its users, but children play on the platform nonetheless. How might the platform better respect the needs of its young users?
- Digital providers must respond to the stream of media and public panics about children's online gaming. What considerations can guide their judgements and policies?

There are also secondary audiences who could find this report useful:

- Journalists repeatedly call attention to societal failings in providing for children. How can they then transcend the too-simple binary of demanding more outdoor play and less screen time?
- A health visitor visits a home and finds toys and devices strewn around. The older toddler is clicking enthusiastically on the tablet. What might they advise the parent/carer?
- A teacher learns of a new game that 'everyone' is playing. Where can the teacher turn for guidance on whether and how to discuss such play with their students?
- A child rights NGO wants to produce some advice on children's right to play, including in digital environments. How can they figure out what to call for more (or less) of?
- A venture capitalist wants to be sure that they are investing in products that respect children's rights; a standards body plans to include more about child users in its work; a higher education institution decides to recognise child players when it trains its games designers; a local authority wants to build in a digital dimension to its plans for becoming a child-friendly city… The list goes on because children's play does not receive the public attention it deserves. But under the radar, many are worried, and many questions remain unanswered.

We hope valuable answers can be found in this report and that our readers will help us reach those who, in one way or another, have the power to improve children's opportunities for free play in a digital world.

Annex 1: Methodology

Literature reviews

We commissioned two literature reviews: one on free play in general, and the other on play in relation to digital technologies.

A Panorama of Play

The first review resulted in a published report, *A Panorama of Play* (Cowan, 2020), based on 190 academic papers, pieces of research and reports. The report concluded by defining the eight qualities of free play – intrinsically motivated, voluntary, open-ended, imaginative, stimulating, social, emotionally resonant and diverse. These informed the subsequent literature review and the public consultation.

The Kaleidoscope of Play in a Digital World

The second literature review investigated how these eight qualities of free play manifest in the digital environment, resulting in *The Kaleidoscope of Play in a Digital World* (Colvert, 2021). This drew on 201 academic publications and reports across disciplines ranging from social sciences, humanities and human-computer interaction (HCI). *The Kaleidoscope of Play* summarised eight ways in which the social, material and spatial aspects of the digital environment interact and significantly configure children's digital playful possibilities: accessibility, ethics, privacy, adaptability, multi-sensory engagement, affective cultures, constructive communication and diverse representation.

The results of both reviews are summarised in Annexes 2 and 3.

Public consultation

We held a UK-wide public consultation on play in a digital world from December 2020 to March 2021. The broad objective of the consultation was to engage children, young people, parents, carers and professionals working with children to re-imagine what play in the digital environment could and should be. This was inspired by the concept of value-sensitive design (Friedman & Hendry, 2019), which emphasises the ethical dimension of what people deem important in their lives.

Sampling

A total of 126 participants joined our online consultation, of whom 63 were children aged 3 to 18, 33 were parents and 30 were professionals who worked with children from north-east, south-east and south-west England, West Yorkshire, West Midlands, Wales and Scotland. Participants were diverse in ethnicity, ranging from white British and European (e.g. Polish), Black Afro-Caribbean, South Asian, Chinese and other Asian backgrounds, Arab and mixed multiple ethnic groups. They also represented children and adults in diverse circumstances, for example, children in foster care, foster parents and professionals with disabilities (e.g. hearing loss).

Group composition

We organised them into 27 groups of various combinations to adapt to participants' intermittent interests during the COVID-19 lockdown. Participants' fluctuating interests required us to be more spontaneous and flexible in organising participants into groups for the online discussion, thus allowing for a mixture of young people and the professionals working with them, or family groups with one or two parents and their children, or a mix of parents and professionals. To ensure a lively discussion in which everyone had a chance to express their views, we set the participant/moderator ratio at a maximum of six participants per moderator.

Consultation design

The consultation combined a design-led approach with the concept of public deliberation (Parkinson & Mansbridge, 2012; Steiner, 2012). Learning from resources on meaningful engagement with children online (Cortesi et al, 2021; Third & Moody, 2021) and offline (Coleman et al, 2018), and aware of potential digital fatigue, we limited each session of our online consultation to 45 minutes and devised conversation prompters that would both appeal to children's playfulness and engage the inner child in our adult participants. We used cultural probes, a design-led technique to elicit insights from technology users to inspire innovation (Wyeth & Diercke, 2006). The cultural probes took the form of illustrations of children's everyday playful activities that represented the qualities of free play identified in academic research (Cowan, 2020). We applied the open-ended and reflective qualities of deliberation to encourage participants to work through their play experience in physical and digital contexts and articulate their expectations of play in the digital environment.

We structured our consultation into three sections: 1) ice-breaking in which participants were asked to introduce themselves and recall their most recent play; 2) experience sharing in which the cultural probes were used to help participants bridge their everyday playful experience with the concept of free play and to challenge participants' familiarity with digital play, by asking them to map the qualities of their play 'in real life' without devices onto the digital environment; and 3) envisioning future digital play, where we asked participants how they thought their play experience could be improved.[44]

Recruitment and ethics

We recruited our participants mainly through intermediaries, including public and commercial organisations advocating play, youth groups and parent groups. We devised an email consent process[45] to address the difficulties in participant recruitment and onboarding posed by the COVID-19 pandemic: two email templates, for participants over and under 18, set out the research activities, objectives, confidentiality, anonymity and participants' rights to withdraw without any consequences. We allowed for audio-recorded consent at the beginning of the consultation session in cases of adults joining a group of other adults, children accompanied by their parents or carers, or teenagers for whom parental consent had been provided before the session. We reminded the participants of our research objectives and commitment to confidentiality, anonymity and participants' rights to withdraw before asking to audio-record their consent.

Zoom handling

We used Zoom to host our online public consultation. We mitigated Zoom's safety and security risks (Aiken, 2020) by only providing a new Zoom link and password to join our consultation via email after participants had confirmed their attendance. We did not use Zoom's breakout rooms for safety reasons unless we, having passed the UK Disclosure

[44] Our consultation topic guide can be found here.

[45] An email consent process can be found here.

and Barring Service (DBS), could each moderate a breakout room. We deleted the video, retaining only the audio recording from Zoom to ensure participants' anonymity.

Analysis

We had the audio recording transcribed and we anonymised the transcript before inputting it into NVivo for inductive thematic analysis. Next, we grouped the themes into i) qualities of playful experience, ii) features of play materials (e.g. cardboard box, games and apps) that either enable or constrain any qualities of play and iii) calls for change. Finally, we mapped participants' descriptions of their play onto existing literature on play, and the features of the materials participants used to facilitate their play to identify the relationship between the features and qualities of play.

Expert consultation

We consulted 36 industry and academic experts across disciplines, ranging from digital design, gaming worlds, child development and media studies. Some were interviewed individually during the course of the research. All were then sent the initial findings from the public consultation and national survey (see below) for the digital products and services – Minecraft, Roblox, Nintendo Wii, Fortnite, WhatsApp, Zoom, TikTok and YouTube – and our analysis of what could be redesigned in the digital environment. The experts were invited to reflect on the findings and, for the digital products and services with which they were familiar, to contribute their perspectives on how they work and how they could be improved. Finally, we analysed the experts' inputs and integrated their views into our findings for the digital products and services and our overall conclusions.

The survey

We commissioned Family Kids & Youth to conduct a national survey of children aged 6 to 17 years old. For the slide deck with survey sampling and detailed findings, see Family Kids & Youth (2021).

Sample

Survey respondents were recruited online through PanelBase, which maintains a panel of 340,000 UK citizens. Originally, 1,933 participated, but 250 (13%) were screened out because they did not meet the sample demographic criteria. Furthermore, 150 respondents (8%) abandoned the survey part way through, leaving us with the final sample of 1033 children aged 6 to 17 years old who participated. These participants were sampled to represent the UK population, with quotas set for age and gender. Fieldwork was carried out from 25 June to 2 July. Questionnaire completion took between 10 minutes (shorter version for those aged 6–9) and 15 minutes (full version for those aged 10–17). The survey sample was slightly more middle-class and slightly more from Black and ethnic minority groups than the national population.[46]

Questionnaire

The objectives of the questionnaire were to obtain: 1) children's perspectives on the qualities of their play 'in real life' and when using digital products and services, and 2) children's perceptions of the features of the sampled digital products and services that children use (referred to as 'apps' in phrasing the questionnaire for children). These

[46] Respondent breakdown by socio-economic group (with national statistics in brackets) was AB 26% (27%), C1 21% (27%), C2 16% (20%), DE 15% (25%), no information 22%. For ethnicity, respondents were white 83% (national statistics 86%) and BAME (Black and Minority Ethnicity) 17% (14%).

were selected based on discussions in the public consultation and their popularity (see Annex 4). Each child was asked to rate two digital products and services that they played. The wording of some questions was adjusted in the version for younger children to facilitate comprehension, and in order to keep their questionnaire short, they did not rate the features.

Analysis

We analysed the survey results to compare and contrast children's perceptions of the qualities of their play 'in real life' and in the digital environment and to identify the features of applications that children use. We used Pearson's correlations to analyse the relation between children's perceptions of the features of the digital products and services and the qualities of free play they experienced with each app. Based on the correlations between the digital features and qualities of play children perceived, we made recommendations on what can be changed to improve the qualities of free play in the digital environment. We were aware that the research took place during the pandemic, a time of heightened reliance on digital technologies.

Annex 2: The qualities of free play

Table 2 summarises the qualities of free play, based on research reviewed in *A Panorama of Play* and our public consultation.

Table 2: 12 qualities of free play and supporting evidence

The research perspective, from *A Panorama of Play*	The perspective of children and adults in the public consultation	Supporting evidence from the literature	Qualities of play: indicators in the survey[47]
Intrinsically Motivated The play happens for its own sake rather than to serve other purposes, especially instrumental ones. Because it is intrinsically satisfying, it is sustained by the interest of the player(s) themselves.	**Intrinsically motivated and voluntary** Children did not distinguish between intrinsically motivated and voluntary qualities of play. They describe play as self-initiated, intuitive, unstructured and not serving any instrumental purposes: they played just to have fun. Adults described this quality of play as 'child-led'. These descriptions imply being able to start and stop playing as they please.	**Intrinsically motivated** Huizinga (1938); Vygotsky (2004); Vygotsky (1978); Rubin et al (1983); UN (1989); Featherstone & Bayley (2013); Gray (2017).	**Intrinsically motivated** I play like that because other people want me to (reverse code).
Voluntary The play is initiated by the player(s), entered into willingly and cannot be imposed or insisted upon. It has a spontaneous quality and cannot be totally planned for, although others may inspire or invite it. The players choose when to play, for how long and when to quit.		**Voluntary** Caillois (1961/2001); Rousseau, cited in Frost (2010); Einarsdóttir (2014); Hewes (2014); Gray (2017).	**Voluntary** It's hard to stop playing like that even when I've had enough (reverse code).
Open-ended Players choose what and how to play, with choices generally made in the moment as play unfolds. Although free from external rules, free play can be orderly, even rule-governed, with the players developing an internal structure negotiated and open to adaptation through the play itself.	**Open-ended** In the consultation, the idea of open-ended play was both a valued quality of playful experiences and a feature of the digital and non-digital products and services that afford ample possibilities for children to direct their own play – examples included toys, a cardboard box, LEGO, Minecraft.	**Open-ended** Huizinga (1938); Caillois (1961/2001); Blurton Jones et al (1976); Rubin et al (1983); Shier (1984); Play England (2012); Gray (2017); Casey & Robertson (2019).	**Open-ended** When I play like that, I have the power to make up what will happen next.
Imaginative Free play escapes the immediate 'here and now'. As an experience, it marks a separation from day-to-day life, often achieved through all-absorbing make-believe and imagined realities. This includes the inventive use of the material, spatial and embodied resources to hand, transforming meanings through creative interpretation and improvisation.	**Imaginative and creative** Imaginative and creative Participants talked a lot about creativity, recognising that imaginative play often entails creative outputs, such as a LEGO house, a Minecraft town, a piece of music, a castle, a spaceship made out of a cardboard box or a video clip. Children talked especially about their love of imaginative and creative world-building activities, both online and offline.	**Imaginative** Caillois (1961/2001); Garvey (1977); Vygotsky (1986); Pellegrini & Smith (2005); Golinkoff et al (2006); Gray (2017).	**Imaginative** I use my imagination when I play like that.

[47] Indicators inevitably only partially capture the complexity of a research concept or a dimension of people's experience. Three indicators were asked in reverse to ease comprehension, with scores reversed in the analysis.

