ICT COALITION

Looking forward :
Technological and social change in the lives
of European children and young people

Report for the ICT Coalition for Children Online

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Foreword

The ICT Coalition for Children Online was set up to develop the "ICT Principles for the Safer Use of Connected Devices and Online Services by Children and Young People in the EU" launched in January 2012.

The Coalition brought together for the first time many key industry players from across an increasingly wide and converging communication and Internet market, including connectivity platforms, online services and Internet-connected gaming devices. There are currently 20 members.

One of the goals of the ICT Coalition is to think ahead and try to envisage scenarios of the future interplay between technology, families, educators, children and the role that industry can play. Therefore, it has commissioned a report by Dr Alicia Blum-Ross at the LSE, who worked with a team of experts across Europe, to formulate their predictions on how relationships between technology - meant here as all the areas covered by the products and services of the ICT Coalition members - and the cultural and social practices and institutions that affect children and young people will likely evolve. Focusing on the near-term future (the next three to five years) the experts have been asked to focus on how digital technologies may impact children and families, and the role that educators and industry can play in promoting positive change. The experts have consulted directly with young people, parents and teachers in five Member States, along with an extensive consultation of the relevant literature, which brings credibility to their findings.

It should be noted that this report reflects the opinions and findings of the experts, ICT Coalition members recognise their own responsibilities and will now review and discuss the findings, with the aim of incorporating them as appropriate. Members will continue to be vigilant in making their products and services as safe as they reasonably can be. The ICT Coalition looks forward to continuing constructive dialogue on these issues in its regular Stakeholder Forums in Brussels, and to working within the partnerships which form the foundation of the ICT Coalition to enhance the opportunities available to young people from a rapidly-evolving online world.

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INTRODUCTION

Checking homework assignments online, playing interactive games, chatting with parents and friends on messaging apps, watching dance videos, calling grandmothers, and asking for information via smart home devices are just a few examples of the daily ways in which digital technologies have become embedded in the lives of children and young people across Europe. New and emerging devices and services promise to make families' lives easier, as they create new ways of connecting, creating and relaxing. They also promise to support learning at home and school by enabling ready access to information, and new and exciting pathways for young people to follow their interests. Yet alongside these conveniences come trade-offs, with implications for privacy, safety, health and wellbeing.

This report has been commissioned by the ICT Coalition for Children Online ('ICT Coalition'), a membership organisation for ICT companies operating in Europe that "aims to help younger internet users across Europe to make the most of the online world and deal with any potential challenges and risks." Members of the ICT Coalition must adhere to a set of shared child online safety principles and report periodically on their progress in complying with these principles.

The aim of this report is to provide context for ICT Coalition member organisations as they strategise to continue implementing or updating these core principles. Given that the technology industries are a fast-moving environment, our mandate was to study and understand current debates and project changes that might characterise the next three to five years. To fulfill this goal, we not only examined specific technologies (devices, platforms and services) but also considered how public opinion, social practices and expectations already have and will continue to evolve both in response to and in order to shape technological change. Some of the technologies we describe here are 'emerging' or 'new' - like virtual reality (VR) or the Internet of Things (IoT). Some are new ways of accomplishing old tasks - like digital school platforms used to link between home and school and track behaviour and achievement. Some of these are widely used, and their usage will only increase; others now are used only by a small (usually privileged) few and may or may not stand the test of time. For these reasons, we have focused on changing practices and debates as much as on specific technologies.

Previously new technologies rapidly become old and taken for granted. In the words of one of the industry stakeholders we interviewed (see methods section), "it just becomes wallpaper. We quickly forget about how, actually, this [made] our lives so much easier." For this reason, we cannot draw a clear line between existing practices and evolving ones. Some of the discussions in this report are grounded in the here-and-now, in the texture and debates of current life. Others project into the future, to imagined or anticipated social and technological change. We have attempted to strike a balance between present debates and potential ones, between evidence of what is already valued and feared, and what might be.