The research perspective, from *A Panorama of Play*	The perspective of children and adults in the public consultation	Supporting evidence from the literature	Qualities of play: indicators in the survey[47]
Stimulating Distinct from the imaginative quality of play, though often going hand in hand with imagination, we here capture the idea that children seek and engage with activities they find stimulating, absorbing, and facilitating of new ideas and new possibilities.	**Stimulating** Play is stimulating and challenging for children and young people when it is interactive and competitive. This keeps children engaged and absorbed in their play. Play is interactive when it involves virtual and/or physical feedback.	**Stimulating** Barnett (2007); Nakamura & Csikszentmihalyi (2014); Ball et al (2012); Vygotsky (1978).	**Stimulating** Playing like that can be an exciting or challenging experience.
Emotionally resonant Free play is often associated with pleasure and joy. However, it can feature a wide range of emotions and can deal with serious themes. It can be emotionally 'affective' or satisfying to children in multiple ways, resonating with their inner lives and helping them to make sense of the world.	**Emotionally resonant** Play serves a serious purpose when children use it to make sense of the world. In this process, play becomes a way for children to test ideas, and work through their experiences and emotions. Adults noted that this also supports children's learning and development.	**Emotionally resonant** Erikson (1950); Isaacs (1951); Bettelheim (1972); Edstorm (2003); Howard et al (2006); Santer (2007); Winnicott (2009); Burns & Irvine (2011); Fearn & Howard (2012); Bateman et al (2013); Zosh et al (2017); Hill & Wood (2019).	**Emotionally resonant** I have a lot of different feelings when playing like that.
Social Whether free play involves others or happens alone, it unfolds within a socio-cultural context. It requires others to sustain the play – even if those others may be imagined rather than present. This means it may need to meet the desires and needs of others and of the self if the play is to continue.	**Social** Playing requires others (imagined or real) to sustain the play, so each player attends to the desires of other players. It unfolds within the socio-cultural context of the players' lives. Children emphasise that they play to stay connected, to build and nurture relationships with their peers and family, and to gain a sense of belonging.	**Social** Plato (2008); Gray (2017); Opie & Opie (1959); Potter & Cowan (2020).	**Social** I like talking with other people about playing like that.
Diverse Free play encompasses the activities of children across ages, cultures and circumstances. Cultural values of childhood shape the time, spaces and resources available for free play, so it takes diverse forms according to different contexts.	**Diverse** Diverse quality of play is closely associated with open-ended quality of play and is afforded by the open-ended design features of products and services used for play. T he open-ended quality of play and the open-ended features of products and services used for play open up diverse possibilities.	**Diverse** Casby (2003); Cohen (2006); Gaskins, Haight & Lancy (2007); Burns & Irvine (2011); Roopnarine (2012); Whitebread et al (2012).	**Diverse** People can be playful in different ways that are important to them.

The research perspective, from *A Panorama of Play*	The perspective of children and adults in the public consultation	Supporting evidence from the literature	Qualities of play: indicators in the survey[47]
Risk-taking Risk-taking or risky play is a contested quality of play because it involves dangerous and uncertain experiences and is valued when it remains within individuals' acceptable limits. Players enjoy the resulting thrill and excitement, which can be linked to a sense of accomplishment.	**Risk-taking** Players expose themselves to uncertainties, explore mental, social and physical boundaries, and discover their evolving capacities. Play includes competing with others, setting new targets, breaking rules, flouting authority, and being naughty, rude or mischievous.	**Risk-taking** National Playing Fields Association and Children's Play Council (2000); Gordon & Esbjörn-Hargens (2007); Sandseter (2009); Grieshaber & McArdle (2010); Lindon (2011); Play England (2012); Sandseter et al (2020); Karabon & Steiner (2020); Dodd & Lester (2021).	**Risk-taking** When playing like that, I can be naughty or break some rules without being told off.
Sense of achievement A sense of achievement through play is often associated with stimulating and risk-taking qualities. It manifests in the delight and pride in one's successful attempt to do something that stretches one's personal limits, or something that one has not done before.	**Sense of achievement** Play facilitates new ways to achieve, leading players further and deeper into the experience. A sense of achievement comes from solving puzzles, learning, constructing something, gaining skills or receiving rewards, especially if players must push their mental or physical limits.	**Sense of achievement** Stephenson (2003); Coster & Gleeve (2008); Vygotsky (1978).	**Sense of achievement** After playing like that, I feel really happy that I've achieved something.
Immersive When play is immersive, players enjoy being completely absorbed in the unbroken flow of their activities. The flow state has its own dynamic, immersing the player and making the 'real world' seem far away or forgotten.	**Immersive** Players feel they are in a different world when they are engaged and absorbed in their play. Play can be immersive in and of itself, or with the help of digital (e.g. Virtual Reality) or non-digital (e.g. stories) techniques.	**Immersive** Huizinga (1938); Csikszentmihalyi (1996).	**Immersive** When playing like that, I feel like I'm in a different world.
Safety Children appreciate adults' efforts to foster a safe, fair and inclusive environment in which they can play. This may seem to contradict children's appetite for risky play, but a sufficient sense of safety is needed to reassure children to take risks.	**Safety** Players need to feel safe to fully enjoy the positive qualities of free play and to feel confident in trying things out and taking risks. They rely on safety measures to help them navigate and manage associated social, physical and other pressures or risks of harm.	**Safety** Economic and Social Research Council (2000); National Playing Fields Association (2000); Cunningham (2006); Danks & Schofield (2007); Finney & Atkinson (2020).	**Safety** Playing like that can sometimes bother or upset me (reverse code).

Annex 3: Design features of the digital environment

Table 3 summarises the features of the digital environment, based on research reviewed in *The Kaleidoscope of Play in a Digital World* and our public consultation.

Table 3: Design features shaping free play in the digital environment

The research perspective, from *The Kaleidoscope of Play*	The perspective of children and adults in the public consultation	Supporting evidence from the literature	Digital features: indicators in the survey[48]
Affordability Demographic and socio-economic factors affect ownership of devices and digital resources that children can spontaneously use in their play.	**Affordable and fair opportunity to play** Digital resources and infrastructures that children use for play are not equally accessible across diverse demographics and socio-economic backgrounds. Affordability is key to equal access to digital play resources.	**Access to digital resources** Marsh, Lahmar, et al (2020); UNICEF (2017); Salen Tekinbaş (2020).	**Expensive** XXX is too expensive for me to use fully. **Needs high tech** XXX needs a fast computer or internet connection to play or use.
Inclusive design Digital products, services, systems and infrastructures can be designed to be sensitive and accommodating of various forms of abilities, disabilities, special sensory or communication requirements.	**Inclusive and universal design** Various accessibility features should be built into digital products and services to accommodate a diverse range of abilities, disabilities, special sensory or communication requirements, to make play more inclusive.	**Inclusive Design** Sobel et al (2015); Ellcessor (2016); Titchkosky (2011); Yip et al (2019).	**Excludes people** Some people can feel excluded when playing or using XXX.
Rules of use and boundaries Social norms, views and value systems prescribe the rules and boundaries for children's playful possibilities in both digital and physical domains.	**Onboarding, permissions, pathways and boundaries** Children require resources, permission slips, age-appropriate instructions and age rating as a reference line to help them navigate playful possibilities, both online and offline.	**Onboarding and pathways** Marsh et al (2020); Burnett & Merchant (2014); Arnott (2016); Sakr & Oscar (2020); Sakr (2020); Ito et al (2010).	**Onboarding** It is easy for new users to understand how to play or use XXX. **Pathways** XXX gives me clues or instructions on how to get better at playing.
Age-appropriate Digital products and services are considered age-appropriate when their design features are compatible with and respectful of children's developmental factors and their associated motivations to play.	**Age-appropriate** Children require digital products, services and content that are suitable for and compatible with their evolving capacities to nurture their intrinsic motivation to play and to ensure their freedom to start and stop playing at will. Age-appropriate services	**Age-appropriate** Olson (2010); Greenberg et al (2010); Döveling et al (2018); Du et al (2021); Salen Tekinbaş (2020); Bailey (2016); Information Commissioner's Office (2020b); Van	**Age-appropriate** XXX is good for people my age.

[48] XXX refers to particular digital products and services in the survey (e.g. Minecraft, Zoom, WhatsApp). The features included in the survey were partly decided by ease of phrasing for children and overall questionnaire length.

The research perspective, from *The Kaleidoscope of Play*	The perspective of children and adults in the public consultation	Supporting evidence from the literature	Digital features: indicators in the survey[48]
	can be realised through technical solutions, such as age verification technologies.	Dijck (2014); Kleeman (2021); Ringland et al (2016); Sobel et al (2015); Navarro (2020).	
Transparency In data-driven societies, transparency is a legal principle that requires businesses to respect the rights of data subjects (including children) to be informed about how information about them is used.	**Transparency** Children require clear and accessible terms of use, including conditions of service usage and (particularly) privacy policies that clearly set out how information about them is used by the service providers as well as third parties.	**Transparency** Main (2019); Hartung (2020).	**Transparency** XXX gives me information so I can understand how it works.
Privacy and datafication Children's play in the digital environment exposes children to pervasive and seamless real-time data processing, often when the digital products and services are used free of charge, with very limited control over who can see or use the data or user-generated content, and for what purposes.	**Privacy management** Children require real-time notification and control features to enable them to set and manage personal information visibility and searchability, and manage who can contact them.	**Privacy management** McReynolds et al (2017); Pangrazio & Selwyn (2018); Mascheroni & Holloway (2019); Information Commissioner's Office (2020a); Van Dijk (2014); Mascheroni & Holloway (2017).	**Privacy** XXX gives me control over what other people see about me. **Contact** XXX gives me control over who can contact me through the app. **Shares data** XXX shares my information with other apps or businesses.
Persuasive marketing strategies In-game advertising or freemiums prey on children and young people's "immature critical thinking skills and impulse inhibition" (Radesky et al, 2020b, p. 1), making it difficult for them to resist the temptation to part with money. **Child influencers** Research shows children's rising interest in digital influencers, especially those who are famous, local to the area or who share similar interests. The content strategies, children's consumer socialisation and the impacts of child influencers on children's intrinsic motivation are not yet well understood.	**In-app/in-game advertisements** Parents, carers and children reported inappropriate advertisements popping up in the games or applications that children use for fun. Examples of this include mature content advertisement and betting sites. **Social pressure** Children reported forms of peer pressure which either inspired or influenced their choices of digital products and services, and the length of their digital engagement. Depending on the choice and its consequences, social pressure could be either good or bad.	**Persuasive marketing** Radesky, Chassiakos, et al (2020); Martínez (2017); Marsh et al (2015). **Child influencers/ social pressure** Office of Communications (2020a); De Veirman et al (2019); McRoberts et al (2016).	**Advertising** XXX includes adverts for things to buy or do.

The research perspective, from *The Kaleidoscope of Play*	The perspective of children and adults in the public consultation	Supporting evidence from the literature	Digital features: indicators in the survey[48]
Persuasive design Persuasive design refers to design strategies to encourage targeted behaviours through various means, including computer-mediated and human-computer persuasion. Examples of these strategies in the digital environment include personalisation (making content and display more relevant to users), digital nudges and loot boxes. **Personalisation (ethical issues)** Personalisation often involves pervasive data processing to deduce users' interests and automated decision making based on algorithmic profiling. This could curtail the diversity of experiences, opportunities and content which could in turn distort children's world views.	**Commercial pressure** Children are frustrated by in-game micro-transactions, or loot boxes, and freemiums. These loot boxes entice them to use 'real-world' money to buy consumable virtual items, ranging from customisation (e.g. avatar/skin) or game-changing equipment (e.g. weapons or abilities). **Task-based rewards** Children prefer to perform tasks to earn rewards or progress to the next level, instead of spending real-world money to enhance their gameplay. **No or managed commercial pressure** Children and young people explicitly called for mechanisms to curb or filter out commercial pressures or persuasive advertisements in the digital products and services that they use.	**Persuasive design** Kidron et al (2018); Macey & Hamari (2018); Zendle et al (2020); Hartung (2020); Castmo & Persson (2018); Harjumaa & Oinas-Kukkonen (2007); Fogg (2002). **Personalisation** Carrington (2012); Kucirkova (2019); Hartung (2020); Radesky et al (2020b).	**Commercial** XXX shows me things to spend real money on in the app.
Socially evocative features Digital products and services are increasingly designed to elicit emotional responses from users and cultivate personal investment in and/or emotional attachment to the interaction. They take various forms, as below.	**Compulsiveness** Digital products and services are increasingly designed with the intention to encourage extended user engagement or cultivate dependency and/or addiction (e.g. persuasive design). They take various forms, as below.	**Socially evocative/ Compulsive features** Mascheroni & Holloway (2019); Department for Digital Culture Media & Sport (2019); Zendle et al (2020); Shinkle (2008).	**Compulsive** It can be hard to stop playing or using XXX.
Immersive Digital and non-digital resources can enhance user engagement such that users feel as if they have escaped the here and now. **Tangible interface** Tangible interface is an interaction design that produces various sensory experiences and multiple stimuli, spanning virtual and physical contexts.	**Immersion techniques** Digital and non-digital techniques can be deployed to offer players a life-like experience without real-world judgement or consequences. These techniques afford players opportunities to escape the here and now. **Fuller range of sensory engagement** Children and young people seek to extend the range of their sensory engagement	**Immersive features** Yamada-Rice (2018); Yamada-Rice (2017); Ferraz et al (2017); Yamada-Rice (2021); Department for Digital Culture Media & Sport (2019). **Tangible interface** Zaman et al (2012); Revelle (2013); Mascheroni & Holloway (2019);	**Creative** XXX gives me ways to be creative.

The research perspective, from *The Kaleidoscope of Play*	The perspective of children and adults in the public consultation	Supporting evidence from the literature	Digital features: indicators in the survey[48]
Interactive Digital products and systems are interactive when they provide feedback to users. Interactivity can enhance both the stimulating and emotionally resonant qualities of free play. However, there are cases of over-stimulation which could result in discomfort or challenges to players' self-control. **Competition or challenge** Depending on the stage of development, children of a certain age (13–16) find competition stimulating, while those aged 10 are more likely to be stimulated by challenges such as puzzle solving.	online. They want to enjoy a similar range of sensory experience as offline. **Interactive** Children and young people value physical and/or virtual feedbacks in various forms when they play: interactivity keeps them engaged. **Competition** Children and young people enjoy competition in their play, whether with others or just by competing with themselves to set a new personal record. Competition involves varied sensory engagement and induces emotional investment. Often, the gratification from competition is a sense of accomplishment.	Shaer & Hornecker (2010). **Interactive** Plowman (2016); Back et al (2016); Back et al (2018); Jeon (2017). **Competition** Greenburg et al (2008).	
Open-ended design for flexible and generative use Open-ended design is a feature of products or systems that affords improvisation, giving players the freedom to dynamically change the features, content, rules and meaning of their play according to their interests in the spur of the moment, beyond superficial changes to appearances or content curation. Examples include programmable technologies, mobile and embedded technologies, sandbox games and design that supports 'modding' (modifying the code). **User control** Research shows that children appreciate opportunities to negotiate the rules of play. Children are also receptive to and build on each other's interests in their play. Negotiability in the rules of play, pace and flow of the playful experience is often	**Open design for flexible and generative use** Children and young people value design features that afford them opportunities to modify the functionality of and improvise with digital and non-digital products and services to suit their requirements and playful purposes in the flow of their play. **User control** Design functions in games or applications that allow users to exercise control over the rules of play, pace, levels of difficulty and flow can afford players negotiability, or the ability to direct or shape their play experience (e.g. in terms of pace, speed and difficulties, appearance, capabilities of their characters). **Personalisation** Was not discussed in the public consultation.	**Adaptability/Open design for flexible use** De Valk et al (2013); Plowman & C (2014); Shapiro (2018); Kahila et al (2020). **User control** Gee (2009); Chambers (2012); Colvert (2019). **Personalised design** Ringland (2019); Kucirkova (2019); Hartung (2020).	**Flexible (open-ended design)** XXX gives me plenty of ways to change how it can be used.

The research perspective, from *The Kaleidoscope of Play*	The perspective of children and adults in the public consultation	Supporting evidence from the literature	Digital features: indicators in the survey[48]
afforded by user control functions. **Personalisation (as a design feature)** Personalisation is a design feature that affords child users agency to customise their device to suit their own needs and interests.			
Hybridity Digital and non-digital resources can be considered hybrid when they lend themselves for players' manipulation, such that players can maintain their presence or shift between and across virtual and physical spaces, whether they are in the same physical locations or not. Examples include augmented reality (AR), virtual reality (VR) or games like Pokémon Go.	**Hybridity and intergenerational** Children and young people value design features that support or encourage physical activities in co-locations (e.g. physical and virtual spaces) and/or feed the physical activities back to activities in the digital spaces, thus affording them opportunities to move between and across virtual and physical spaces, as well as engaging participants from various locations and age groups.	**Hybridity** Black et al (2016, 2018); Ferraz (2017); Soute et al (2009); Wood (2019); Bailey (2016); Jones et al (2018); Dylan et al (2020); Yamada-Rice 2017).	**Hybrid** XXX can be used to get me to move my body about or do exercise.
Multi-generational participation Products and environments for play can be designed to promote multi-generational participation, or joint media engagement across various age groups. Examples include 'maker spaces' which are physical spaces that offer access to digital and non-digital resources so that participants across age groups can collaborate on building something together.	**Multi-generational participation** Respondents discussed multi-generational play with enthusiasm, although they said little about the features of the digital environment that enable this.	**Intergenerational** Chambers (2012); Ito et al (2010); Gee (2018); Jenkins (2006b); Blum-Ross et al (2020); Clark (2011).	**Intergenerational** XXX can be played or used together by people of different ages.
Transmedia Transmedia provides multiple entry points into play and can enhance children's imaginative and playful engagement through, for example, the storyline and characters. Examples of these include films, books, video games, game mechanics and toys.	**Transmedia** Children, parents and professionals working with them reported children's patterns of media use as having a ripple effect of encouraging appetite for other game play (with or without digital technologies). For example, people were inspired to play a game based on the story world they have read about or watched on television.	**Transmedia** Potter & Cowan (2020); Wohlwend (2020); Marsh et al (2020); Edwards (2014); Burn & Richards (2014); Willett et al (2013); Jenkins (2006a); Herr-Stephenson et al (2013).	**Transmedia** XXX can be played or used along with objects in my home (such as toys, games, or devices).

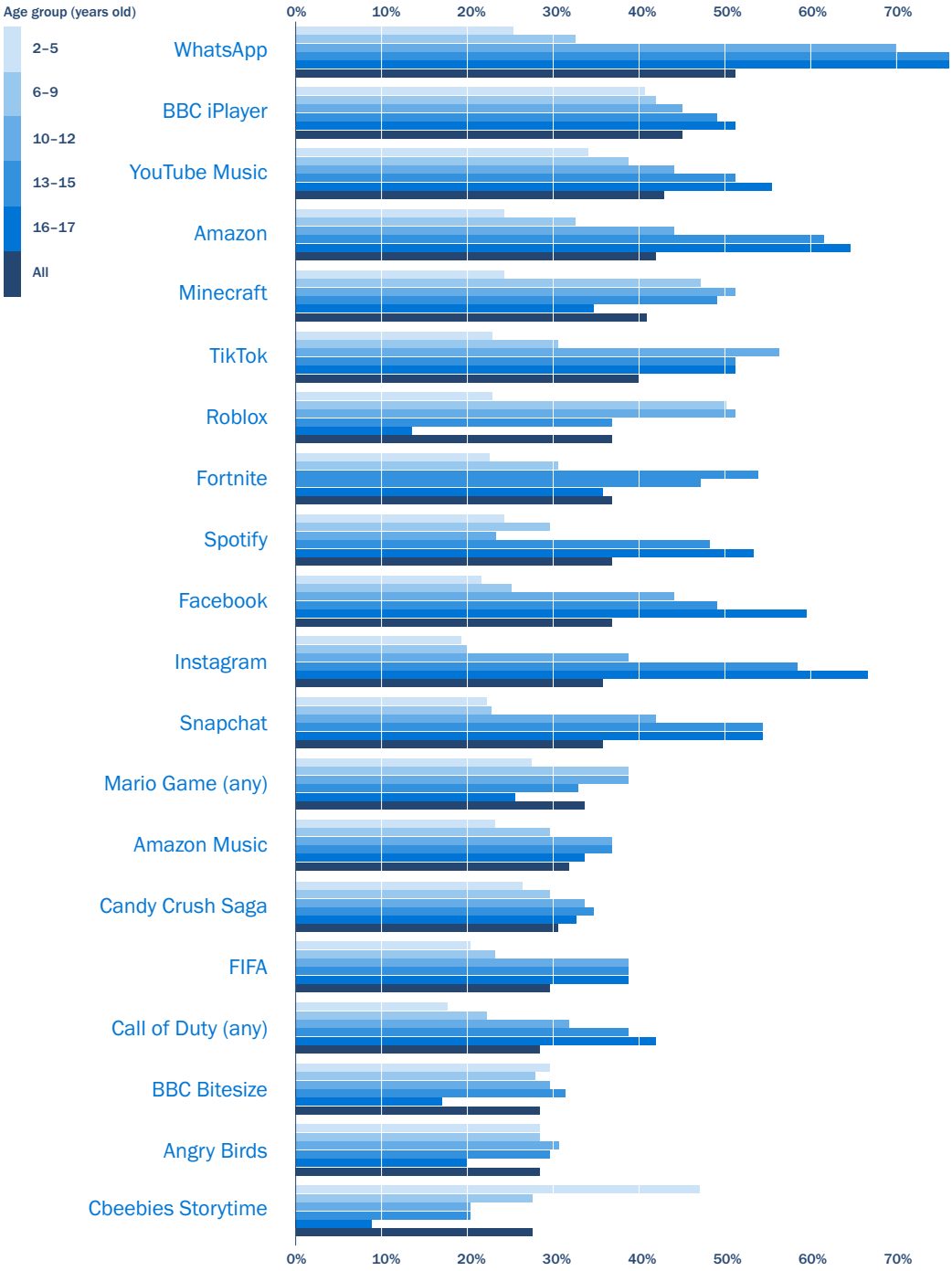
The research perspective, from *The Kaleidoscope of Play*	The perspective of children and adults in the public consultation	Supporting evidence from the literature	Digital features: indicators in the survey[48]
Communication tools Digital resources such as social apps (e.g. Discord, WhatsApp, Facebook, Instagram) and devices (e.g. iPad and smartphones) offer ample opportunities for children to build relationships with others through play. Children can and do adapt these technologies to suit their social interaction and requirements.	**Communication tools** Children, parents and professionals use voice, non-voice and/or audio-visual communication tools, sometimes improvising communication tools to enhance the social quality of their play (e.g. a voice call to coordinate game play in a first-person shooter game). Tools include video conferencing platforms, social media and in-game chat functions.	**Communication tools** Ito et al (2010); Griffin (2020); Yau & Reich (2017); Hartas (2020); Office of Communications (2020b); Ettinger & Cohen (2020).	**Communication** XXX lets me chat or message people in the app.
Moderation Various technology – and human-based solutions are available to moderate content and conduct exchanged in communication across various platforms.	**Safety mechanisms** While technical safety solutions are available, children, parents and professionals working with children called for more effective and responsive safety mechanisms, including content, contact and conduct moderation, and other security and parental control features.	**Moderation** Office of Communications (2020c); Du et al (2021); Ettinger & Cohen (2020); Ringland et al (2017).	**Provides help** XXX can help me if something upsetting happens
Toxic social interactions While there are many instances of positive and healthy relationships being developed online, others can be damaging, for example, online grooming, sexual exploitation and cyberbullying. The "omnipresent, pervasive, and permanent nature of cyber interactions" can have adverse effects on children's mental health, requiring concerted efforts across "support networks including parents, peers, and school personnel" to encourage victims to seek and receive the help they need (Dennehy et al, 2020, p. 1).	**Safety challenges** Children and young people are vulnerable to risks from inappropriate content, contact and conduct. If poorly managed, these risks can escalate to actual physical and psychological harms (e.g. cyberbullying; grooming). Children need to be safe and feel safe to fully enjoy free play. **Cyber security issues** Children and parents reported technical and social manipulation that resulted in information (privacy) and financial loss as part of children's playful digital engagement. Such manipulation also creates unfair competitive advantage among players.	**Toxic social interaction** Machimbarrena et al (2018); Salen Tekinbaş (2020); Dennehy et al (2020); UNICEF (2017).	**Hateful** Sometimes I see people saying nasty things on XXX.
Diverse cultural representation Digital products and services can be considered diverse in cultural representation when	**Exclusive and toxic culture** Exclusive and toxic culture Children and young people reported identity- and gender-based	**Diverse cultural representation** Salen Tekinbaş (2020); Kafai et al (2016);	**Variety** XXX offers different kinds of activities when using the app.

The research perspective, from *The Kaleidoscope of Play*	The perspective of children and adults in the public consultation	Supporting evidence from the literature	Digital features: indicators in the survey[48]
they include a diverse range of identity expression and representation of ethnicity, age, gender, class, abilities (or disabilities) and sexualities that encourage pro-social interaction rather than abusive, discriminatory or exclusionary practices. However, such diversity in representation is currently lacking, particularly in the gaming communities.	discrimination, through verbal abuse and toxic social interaction, particularly in digital gaming. Identity- and gender-based verbal abuse and toxic social interaction are also observed on social media. These toxic social practices leave the abused feeling excluded.	Marsh et al (2018).	

Annex 4: Children's use of digital products and services

Which digital products and services do children use? Comprehensive data on children's uses of digital products and services was made available to us by Dubit Trends (2021). Their survey of 1246 children aged 2 to 17 (April 2021) reveals the top twenty digital products and services used in the previous week (Figure 13 and Table 4). This informed our selection of digital products and services.[49]

Figure 13: Top 20 digital products and services used by all children in the last week, by age group (Dubit Trends, April 2021)



[49] We grouped children according to the Age-Appropriate Design Code (Information Commissioner's Office, 2020a). See Kidron & Rudkin (2017) and 5Rights Foundation (2021a).

Some – but not all – of the top 20 digital products and services used by children aged 2–5 years old are specifically intended for children to use. This changes as children grow older. Gaming dominates the top 20 digital products and services used by 6 to 9-year-olds, which are not all designed for their needs. From 10–12 years old, children's app usage is more mixed, including online audio-visual services, video games, messaging and social media, particularly among teenagers.

Table 4: Top 20 digital products and services used by each age group in the last week (Dubit Trends, April 2021)

Rank	2–5 years old	6–9 years old	10–12 years old	13–15 years old	16–17 years old	All (2–17 years old)
1	**CBeebies Storytime** 47%	**Roblox** 50%	**WhatsApp** 69%	**WhatsApp** 75%	**WhatsApp** 75%	**WhatsApp** 51%
2	**CBeebies Playtime app** 45%	**Minecraft** 47%	**TikTok 56%**	**Amazon** 61%	**Instagram** 66%	**BBC iPlayer** 45%
3	**CBeebies Go Explore** 43%	**BBC iPlayer** 42%	**Fortnite** 54%	**Instagram** 58%	**Amazon** 64%	**YouTube Music** 43%
4	**BBC iPlayer** 41%	**YouTube Music** 39%	**Minecraft** 51%	**Snapchat** 54%	**Facebook** 59%	**Amazon** 42%
5	**CBeebies GoGet Creative** 37%	**Mario Game (any)** 39%	**Roblox** 51%	**TikTok** 51%	**YouTube Music** 55%	**Minecraft** 41%
6	**YouTube Music** 34%	**Amazon** 33%	**BBC iPlayer** 45%	**YouTube Music** 51%	**Snapchat** 54%	**TikTok** 40%
7	**BBC Bitesize** 30%	**WhatsApp** 33%	**Facebook** 44%	**Minecraft** 49%	**Spotify** 53%	**Roblox** 37%
8	**Angry Birds** 29%	**Among Us** 31%	**YouTube Music** 44%	**Facebook** 49%	**BBC iPlayer** 51%	**Fortnite** 37%
9	**Mario Game (any)** 28%	**Fortnite** 31%	**Amazon** 44%	**BBC iPlayer** 49%	**TikTok** 51%	**Spotify** 37%
10	**LEGO Life** 28%	**TikTok** 31%	**Snapchat** 42%	**Spotify** 48%	**Call of Duty (any)** 42%	**Facebook** 37%
11	**Pop Fun TV App** 28%	**Amazon Music** 30%	**Spotify** 24%	**Fortnite** 47%	**FIFA** 39%	**Instagram** 36%
12	**LEGO Worlds** 27%	**Candy Crush Saga** 30%	**Mario Game (any)** 39%	**Call of Duty (any)** 39%	**Fortnite** 36%	**Snapchat** 36%
13	**Candy Crush Saga** 27%	**Spotify** 30%	**Instagram** 39%	**FIFA** 39%	**Minecraft** 35%	**Mario Game (any)** 34%
14	**Playkids** 26%	**LEGO Life** 30%	**FIFA** 39%	**Amazon Music** 37%	**Apple Music** 34%	**Amazon Music** 32%
15	**WhatsApp** 26%	**Angry Birds** 29%	**Amazon Music** 37%	**Roblox** 37%	**Amazon Music** 34%	**Candy Crush Saga** 31%
16	**Amazon** 25%	**Pop Fun TV App** 29%	**Xbox Live** 35.7%	**Twitter** 36%	**Candy Crush Saga** 33%	**FIFA** 30%
17	**Spotify** 25%	**BBC Bitesize** 28%	**Candy Crush Saga** 34%	**Xbox Live** 36%	**Twitter** 33%	**Call of Duty (any)** 29%
18	**Pokémon Go** 25%	**LEGO Worlds** 28%	**Pokémon Go** 34%	**Grand Theft Auto** 36%	**Grand Theft Auto** 30%	**BBC Bitesize** 29%
19	**Minecraft** 25%	**CBeebies Storytime** 28%	**PlayStation Network** 34%	**Candy Crush Saga** 35%	**Facebook Live** 29%	**Angry Birds** 29%
20	**CBBC Buzz** 24%	**CBeebies Playtime app** 27%	**Xbox Game Pass** 33%	**Apple Music** 35%	**PlayStation Network** 28%	**CBeebies Storytime** 28%

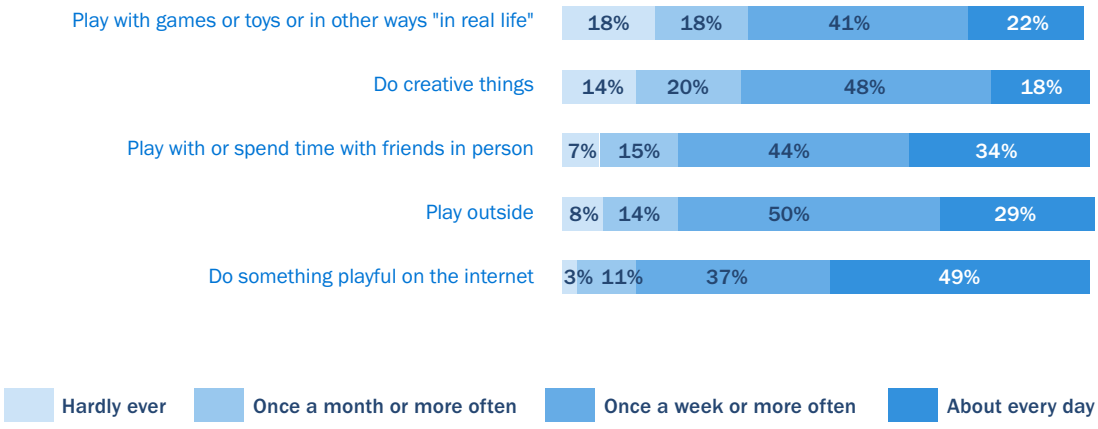
Annex 5: Digital and non-digital play compared

Many reports on play examine play either offline or online, but rarely both. While our focus, too, is primarily on the digital environment, in order to recognise the importance of a holistic and comparative view of children's play, the survey included a few questions about children's play in non-digital contexts. This provided a snapshot of the state of play for children in the UK during 2021, as well as a point of comparison with digital contexts.

Frequency of play in different contexts

The findings show how children have thoroughly embedded digital play in their daily lives, to the point where playing online is now **the most common form of play** (Figure 14).[50] This starkly confirms other research showing that children of all ages are spending substantial amounts of time playing online, reflecting both experiences during the pandemic and also longer-term trends in childhood (Colvert, 2021; Mullan, 2019). Indeed, playing online is a daily occurrence for many children, while playing outside and playing with friends in person, along with other forms of play, now tend to be practised only weekly.

Figure 14: How often do you do these things?
Base: 1033 6 to 17-year-olds



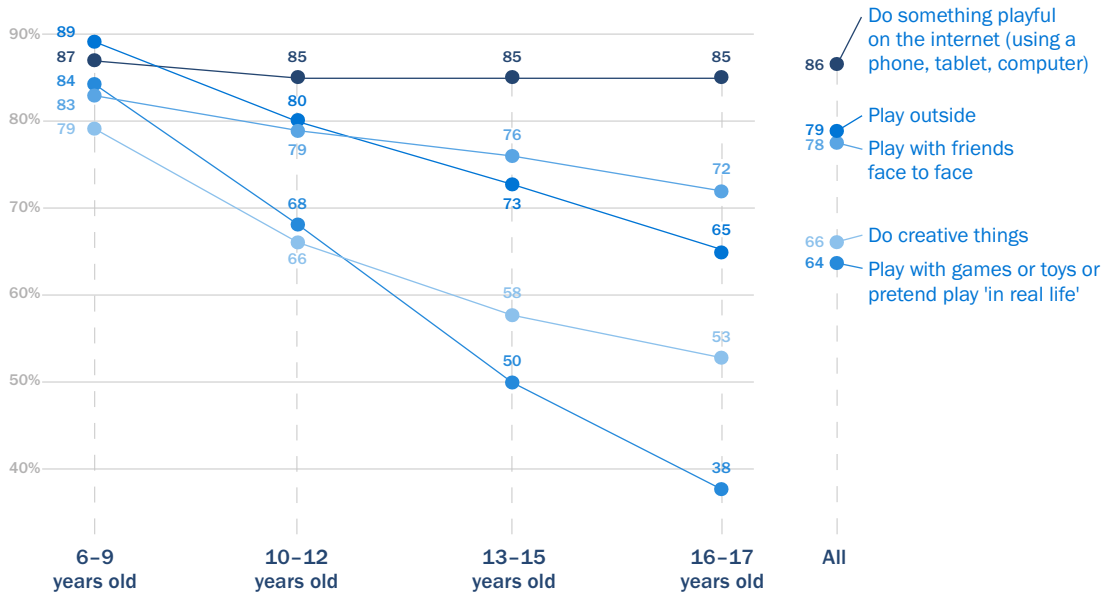
Note: Full question wordings were: Play with games or toys or in other ways "in real life" (not using a device); Do creative things (like doing art, or making things, or music); Play with or spend time with friends in person ("in real life"); Play outside (for example, in the street, a park, or garden or playing sport); Do something playful on the internet (using a phone, tablet, or computer). Totals may vary from 100% due to rounding error.

Girls engage significantly more in creative activities (75% agree) than boys (58 %), while boys engage significantly more in outdoor play (83% agree) than girls (75%).[51] Furthermore, children's weekly mix of playful activities changes notably by age (Figure 15). Young children aged 6–9 report frequently playing outdoors, with friends, with toys, doing creative activities and online. But as they grow older, the frequency of playing offline reduces steadily. By contrast, online play remains central to children's lives, with nearly 9 in 10 children playing online at least weekly from 6 through to 17 years old. This may reflect the difficulty with the term 'play', although we also tried in the survey to emphasise activities conducted in a playful way.

[50] The survey was conducted during the summer term 2021, when the pandemic curtailed children's freedoms.

[51] Detailed findings by age and gender can be found in Family Kids & Youth (2021).

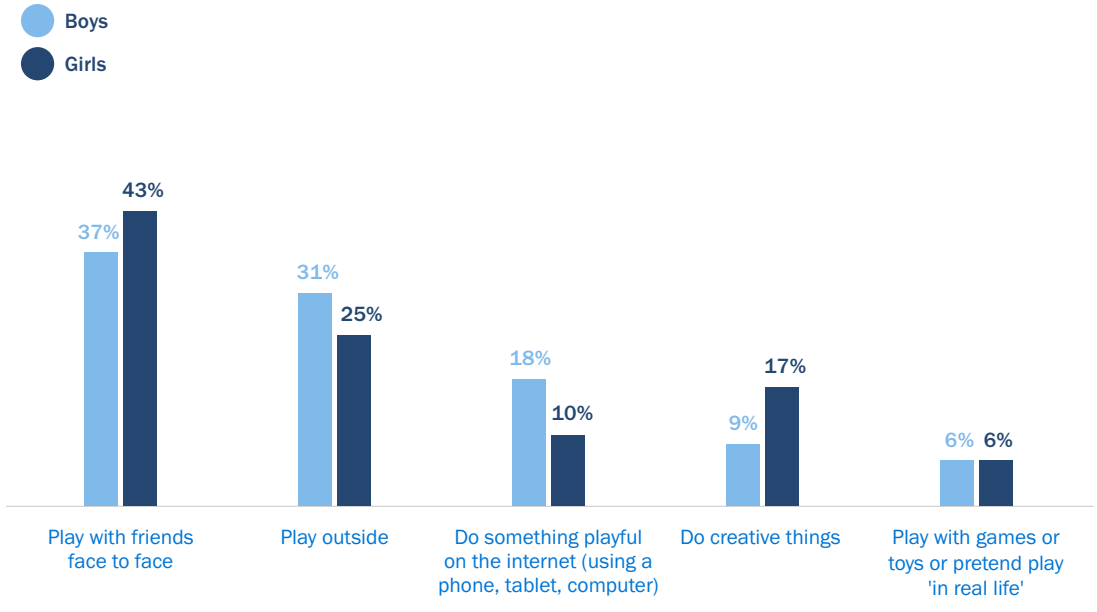
Figure 15: How often do you do these things, by age? (% who play in this way at least weekly)
Base: 1033 6 to 17-year-olds



Preferences for play in the future

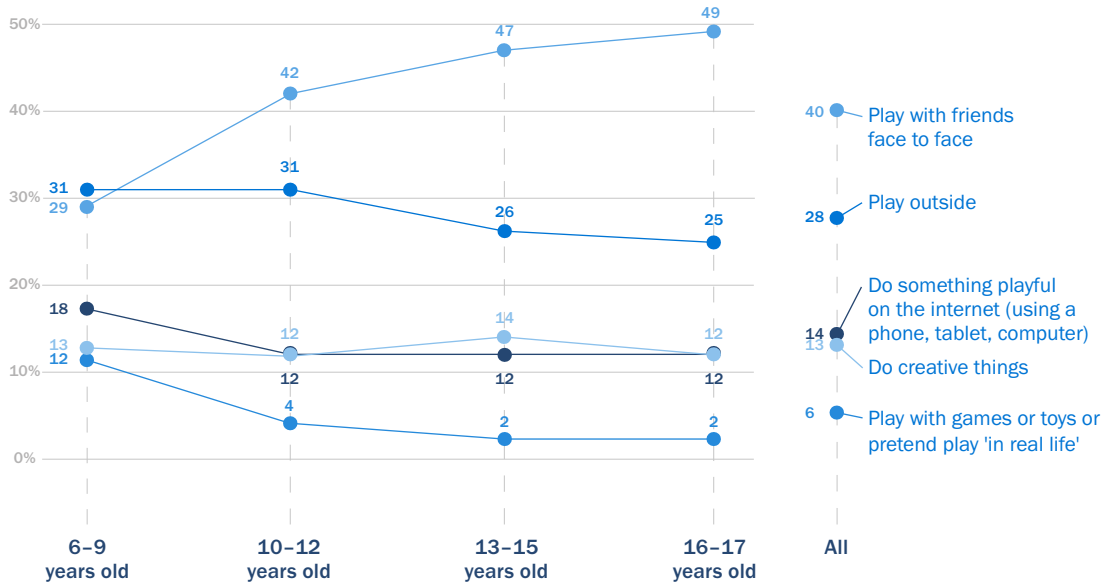
Importantly, the present situation is not what children wish for. They want more opportunities for free play outside and more time to play with friends face to face. Asked to choose one among these activities, 40% chose more play with friends face to face, and 28% chose more play outside. Just 14% chose more playing online (Figure 16), more often boys (1 in 6) than girls (1 in 10).[52]

Figure 16: Which one of these activities would you like to do more often?
(Base: 1033 6 to 17-year-olds)



[52] If they had not had to choose one activity, the percentages wanting more of these activities would have been higher.

Figure 17: Activities that children would like to do more of by age groups (Which one of these activities would you like to do more often?)
Base: 1033 6 to 17-year-olds



Younger children aged 6–9 (12%) prefer to play with games or toys or pretend play 'in real life' than older children. But interestingly, the older the children become, the greater their appetite for play with friends face to face, with the largest proportion of children from the 16–17 age group (49%) reporting wanting to spend playful time with friends face to face more often.

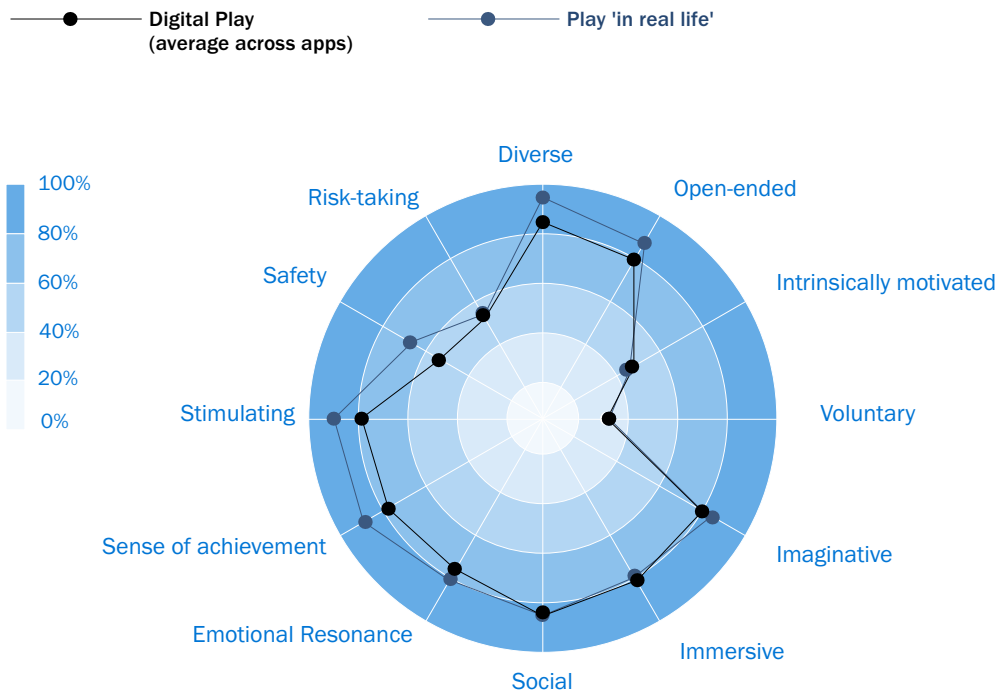
The qualities of play in non-digital and digital contexts compared

In sum, although online play is now the most common form of play, what children actually want is more opportunity to play outside and with their friends in person. We can gain some insights into why this is the case by comparing the qualities of play that children report in non-digital contexts.

Children's ratings of the qualities of play they enjoy **in digital and non-digital contexts are intriguingly similar**, as shown in the 'spider diagram' (Figure 18). However, offline as online, there are some constraints. In real life, as in the digital environment, these constraints appear to limit children's intrinsic motivation and voluntary play, as well as their safety and their freedom to take risks in their play.

Statistical analysis comparing the findings in the spider diagram reveal that, while children find digital and non-digital play equally **social, immersive** and **emotionally resonant**, they find play 'in real life' more **diverse** (95%, compared with 86% for digital contexts), **open-ended** (85% vs 77%), **stimulating** (90% vs 82%), **imaginative** (82% vs 78%), **safe** (66% vs 55%) and more able to give players a **sense of achievement** (88% vs 78%). There are no qualities of play on which digital is rated significantly more highly than non-digital contexts.

Figure 18: Children's ratings on the 12 qualities of play, for play 'in real life' and in digital contexts (% agree)
Base: 1033 6 to 17-year-olds



There are significant differences in how younger children aged 6–12 play 'in real life' compared to those aged 13–17. Children aged 6–12 described their play 'in real life' as more stimulating (93% agree), open-ended (89%), imaginative (89%) and social (88%), with a sense of achievement (89%). For children aged 13–17, play in real life is less stimulating (87%), open-ended (78%), imaginative (72%) and social (81%), with a slightly lower sense of achievement (87%). However, play for children aged 13–17 is significantly more voluntary (39%) than for children aged 6–12 (28%). There is no significant difference in how boys and girls perceive their play 'in real life'.

Clearly, different barriers and impediments as well as enablers of free play apply in these very different contexts, and these could be compared and contrasted for their impact on children's play experiences in future research. Ultimately, a holistic understanding of children's play is needed, so that interventions can respect, protect and fulfil the child's right to play in all contexts, and make strategic decisions to optimise resources in the best interests of children.

References

5Rights Foundation. (2021a). *'But how do they know it is a child?' Age Assurance in the Digital World.* 5rights-foundation.com/in-action/but-how-do-they-know-it-is-a-child-age-assurance-in-the-digital-world.html

5Rights Foundation. (2021b). *Pathways: How digital design puts children at risk.* 5rightsfoundation.com/uploads/Pathways-how-digital-design-puts-children-at-risk.pdf

5Rights Foundation. (2021c). *Risky by design.* riskyby.design/introduction

Aiken, A. (2020). Zooming in on privacy concerns: Video app Zoom is surging in popularity. In our rush to stay connected, we need to make security checks and not reveal more than we think. *Index on Censorship*, 49(2), 24-27.

All Top Everything. (2021). *Top 10 Biggest Video Game Companies in the World.* alltopeverything.com/top-10-biggest-video-game-companies/

Anable, A. (2018). *Playing with feelings: Video games and affect.* University of Minnesota Press. doi.org/10.5749/j.ctt20mvgwg

Arlinkasari, F. & Cushings, D.F. (2018). *Developmental-Affordances: An Approach to Designing Child-friendly Environment*. Proceedings of the Annual Conference on Social Sciences and Humanities (ANCOSH 2018) – Revitalization of Local Wisdom in Global and Competitive Era. researchgate.net/publication/329488581_Developmental-Affordances_An_Approach_to_Designing_Child-friendly_Environment

Back, J. et al. (2016). *Designing for Children's Outdoor Play.* Proceedings of the 2016 ACM Conference on Designing Interactive Systems. dl.acm.org/doi/abs/10.1145/2901790.2901875

Back, J. et al. (2018). Playing close to home: Interaction and emerging play in outdoor play installations. *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*, 156, 1-11. doi.org/10.1145/3173574.3173730

Bailey, C. (2016). Free the sheep: improvised song and performance in and around a minecraft community. *Literacy,* 50(2), 62-71. doi.org/10.1111/lit.12076

Baines, E. & Blatchford, P. (2019). *School break and lunch times and young people's social lives: A follow-up national study (Final Report to the Nuffield Foundation [Ref EDU/42402]).* UCL Institute of Education. nuffield-foundation.org/wp-content/uploads/2019/05/Final-report-School-break-and-lunch-times-and-young-peoples-lives-A-follow-up-national-study.pdf

Ball, D. et al. (2012). *Managing Risk in Play Provision: Implementation Guide.* P. S. Forum. hands-on-international.net/wp-content/uploads/managing-risk-in-play-provision.pdf

Barassi, V. (2020). *Child Data Citizen: How Tech Companies Are Profiling Us from before Birth* (1st ed.) MIT Press. mitpress.mit.edu/books/child-data-citizen?_ga=2.147312311.1208907863.1624138438-898542324.1621987361

Barnett, L. (2007). The nature of playfulness in young adults. *Personality and Individual Differences,* 43(4), 949-958. doi.org/10.1016/j.paid.2007.02.018

Bateman, A. et al. (2013). Living in a broken world: How young children's well-being is supported through playing out their earthquake experiences. *International Journal of Play,* 2(3), 202-219. doi.org/10.1080/21594937.2013.860270 (Taylor & Francis)

BBC. (2020). *Is TikTok safe?* bbc.co.uk/programmes/m000p3p9

Bengtsson, T. et al. (2021). Playing Apart Together: Young People's Online Gaming during the COVID-19 Lockdown. *YOUNG.* doi.org/10.1177/11033088211032018

Berriman, L. & Mascheroni, G. (2019). Exploring the affordances of smart toys and connected play in practice. *New Media & Society*, 21(4), 797-814. doi.org/10.1177/1461444818807119

Bettelheim, B. (1972). Play and Education. *The School Review*, 81(1), 1-13. journals.uchicago.edu/toc/schoolreview/1972/81/1

Blurton Jones, N. et al. (1976). *Play: Its role in development and evolution.*

Brooks, M. (2021). *Giving kids and teens a safer experience online.* blog.google/technology/families/giving-kids-and-teens-safer-experience-online/

Buchanan, R. (2001). Design research and the new learning. *Design issues*, 17(4), 3-23.ida.liu.se/~steho87/desres/buchanan.pdf

Buckingham, D. et al. (2010). *The Rhetorics of Creativity: A Literature Review.* Creativity, Culture & Education. researchgate.net/publication/41539436

Bulger, M. et al. (2021). *The Missing Middle: Reimagining a Future for Tweens, Teens, and Public Media.* Joan Ganz Cooney Center, Sesame Workshop. joanganzcooneycenter.org/publication/missing-middle/

Burgess, J. & Green, J. (2018). *YouTube: Online video and participatory culture.* John Wiley & Sons.

Burn, A. (2020). *Interview with Andrew Burn* [Interview]. Digital Futures Commission. digitalfuturescommission.org.uk/blog/interview-with-andrew-burn/

Burnett, C. & Merchant, G. (2014). Points of view: Reconceptualising literacies through an exploration of adult and child interactions in a virtual world. *Journal of Research in Reading*, 37(1), 36-50. doi.org/10.1111/jrir.12006

Burns, V. & Irvine, C. (2011). *"I'd Play All Day and Night if I Could": A Report on Children's Views on Their Right to Play. A Consultation by the Children's Parliament on behalf of the International Play Association (Scotland).* childrensparliament.org.uk/wp-content/uploads/Right-to-play-report-for-web.pdf

Carrington, V. (2012). 'There's No Going Back'. Roxie's iPhone®: An Object Ethnography. *Language and Literacy*, 14(2), 27-40. doi.org/10.20360/G2WW28

Casby, M. (2003). The Development of Play in Infants, Toddlers, and Young Children. *Communication Disorders Quarterly*, 24(4), 163-174. doi.org/10.1177/15257401030240040201

Casey, T. & Robertson, J. (2019). *Loose Parts Play.* inspiringscotland.org.uk/wp-content/uploads/2019/07/Loose-Parts-Play-Toolkit-2019-web.pdf

Castmo, M. & Persson, R. (2018). *The Alliance of Digital Nudging & Persuasive Design: The Complementary Nature of the Design Strategies.* lup.lub.lu.se/luur/download?fileOId=8950235&func=downloadFile&recordOId=8950219

Cavoukian, A. (2009). *Privacy by design.* iapp.org/media/pdf/resource_center/pbd_implement_7found_principles.pdf

Chambers, D. (2012). 'Wii play as a family': The rise in family-centred video gaming. *Leisure Studies*, 31(1), 69-82. doi.org/10.1080/02614367.2011.568065

Chester, J. et al. (2021). *Big Food, Big Tech, and the Global Childhood Obesity Pandemic.* Center for Digital Democracy. democraticmedia.org/article/big-food-big-tech-and-global-childhood-obesity-pandemic

Cohen, J. (2006). Social, emotional, ethical and academic education: Creating a climate for learning, participation in democracy and well-being. *Harvard educational review*, 76(2), 201-237. researchgate.net/publication/235420498_Cohen_J_2006_Social_emotional_ethical_and_academic_education_Creating_a_climate_for_learning_participation_in_democracy_and_well-being_Harvard_Educational_Review_Vol_76_No_2_Summer_pg_201-237_wwwhepgo

Coleman, S. et al. (2018). Dramatizing Deliberation: A method for encouraging young people to think about their rights. *Journal of Public Deliberation,* 14(1), 1-15. eprints.whiterose.ac.uk/137642/

Colvert, A. (2019). Presenting a new hybrid model of ludic authorship: Reconceptualising digital play as 'three-dimensional' literacy practice. *Cambridge Journal of Education,* 50(2), 145-165. doi.org/10.1080/0305764X.2019.1660307

Colvert, A. (2021). *The Kaleidoscope of Play in a Digital World:* A Literature Review. Digital Futures Commission – 5Rights Foundation. digitalfuturescommission.org.uk/wp-content/uploads/2021/06/DFC-Digital-Play-Literature-Review.pdf

Cortesi, S. et al. (2021). *Youth Participation in a Digital World: Designing and Implementing Spaces, Programs, and Methodologies.* Berkman Klein Center for Internet & Society at Harvard University. cyber.harvard.edu/publication/2021/youth-participation-in-a-digital-world

Coster, D. & Gleeve, J. (2008). *Give us a go! Children and young people's views on play and risk-taking.* Playday. playday.org.uk/wp-content/uploads/2015/11/give_us_a_go_children_and_young_peoples_views_on_play_and_risk_taking.pdf

Cowan, K. (2020). *A Panorama of Play: A Literature Review.* Digital Futures Commission – 5Rights Foundation. digitalfuturescommission.org.uk/wp-content/uploads/2020/10/A-Panorama-of-Play-A-Literature-Review.pdf

Csikszentmihalyi, M. (1996). *Creativity: Flow and the psychology of discovery and invention.* HarperCollins Publishers. psycnet.apa.org/record/1996-97915-000

Cunningham, H. (2006). *The Invention of Childhood.* BBC. penguin.co.uk/books/107/1071842/the-invention-of-childhood/9781446416150.html

D4CR Association. (2021). *Designing for Children's Rights.* designingforchildrensrights.org/

D'Anastasio, C. (2021). *On Roblox, Kids Learn It's Hard to Earn Money Making Games.* wired.com/story/on-roblox-kids-learn-its-hard-to-earn-money-making-games/

Danks, F. & Schofield, J. (2007). *Nature's Playground: Activities, Crafts, and Games to Encourage Children to Get Outdoors.* Chicago Review Press. books.google.com.tr/books?id=Rc6kGQAACAAJ

De Valk, L. et al. (2013). *Leaving room for improvisation: towards a design approach for open-ended play.* Proceedings of the 12th International Conference on Interaction Design and Children, New York, USA. doi.org/10.1145/2485760.2485771

De Veirman, M. et al. (2019). What Is Influencer Marketing and How Does It Target Children? A Review and Direction for Future Research. *Frontiers in Psychology,* 10, 2685. doi.org/10.3389/fpsyg.2019.02685

Dennehy, R. et al. (2020). Young people's conceptualizations of the nature of cyberbullying: A systematic review and synthesis of qualitative research. *Aggression and Violent Behavior,* 51. sciencedirect.com/science/article/pii/S1359178919300217

Department for Digital Culture Media & Sport. (2018). *Secure by Design: Improving the cyber security of consumer Internet of Things Report.* gov.uk/government/publications/secure-by-design-report

Department for Digital Culture Media & Sport. (2019). *Immersive and addictive technologies.* publications.parliament.uk/pa/cm201719/cmselect/cmcumeds/1846/1846.pdf

Deterding, S. (2011). Situated motivational affordances of game elements: A conceptual model. CHI 2011, May 7–12, 2011, Vancouver, BC, Canada. researchgate.net/profile/Sebastian-Deterding/publication/303084050_Situated_motivational_affordances_of_game_elements_A_conceptual_model/links/595f6dbda6fdccc9b1a3c2cc/Situated-motivational-affordances-of-game-elements-A-conceptual-model.pdf

Digital Futures Commission – 5Rights Foundation. (2020). *Research Agenda – Working Paper.* digitalfuturescommission.org.uk/wp-content/uploads/2021/01/DFC-Research-Agenda.pdf

Dinsmore, B. & Pugh, A.J. (2021). The Paradox of Constrained Well-being: Childhood Autonomy, Surveillance and Inequality. *Sociological Forum,* 36(2), 448-470. doi.org/doi.org/10.1111/socf.12687

Dodd, H.F. et al. (2021). Children's play and independent mobility in 2020: Results from the British Children's Play Survey. *International Journal of Environmental Research and Public Health*, 18(8), 4334. res.mdpi.com/d_attachment/ijerph/ijerph-18-04334/article_deploy/ijerph-18-04334.pdf

Dodd, H.F. & Lester, K.J. (2021). Adventurous Play as a Mechanism for Reducing Risk for Childhood Anxiety: A Conceptual Model. *Clinical Child and Family Psychology Review,* 24(1), 164-181. doi.org/10.1007/s10567-020-00338-w

Döveling, K. et al. (2018). From Mediatized Emotion to Digital Affect Cultures: New Technologies and Global Flows of Emotion. *Social Media + Society*, 4(1). doi.org/10.1177/2056305117743141

Du, Y. et al. (2021). Connected Play in Virtual Worlds: Communication and Control Mechanisms in Virtual Worlds for Children and Adolescents. *Multimodal Technologies and Interaction,* 5(5). doi.org/10.3390/mti5050027

Dubit. (2020). *Dubit Guide to Roblox for Brands (Version 3.0).* docsend.com/view/yytafca42a83pbgq

Dubit Trends. (2021). *Dubit Trends.* dubitlimited.com/insights/trends

Dylan, T. et al. (2020). Designing IoT resources to support outdoor play for children. *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, 1-12. doi.org/10.1145/3313831.3376302

Economic and Social Research Council. (2000). The Dangers of Safe Play: Children 5-16 *(Research Briefing No. 22).*

Edelman, R. (2021). *2021 Edelman Trust Barometer: Trust in Technology.* Edelman. edelman.com/trust/2021-trust-barometer/trust-technology

Edstorm, L. (2003). "Building Up" – Block Play After September 11. *Bank Street Occasional Paper Series,* 11, 18-21. educate.bankstreet.edu/occasional-paper-series/vol2003/iss11/5/?utm_source=educate.bankstreet.edu%2Foccasional-paper-series%2Fvol2003%2Fiss11%2F5&utm_medium=PDF&utm_campaign=PDFCoverPages

Einarsdóttir, J. (2014). Children's Perspectives on Play. In Brooker, L. et al. (eds.), *The SAGE Handbook of Play and Learning in Early Childhood,* 319-329. SAGE. doi.org/10.4135/9781473907850

Ellcessor, E. (2016). *Restricted access: Media, disability, and the politics of participation.* NYU Press.

Endeley, R.E. (2018). End-to-end encryption in messaging services and national security – case of WhatsApp messenger. *Journal of Information Security,* 9(01), 95. scirp.org/journal/paperinformation.aspx?paperid=81897

Erikson, E. (1950). *Childhood and Society.* W.W. Norton & Company.

eSafety Commissioner (Australian Government). (2019). *Safety by Design.* esafety.gov.au/sites/default/files/2019-10/SBD%20-%20Overview%20May19.pdf

Ettinger, K. & Cohen, A. (2020). Patterns of Multitasking Behaviours of Adolescents in Digital Environments. *Education and Information Technologies,* 25(1). link.springer.com/article/10.1007/s10639-019-09982-4

European Network of Ombudspersons for Children. (2020). *Common Framework of Reference on Child Rights Impact Assessment: A guide on how to carry out CRIA.* enoc.eu/wp-content/uploads/2020/12/ENOC-Common-Framework-of-Reference-FV.pdf

Evans, S.K. et al. (2017). Explicating Affordances: A Conceptual Framework for Understanding Affordances in Communication Research. *Journal of Computer-Mediated Communication*, 22(1), 35-52. doi.org/10.1111/jcc4.12180

Family Kids & Youth. (2021). *Playful by Design survey report and findings.* Digital Futures Commission. digitalfuturescommission.org.uk/wp-content/uploads/2021/10/DFC-Playful-by-Design-survey-report-and-findings.pdf

Featherstone, S. & Bayley, R. (2013). *The Cleverness of Boys*. A&C Black Publishers Ltd.

Ferraz, M. et al. (2017). *Whole-body interaction in natural environments benefits children's cognitive function compared to sedentary interaction indoors*. Proceedings of the 8th Augmented Human International Conference, Silicon Valley, California, USA. dl.acm.org/doi/10.1145/3041164.3041177

Finney, R. & Atkinson, C. (2020). Children's views about factors affecting access to home, school and community play. *International Journal of Play,* 9(4), 439-456. doi.org/10.1080/21594937.2020.1843806

Fogg, B.J. (2002). Persuasive technology: using computers to change what we think and do. *Ubiquity* (December), 2, Article 5. dl.acm.org/doi/10.1145/764008.763957

Friedman, B. & Hendry, D.G. (2019). *Value sensitive design: Shaping technology with moral imagination.* MIT Press.

Frost, J.L. (2010). *A history of children's play and play environments: Toward a contemporary child-saving movement.* Routledge.

Garvey, C. (1977). *Play.* Open books.

Gaskins, S. et al. (2007). The Cultural Construction of Play. *Play and Development: Evolutionary, Sociocultural, and Functional Perspectives, Issue.* Lawrence Erlbaum Associates Publishers. researchgate.net/publication/284762775_The_cultural_construction_of_play

Gee, J.P. (2009). Deep learning properties of good video games: How far can they go? In Ritterfield, U. et al. (eds.), *Serious games: Mechanisms and effects,* 67-82. Routledge.

Gee, J.P. (2018). Affinity spaces: How young people live and learn on line and out of school. *Phi Delta Kappan,* 99(6), 8-13. doi.org/10.1177/0031721718762416

Gill, T. (2021). *Urban playground: How child-friendly planning and design can save cities.* issuu.com/bernardvanleerfoundation/docs/urban_playground_tim_gill_sample

Golinkoff, R.M. et al. (2006). Play = Learning: A challenge for parents and educators. In Singer, R.M.G.D. & Hirsh-Pasek, K. (eds.), Play = *Learning: How Play Motivates and Enhances Children's Cognitive and SocioEmotional Growth,* 1-22. Oxford University Press.

Gordon, G. & Esbjörn-Hargens, S. (2007). Are We Having Fun Yet? An Exploration of the Transformative Power of Play. *Journal of Humanistic Psychology,* 47(2), 198-222. doi.org/10.1177/0022167806297034

Gray, P. (2017). What Exactly Is Play, and Why Is It Such a Powerful Vehicle for Learning? *Topics in Language Disorders,* 37(3), 217-228. doi.org/10.1097/tld.0000000000000130

Greenberg, B.S. et al. (2010). Orientations to Video Games Among Gender and Age Groups. *Simulation & Gaming,* 41(2), 238-259. doi.org/10.1177/1046878108319930

Griffin, A. (2020). Coronavirus: World Health Organization tells people to stay at home and play games. *The Independent.* independent.co.uk/life-style/gadgets-and-tech/news/coronavirusworld-health-organisation-play-games-covid-19-advice-a9438916.html

Grimes, S.M. (2021). Digital Playgrounds: *The Hidden Politics of Children's Online Play Spaces, Virtual Worlds, and Connected Games.* University of Toronto Press.

Harjumaa, M. & Oinas-Kukkonen, H. (2007). *Persuasion theories and IT design – International Conference on Persuasive Technology.* Springer. link.springer.com/chapter/10.1007/978-3-540-77006-0_37

Hartas, D. (2020). Teenage play and peer interactions: Virtual, social and emotional geographies. In Hartas, D. (eds.), *Young people's play, wellbeing and learning*, 1-31. Springer International Ltd. doi.org/10.1007/978-3-030-60001-3_1

Hartung, P. (2020). *The children's rights-by-design standard for data use by tech companies* (Issue brief no. 5 | November 2020). Good Governance of Children's Data project, Issue. UNICEF. unicef.org/globalinsight/reports/childrens-rights-design-new-standard-data-use-tech-companies

Herr-Stephenson, B. et al. (2013). *T is for Transmedia: Learning through Transmedia Play.* The Joan Ganz Cooney Center & The USC Annenberg Innovation Lab. joanganzcooneycenter.org/publication/t-is-for-transmedia/

Hewes, J. (2014). Seeking Balance in Motion: The Role of Spontaneous Free Play in Promoting Social and Emotional Health in Early Childhood Care and Education. *Children (Basel)*, 1(3), 280-301. doi.org/10.3390/children1030280

Hill, M. & Wood, E. (2019). 'Dead Forever': An ethnographic study of young children's interests, funds of knowledge and working theories in free play. *Learning, Culture and Social Interaction,* 23, 100292. doi.org/10.1016/j.lcsi.2019.02.017

Howard, J. et al. (2006). Children's categorisation of play and learning based on social context. *Early Child Development and Care,* 176(3-4), 379-393. doi.org/10.1080/03004430500063804

Hughes, B. (1990). Children's play – a forgotten right. *Environment and Urbanization,* 2(2), 58-64. doi.org/10.1177/095624789000200207

Huizinga, J. (1938). *Homo ludens: A study of the play-element in our culture.* Routledge & Kegan Paul.

Information Commissioner's Office. (2020a). *Age-Appropriate Design: A Code of Practice for Online Services.* ico.org.uk/for-organisations/guide-to-data-protection/key-data-protection-themes/age-appropriate-design-a-code-of-practice-for-online-services/

Information Commissioner's Office. (2020b). Annex B: *Age and developmental stages.* ico.org.uk/for-organisations/guide-to-data-protection/ico-codes-of-practice/age-appropriate-design-a-code-of-practice-for-online-services/annex-b-age-and-developmental-stages/

Isaacs, S. (1951). *Social Development in Young Children.* Routledge.

Ito, M. et al. (2010). *Hanging Out, Messing Around, and Geeking Out – Kids Living and Learning with New Media.* MIT Press.

Jenkins, H. (2006a). *Convergence culture: Where old and new media collide.* NYU Press.

Jenkins, H. (2006b). *Fans, bloggers, and gamers: Exploring participatory culture.* NYU Press.

Jeon, M. (eds.) (2017). *Emotions and affect in human factors and human-computer interaction.* Elsevier.

Jones, M.D. et al. (2018). *HCI Outdoors: Understanding Human-Computer Interaction in Outdoor Recreation.* Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems. dl.acm.org/doi/10.1145/3170427.3170624

Kafai, Y.B. et al. (2016). *Diversifying Barbie and Mortal Kombat: Intersectional Perspectives and Inclusive Designs in Gaming.* Lulu.com. lulu.com/shop/yasmin-b-kafai-and-gabriela-t-richard-and-brendesha-m-tynes/diversifying-barbie-and-mortal-kombat-intersectional-perspectives-and-inclusive-designs-in-gaming/paperback/product-23112778.html

Kahila, J. et al. (2020). Children's gaming involves much more than the gaming itself: A study of the metagame among 12- to 15-year-old children. Convergence: *The International Journal of Research into New Media Technologies*, 27(3), 768-786. doi.org/10.1177/1354856520979482

Karabon, A. & Steiner, A. (2020). Risk taking during play: ecological influences and behavioral outcomes of young children's appraisal of risks in outdoor spaces. *International Journal of Play,* 9(3), 318-330. doi.org/10.1080/21594937.2020.1806498

Kidron, B. et al. (2018). *Disrupted childhood: The cost of persuasive design.* 5Rights Foundation. 5rightsfoundation.com/static/5Rights-Disrupted-Childhood.pdf

Kidron, B. & Rudkin, A. (2017). *Digital Childhood: Addressing Childhood Development Milestones in the Digital Environment.* 5Rights Foundation. 5rightsfoundation.com/static/Digital_Childhood_report_-_EMBARGOED.pdf

Kleeman, D. (2021). *As Kids Kickstart The Metaverse, Is Public Service Media Ready?* thechildrensmediafoundation.org/public-service-media-report/articles/as-kids-kickstart-the-metaverse-is-public-service-media-ready

Koetsier, J. (2021). *Here Are The 10 Most Downloaded Apps Of 2020.* forbes.com/sites/johnkoetsier/2021/01/07/here-are-the-10-most-downloaded-apps-of-2020/?sh=494084fc5d1a

Kucirkova, N. (2019). Children's agency by design: Design parameters for personalization in story-making apps. *International Journal of Child-Computer Interaction,* 21, 112-120. doi.org/10.1016/j.ijcci.2019.06.003

Kurt, S. (2021). *Herzberg's motivation-hygiene theory.* educationlibrary.org/herzbergs-motivation-hygiene-theory-two-factor/

Lenhart, A. & Owens, K. (2021). The Unseen Teen: The Challenges of Building Healthy Tech for young people. datasociety.net/wp-content/uploads/2021/05/The-Unseen-Teen-.pdf

Lindon, J. (2011). *Too Safe for Their Own Good: Helping Children Learn about Risk and Lifeskills.* JKP. books.google.com.tr/books/about/Too_Safe_for_Their_Own_Good.html?id=W1SwAIwR-nkC&redir_esc=y

Livingstone, S. & Blum-Ross, A. (2020). *Parenting for a digital future: How hopes and fears about technology shape children's lives.* Oxford University Press. oxford.universitypressscholarship.com/view/10.1093/oso/9780190874698.001.0001/oso-9780190874698

Livingstone, S. et al. (2021). *Child Rights Impact Assessment – A tool to realise children's rights in the digital environment. Digital Futures Commission* – 5Rights Foundation. digitalfuturescommission.org.uk/wp-content/uploads/2021/04/CRIA-Report-revised-final.pdf

Livingstone, S. & Pothong, K. (2021). *Navigating the ethical challenges of consulting children via Zoom.* digitalfuturescommission.org.uk/blog/navigating-the-ethical-challenges-of-consulting-children-via-zoom/

Livingstone, S. & Stoilova, M. (2021). *The 4Cs: Classifying Online Risk to Children.* core-evidence.eu/updating-the-4cs-of-online-risk/

Lomas, N. (2021). *YouTube's recommender AI still a horror show, finds major crowdsourced study.* Techcrunch. techcrunch.com/2021/07/07/youtubes-recommender-ai-still-a-horrorshow-finds-major-crowdsourced-study/?guccounter=2&guce_referrer=aHR0cHM6Ly90LmNvLw&guce_referrer_sig=AQAAADCHFnaHrulKYkgYKnOkQk-

7gLmh64zXMdcalQpoVNVse8htC4hfnWRdwugksZ8CsP3taZhZITuag6sPsaDaNDjFSVG03oW-LIdrPBRtU6Jai0y6iCr-RueZsXCA8GFvZIerhjtkvDRNwgnM1WhIBTQ5gKQueaN1xN4q5FBieuuQ_

Macey, J. & Hamari, J. (2018a). eSports, skins and loot boxes: Participants, practices and problematic behaviour associated with emergent forms of gambling. *New Media & Society,* 21(1), 20-41. doi.org/10.1177/1461444818786216

Macey, J. & Hamari, J. (2018b). Investigating relationships between video gaming, spectating esports, and gambling. *Computers in Human Behaviour,* 80(C), 344–353. doi.org/10.1016/j.chb.2017.11.027

Machimbarrena, J.M. et al. (2018). Internet Risks: An Overview of Victimization in Cyberbullying, Cyber Dating Abuse, Sexting, Online Grooming and Problematic Internet Use. *International Journal of Environmental Research and Public Health,* 15(11), 2471. doi.org/10.3390/ijerph15112471

Main, A. (2019). *Countermeasures: Learning to Lie to Objects.* Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems, Glasgow, Scotland, UK. doi.org/10.1145/3290607.3310420

Marsh, J. et al. (2015). *Exploring play and creativity in preschoolers' use of apps: Report for the children's media industry.* Tech and Play. techandplay.org/tap-media-pack.pdf

Marsh, J. et al. (2018). Play and creativity in young children's use of apps. *British Journal of Educational Technology,* 49(5), 870-882. doi.org/10.1111/bjet.12622

Marsh, J. et al. (2020). *Children, technology and play.* The LEGO Foundation. legofoundation.com/media/2965/children-tech-and-play_full-report.pdf

Martínez, C. (2017). The struggles of everyday life: How children view and engage with advertising in mobile games. *Convergence: The International Journal of Research into New Media Technologies,* 25(5-6), 848-867. doi.org/10.1177/1354856517743665

Mascheroni, G. & Holloway, D. (2017). *The Internet of Toys: A report on media and social discourses around young children and IoToys.* digilitey.eu/wp-content/uploads/2017/01/IoToys-June-2017-reduced.pdf

Mascheroni, G. & Holloway, D. (eds.) (2019). *The Internet of Toys: Practices, affordances and the political economy of children's smart play.* Springer International Publishing. link.springer.com/book/10.1007/978-3-030-10898-4

Mascheroni, G. & Siibak, A. (2021). *Datafied hildhoods: Data Practices and Imaginaries in Children's Lives.* Peter Lang. doi.org/10.3726/b17460

McNealy, J. et al. (2021). *"I, Obscura" – Illuminating deceptive design patterns in the wild.* UCLA and Stanford University. c2i2.ucla.edu/2021/07/15/i-obscura-a-dark-pattern-zine-launched-from-stanford-and-ucla/

McReynolds, E. et al. (2017). Toys that Listen: *A Study of Parents, Children, and Internet-Connected Toys.* Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems. dl.acm.org/doi/10.1145/3025453.3025735

McRoberts, S. et al. (2016). *Do It for the Viewers!: Audience Engagement Behaviors of Young YouTubers.* Proceedings of the 15th International Conference on Interaction Design and Children. dl.acm.org/doi/10.1145/2930674.2930676

Microsoft. (n.d.) *About Minecraft.* minecraft.net/en-us/about-minecraft

Mozilla. (2021). *YouTube Regrets: A crowdsourced investigation into YouTube's recommendation algorithm.* Mozilla. foundation.mozilla.org/en/campaigns/regrets-reporter/findings/

Mukherjee, S. & Livingstone, S. (2020). *Children and Young People's Voices.* Digital Futures Commission – 5Rights Foundation. digitalfuturescommission.org.uk/wp-content/uploads/2020/10/Children-and-Young-Peoples-Voices.pdf

Mullan, K. (2019). A child's day: Trends in time use in the UK from 1975 to 2015. *The British Journal of Sociology,* 70(3), 997-1024. onlinelibrary.wiley.com/doi/pdfdirect/10.1111/1468-4446.12369?download=true

Nakamura, J. & Csikszentmihalyi, M. (2014). The Concept of Flow. *In Flow and the Foundations of Positive Psychology,* 239-263. Springer Netherlands. doi.org/10.1007/978-94-017-9088-8_16

National Playing Fields Association, Playlink, & Children's Play Council. (2000). *Best Play: What Play Provision Should Do for Children.* freeplaynetwork.org.uk/pubs/bestplay.pdf

Navarro, J. (2020). Fortnite: A context for child development in the U.S. during COVID-19 (and beyond). *Journal of Children and Media,* 15(1), 13-16. doi.org/10.1080/17482798.2020.1858435

Norwegian Consumer Council (Forbrukerradet). (2018). *Deceived by Design: How tech companies use dark patterns to discourage us from exercising our rights to privacy.* fil.forbrukerradet.no/wp-content/uploads/2018/06/2018-06-27-deceived-by-design-final.pdf

Office of Communications. (2020a). *Children and parents: Media use and attitudes report 2019.* Ofcom. ofcom.org.uk/__data/assets/pdf_file/0023/190616/children-media-use-attitudes-2019-report.pdf

Office of Communications. (2020b). *Children's Media Lives: Life in Lockdown.* Ofcom. ofcom.org.uk/__data/assets/pdf_file/0024/200976/cml-life-in-lockdown-report.pdf

Office of Communications. (2020c). (12 February 2020). *Parents more concerned about their children online.* Ofcom. ofcom.org.uk/about-ofcom/latest/features-and-news/parents-more-concerned-about-their-children-online

Office of Communications. (2021). *Online Nation Report.* Ofcom. ofcom.org.uk/research-and-data/internet-and-on-demand-research/online-nation?utm_medium=email&utm_campaign=Ofcoms%20Online%20Nation%202021%20reveals%20a%20year%20lived%20online&utm_content=Ofcoms%20Online%20Nation%202021%20reveals%20a%20year%20lived%20online+CID_64cd8f1b844caef5a5b055ee52a2c539&utm_source=updates&utm_term=Online%20Nation%202021

Olson, C.K. (2010). Children's Motivations for Video Game Play in the Context of Normal Development. *Review of General Psychology,* 14(2), 180-187. doi.org/10.1037/a0018984

Opie, I. & Opie, P. (1959). *The Lore and Language of Schoolchildren.* Oxford University Press.

Pangrazio, L. & Selwyn, N. (2018). "It's Not Like It's Life or Death or Whatever": Young People's Understandings of Social Media Data. *Social Media + Society,* 4(3), 1-9. doi.org/10.1177/2056305118787808

Parkinson, J. & Mansbridge, J. (2012). *Deliberative systems: Deliberative democracy at the large scale.* Cambridge University Press. cambridge.org/core/books/deliberative-systems/E4CB073306429F1A5B849FB31211B332

Pellegrini, A.D. & Smith, P.K. (2005). *The nature of play: Great apes and humans.* Guilford Press. psycnet.apa.org/record/2005-09269-000

Plato. (2008). *Laws.* books.google.com.tr/books/about/Laws.html?id=pYXYdtI7CcwC&redir_esc=y

Play England. (2012). *Adventure Playgrounds: The essential elements.* static1.squarespace.com/static/609a5802ba3f13305c43d352/t/60b8beb51b7c4d7e9ffdae86/1622720186909/Adventure-Playgrounds.pdf

Play Scotland. (2020). *Children's Rights & Wellbeing Impact Assessment (CRWIA) Statement.* playscotland.org/wp-content/uploads/Play-Scotland-CRWIA-Statement.pdf

Plowman, L. & Stephen, C. (2014). *Digital play.* The Sage handbook of play and learning in early childhood issue. dspace.stir.ac.uk/bitstream/1893/17788/1/Digital%20Play%20Stephen%20%20Plowman%20Sage%20Handbook.pdf

Plowman, L. (2016). Rethinking context: Digital technologies and children's everyday lives. *Children's Geographies,* 14(2), 190-202. doi.org/10.1080/14733285.2015.1127326

Potter, J. & Cowan, K. (2020). Playground as meaning-making space: Multimodal making and re-making of meaning in the (virtual) playground. *Global Studies of Childhood,* 10(3), 248-263. doi.org/10.1177/2043610620941527

Radesky, J. et al. (2020a). *Young Kids and YouTube: How Ads, Toys, and Games Dominate Viewing.* Common Sense Media.

Radesky, J. et al. (2020b). Digital Advertising to Children. *Pediatrics,* 146(1). doi.org/10.1542/peds.2020-1681

d2e111jq13me73.cloudfront.net/sites/default/files/uploads/research/2020_youngkidsyoutube-report_final-release_forweb.pdf

Reid Chassiakos, Y. et al. (2016). Children and Adolescents and Digital Media. *Pediatrics,* 138(5). doi.org/10.1542/peds.2016-2593

Revelle, G. (2013). Applying developmental theory and research to the creation of educational games. *New Dir Child Adolesc Dev,* 2013(139), 31-40. doi.org/10.1002/cad.20029

Ringland, K.E. et al. (2016). *"Will I always be not social?"* Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems. dl.acm.org/doi/10.1145/2858036.2858038

Ringland, K.E. et al. (2017). *Making in Minecraft: A Means of Self-Expression for Youth with Autism.* Proceedings of the 2017 Conference on Interaction Design and Children. doi.org/10.1145/3078072.3079749

Robertson, A. et al. (2021). *Minecraft Review.* Family Video Game Database. Retrieved 28 August from taminggaming.com/game/Minecraft

Robertson, A. et al. (2021). *Fortnite Review.* Family Video Game Database. Retrieved 28 August from taminggaming.com/game/Fortnite

Roopnarine, J.L. (2012). What is the state of play? *International Journal of Play,* 1(3), 228-230. doi.org/10.1080/21594937.2012.735452

Rosen, M. (2019). *Michael Rosen's Book of Play: Why play really matters, and 101 ways to get more of it in your life.* Wellcome Collection. wellcomecollection.org/books/XPDnmBAAADBVfE9D

Rubin, K. et al. (1983). *Play.* Handbook of Child Psychology Issue. researchgate.net/publication/233997999_Play_of_children

Russell, W. (2013). Towards a spatial theory of playwork: What can Lefebvre offer as a response to playwork's inherent contradictions? In *The philosophy of play,* 178-188. Routledge.

Sakr, M. (2020). Imagination and creativity in digital environments. In *Digital play in early childhood,* 66-82. SAGE Publications Ltd. doiorg.ezproxy.is.ed.ac.uk/10.4135/9781526481399.n5

Sakr, M. & Oscar, A. (2020). Stretchy time or screen time: how early years practitioners conceptualise time in relation to children's digital play. *Early Years,* 1-15. doi.org/10.1080/09575146.2020.1744530

Salen Tekinbaş, K. (2020). *Raising Good Gamers: Envisioning an Agenda for Diversity, Inclusion, and Fair Play.* Connected Learning Lab. clalliance.org/publications

Sandseter, E.B.H. (2009). Characteristics of risky play. *Journal of Adventure Education and Outdoor Learning,* 9(1), 3-21. doi.org/10.1080/14729670802702762

Sandseter, E.B.H. et al. (2020). The Prevalence of Risky Play in Young Children's Indoor and Outdoor Free Play. *Early Childhood Education Journal,* 49(2), 303-312. doi.org/10.1007/s10643-020-01074-0

Santer, J. et al. (2007). *Free Play in Early Childhood: A Literature Review.* National Children's Bureau. books.google.co.uk/books?id=yJumYgTUDkgC&source=gbs_navlinks_s&hl=en

Sefton-Green, J.. (2020). Play and Learning in the Digital Age. In Burns, T. & Gottschalk, F. (eds.), *Education in the Digital Age* (81-96). OECD Publishing. oecd-ilibrary.org/sites/1209166a-en/1/3/2/3/index.html?itemId=/content/publication/1209166a-en&_csp_=228b14d29efd07beac99830808e445e5&itemIGO=oecd&itemContentType=book#chapter-d1e11283

Shackell, A. et al. (2008). *Design for Play: A guide to creating successful play spaces.* Play England. playscotland.org/wp-content/uploads/Design-for-Play-a-guide-to-creating-successful-place-spaces.pdf

Shaer, O. & Hornecker, E. (2010). Tangible user interfaces: Past, present, and future directions. *Foundations and Trends in Human-Computer Interaction,* 3(1-2), 4-137. dx.doi.org/10.1561/1100000026

Shapiro, J. (2018). *Digital play for global citizens*. The Joan Ganz Cooney Center. joanganzcooneycenter.org/wp-content/uploads/2018/03/jgcc_digitalplayforglobalcitizens.pdf

Shier, H. (1984). *Adventure Playgrounds: An introduction.* National Playing Fields Association. academia.edu/2305086/Adventure_Playgrounds_An_introduction

Shinkle, E. (2008). Video games, emotion and the six senses. *Media Culture Society,* 30(6), 907-915. doi.org/10.1177/0163443708096810

Skeels, I. (2021). Why playing out is a social justice issue for children. *PlayingOut.* playingout.net/blog/why-playing-out-is-a-social-justice-issue-for-children/

Sobel, K. et al. (2015). *Maximizing children's opportunities with inclusive play.* Proceedings of the 14th International Conference on Interaction Design and Children. dl.acm.org/doi/10.1145/2771839.2771844

Soute, I. et al. (2009). *Evaluating outdoor play for children: Virtual vs. tangible game objects in pervasive games.* Proceedings of the 8th International Conference on Interaction Design and Children, Como, Italy. doi.org/10.1145/1551788.1551844

Steiner, J. (2012). *The foundation of deliberative democracy. Empirical research and normative implications.* Cambridge University Press.

Stephenson, A. (2003). Physical Risk-taking: Dangerous or endangered? *Early Years,* 23(1), 35-43. doi.org/10.1080/0957514032000045573

The Fortnite Team. (2020). *What is Fortnite? Beginner's Guide.* epicgames.com/fortnite/en-US/news/what-is-fortnite-beginners-guide

Third, A. & Moody, L. (2021). *Our rights in the digital world: A report on the children's consultations to inform UNCRC General Comment 25.* 5Rights Foundation & Western Sydney University. 5rightsfoundation.com/uploads/OurRIghtsinaDigitalWorld-FullReport.pdf

Thivant, L. (2018). *Child Friendly Cities and Communities Handbook.* UNICEF. unicef.org/eap/reports/child-friendly-cities-and-communities-handbook

Titchkosky, T. (2011). *The Question of Access:* Disability, Space, Meaning. University of Toronto Press. researchgate.net/publication/303419533_The_Question_of_Access_Disability_Space_Meaning

UNICEF. (2016). *MO-CRIA: Guide to using the child rights impact self-assessment tool for mobile operators.* sites.unicef.org/csr/files/Guide_to_the_MOCRIA_English.pdf

UNICEF. (2017). *Children in a digital world.* unicef.org/media/48581/file/SOWC_2017_ENG.pdf

UNICEF. (2021). *Child Friendly Cities Initiative – Belarus.* childfriendlycities.org/belarus/

UNICEF. (n.d.) *Child Friendly Cities Initiative.* childfriendlycities.org/

United Nations. (2011). Guiding Principles on Business and Human Rights. ohchr.org/documents/publications/guidingprinciplesbusinesshr_en.pdf

United Nations Committee on the Rights of the Child. (2013). *General Comment No. 17 on the right of the child to rest, leisure, play, recreational activities, cultural life and the arts* (Article 31). (CRC/C/GC/17). refworld.org/docid/51ef9bcc4.html

United Nations Committee on the Rights of the Child. (2021). *General Comment No. 25 on Children's Rights in Relation to the Digital Environment* (CRC/C/GC/25). ohchr.org/EN/HRBodies/CRC/Pages/GCChildrensRightsRelationDigitalEnvironment.aspx

Van Dijck, J. (2014). Datafication, dataism and dataveillance: Big Data between scientific paradigm and ideology. *Surveillance & Society,* 12(2), 197-208. doi.org/10.24908/ss.v12i2.4776

Vygotsky, L.S. (1978). *Interaction between learning and development (Mind and Society).* innovation.umn.edu/igdi/wp-content/uploads/sites/37/2018/08/Interaction_Between_Learning_and_Development.pdf

Vygotsky, L.S. (1986). *Thought and language.* MIT Press. mitpress.mit.edu/books/thought-and-language

Vygotsky, L.S. (2004). Imagination and Creativity in Childhood. *Journal of Russian & East European Psychology,* 42(1), 7-97. doi.org/10.1080/10610405.2004.11059210

Wall, J. (2019). From childhood studies to childism: reconstructing the scholarly and social imaginations. *Children's Geographies,* 1-14. doi.org/10.1080/14733285.2019.1668912

Wardle, F. (1997). Outdoor Play: Designing, Building, and Remodeling Playgrounds for Young Children. *Early Childhood News,* 9(2), 36. s3-video.definedstem.com/WebsitePDFs/04d87fc3-adae-40a2-aafa-02b8e24fe576.pdf

WhatsApp. (2021). *WhatsApp Terms of Service.* whatsapp.com/legal/terms-of-service-eea

Whitebread, D. et al. (2012). *The Importance of Play: A report on the value of children's play with a series of policy recommendations.* researchgate.net/publication/340137325_The_importance_of_play_A_report_on_the_value_of_children's_play_with_a_series_of_policy_recommendations

Williamson, B. (2019). New power networks in educational technology. *Learning, Media and Technology,* 44(4), 395-398. doi.org/10.1080/17439884.2019.1672724

Winnicott, D. (2009). *Playing and reality.* Routledge.

Wyeth, P. & Diercke, C. (2006). *Designing cultural probes for children.* Proceedings of the 18th Australia Conference on Computer-Human Interaction; Design: Activities, Artefacts and Environments, Sydney, Australia. doi.org/10.1145/1228175.1228252

Yamada-Rice, D. (2017). Designing play for dark times. *Contemporary Issues in Early Childhood,* 18(2), 196-212. doi.org/10.1177/1463949117714081

Yamada-Rice, D. (2018). Licking planets and stomping on buildings: Children's interactions with curated spaces in virtual reality. *Children's Geographies,* 16(5), 529-538. doi.org/10.1080/14733285.2018.1495316

Yamada-Rice, D. (2021). Children's interactive storytelling in virtual reality. *Multimodality & Society,* 1(1), 48-67. doi.org/10.1177/2634979521992965

Yau, J.C. & Reich, S.M. (2017). Are the Qualities of Adolescents' Offline Friendships Present in Digital Interactions? *Adolescent Research Review,* 3(3), 339-355. doi.org/10.1007/s40894-017-0059-y

Yip, J.C. et al. (2019). *Laughing is Scary, but Farting is Cute: A Conceptual Model of Children's Perspectives of Creepy Technologies.* Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems, May 4–9, 2019, Glasgow, Scotland, UK. dl.acm.org/doi/10.1145/3290605.3300303

YouTube. (2021). *How does YouTube make money?* youtube.com/intl/ALL_uk/howyoutubeworks/our-commitments/sharing-revenue/

Zaman, B. et al. (2012). Editorial: The evolving field of tangible interaction for children: The challenge of empirical validation. *Personal and Ubiquitous Computing,* 16 (Tangible Interaction and Children [Special Issue]), 367-378. link.springer.com/article/10.1007/s00779-011-0409-x

Zendle, D. et al. (2020). The prevalence of loot boxes in mobile and desktop games. *Addiction,* 115(9), 1768-1772. doi.org/10.1111/add.14973

Zosh, J.M. et al. (2017). *Learning through play: A review of the evidence (White paper).* The LEGO Foundation. legofoundation.com/media/1063/learning-through-play_web.pdf

Zuboff, S. (2019). *The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power* (1st ed.) PublicAffairs.

Author Biographies

Sonia Livingstone DPhil (Oxon), OBE, FBA, FBPS, FAcSS, FRSA, is a professor in the Department of Media and Communications at the London School of Economics and Political Science. She is the author of 20 books on children's online opportunities and risks, including Parenting for a Digital Future: How hopes and fears about technology shape children's lives. Sonia has advised the UK government, European Commission, European Parliament, Council of Europe, UN Committee on the Rights of the Child and others on children's rights, risks, opportunities and safety in the digital age.

Dr Kruakae Pothong is a researcher at the 5Rights Foundation and visiting research fellow in the Department of Media and Communications at the London School of Economics and Political Science. Her research spans the areas of human-computer interaction, digital ethics, data protection, internet and other related policies. She specialises in designing social-technical research, using deliberative methods to elicit human values and expectations of technological advances, such as the Internet of Things (IoT) and distributed ledgers.

Acknowledgements

The authors and the Digital Futures Commission (DFC) especially thank Baroness Beeban Kidron OBE and the 5Rights Foundation team, notably Natasha Jetha and Al Mik, and our research assistant Ayça Atabey (PhD candidate, University of Edinburgh), for making this work possible. We also warmly thank the following experts, commissioners and colleagues for their insights, input, data, resources and support throughout the development of this report.

Adam Woodgate (SVP Media Insights, Dubit)

Andrew Burn (Professor of English, Media and Drama, University College London)

Andrew Lamont (Film and Media Studies Teacher, Graveney School)

Andy Robertson (Journalist, Editor of Family Gamer)

Angela Colvert (Senior Lecturer in English Education, University of Roehampton)

Bo Stjerne Thomsen (Vice-President and Chair of Learning Through Play, The LEGO Foundation)

Catherine Jhee (Director of Web and Strategic Communication, Joan Ganz Cooney Center, Sesame Workshop)

Chris Bateman (Senior Lecturer in Game Design, University of Bolton)

Christopher Payne (Government & Public Affairs, LEGO)

Dylan Yamada-Rice (Senior Lecturer in Immersive Storytelling, Manchester Metropolitan University)

Gerison Lansdown (International children's rights consultant)

Ian Douthwaite (CEO, Dubit)

Jackie Marsh (Professor of Education, University of Sheffield)

Jenny Radesky (Academic and developmental behavioural paediatrician, University of Michigan)

Jo Twist (CEO, The Association for UK Interactive Entertainment [UKIE])

Jon Howard (Executive Product Manager, BBC)

Jon Mason and creative team members (Jollywise)

Julian Sefton-Green (Professor of New Media Education, Deakin University)

Kathryn Ringland (Postdoctoral Fellow, University of California Santa Cruz)

Kate Cowan (Senior Research Fellow, University College London)

Katie Salen Tekinbaş (Professor of Informatics, University of California at Irvine)

Kiley Sobel (Research scientist, Joan Ganz Cooney Center, Sesame Workshop)

Kjartan Ólafsson (EU Kids Online)

Larissa Pschetz (Researcher and Lecturer in Design Informatics and Product Design, University of Edinburgh)

Mariya Stoilova (Research Officer, Global Kids Online, London School of Economics and Political Science)

Michael Preston (Executive Director, Joan Ganz Cooney Center, Sesame Workshop)

Paul Ramchandani (LEGO Professor of Play in Education, Development and Learning, University of Cambridge)

Shuli Gilutz (User Experience Researcher and Instructor, Tel Aviv University)

Suzanne Clarke (Senior UX Designer, BBC Research & Development)

Tim Gill (Independent scholar, advocate and consultant on childhood)

Wendy Russell (Senior Lecturer in Play and Playwork, University of Gloucestershire

Zaza Kabayadondo (Director of Industry Partnerships, Joan Ganz Cooney Center, Sesame Workshop)

The Alan Turing Institute

5RIGHTS FOUNDATION

LSE

EY
Building a better working world

UNIVERSITY OF LEEDS

THE BEHAVIOURAL INSIGHTS TEAM

TU DUBLIN
OLLSCOIL TEICNEOLAÍOCHTA BHAILE ÁTHA CLIATH
TECHNOLOGICAL UNIVERSITY DUBLIN

BBC Research & Development

E.A.K.
EraseAllKittens.com

LEGO

LBU LEEDS BECKETT UNIVERSITY

Centre for Data Ethics and Innovation

SESAME WORKSHOP
Joan Ganz Cooney Center

DIGITAL FUTURES COMMISSION
Innovating in the interests of children and young people

5RIGHTS FOUNDATION