For this report, we were asked to consider three main areas of focus:

- Digital families: We examine how families are coming together through technology, yet sometimes being pushed apart. We consider how parents view the task of protecting their children against the risks presented by digital technologies, while still striving to help them realise the opportunities for learning and creativity, communication, play, relaxation and participation.

- Digital learning: We show how children and young people are learning about and through technology at home and in schools and explore how the availability of new technologies may change the tasks of both teaching and learning. We explore whether parents and teachers have the skills and knowledge necessary to help children as they grow up in the digital age.

- Industry: We investigate whether the ICT industries ('industry') are providing the tools, services and outreach needed to support children develop 21st century digital skills, along with and supported by their educators, parents and carers. We consider the role that industry can and should play, focusing on possibilities for needed protections, and for the development of new tools, services and forms of support.

Our research draws not only on a review of secondary literature but also, crucially, on the voices and perspectives of those living out these debates. We conducted interviews with industry stakeholders (members of the ICT Coalition) and organised focus groups in summer 2018 with young people, parents and teachers in five EU member states, Belgium, Bulgaria, Germany, Ireland and Italy. Throughout this report, we offer predictions of near-term changes in terms of digital families, learning and industry. At the end we offer key recommendations that can be initiated in the short term, in some cases using resources already available. We also suggest a series of key questions, that should guide wider planning and implementation in the medium- to longer-term.

KEY FINDINGS

- **Families are spending a substantial portion of their leisure time using digital technologies, but parents of younger children struggle with identifying positive or educational content and services and with avoiding inappropriate or unsafe material.**

From educational apps to entertaining shows, children and parents deeply value the access they now have to diverse content and services. Yet parents and children have a difficult time locating the content and tools they value and that have the most benefit within a highly crowded market. Parents and children need easier ways of curating their online experiences.

- **Older children and parents struggle with the amount of time they each spend online and want tools and support to help ensure this time is well spent.**

Parents and young people both struggle with the concept of 'screen time,' sometimes (but not always) feeling that they have wasted their time online. However, when parents impose blanket restrictions (using rules or technical means), frustration and conflict often results. In addition, these methods are ineffective in reducing exposure to risk. To be effective and more widely used, innovative guidance and new tools need to be developed to facilitate dialogue between parents and children about the benefits each can gain from their time online (as well as the issues that they struggle with) and be better promoted and integrated into products. Engaging tools that support active parental mediation rather than control are needed.

- **Parents and young people are both excited about and skeptical of the Internet of Things.**

While valuing potential conveniences, parents and young people are concerned about the impact that new technologies like 'smart homes' will have on physical health, privacy and relationships. Excitement about such devices is counterbalanced by this skepticism, and by the practical reality that much emerging technology remains unaffordable for many. If these devices are to be widely adopted, manufacturers must address these concerns for families in concrete, transparent ways to ensure that users are able to make informed decisions as regards their adoption and usage.

- **Parents and young people value the ease with which they can communicate using digital technologies, especially the greater freedom and peace-of-mind this can bring, but the ability to be constantly in touch also creates new pressures and anxieties.**

Families use digital technologies to keep in touch with friends and family both near and far away. These services give children greater freedoms - since they can easily check in - but also create pressure for parents and children to stay in increased levels of contact. Yet, to disconnect means missing out on valued participation, and once digital platforms are introduced (e.g. digital school platforms) parents may be seen as negligent if they do not use them.

- **Young people find ways of managing when they have difficult experiences online, but rarely do they turn to parents, teachers or industry (e.g. reporting inappropriate content or contact) as resources to deal with these difficulties.**

Many young people had experienced something uncomfortable online, be it unwanted content or bothersome contact or comments. However, few young people turned to their parents if they had difficulties, primarily because they saw their parents as lacking knowledge about technology or as likely to overreact. Even fewer turned to teachers, perceiving them to be uninterested or unable to help (even as teachers reported a different story), and they turned least of all to industry, whether because they were unmotivated to bother, did not understand the mechanisms, or did not believe, sometimes based on prior experience, that anyone would take action on their behalf.

- **Industry has been proactive in providing services, resources and programmes to help support children's safety online, from parental control tools to educational outreach. However, the impact of these initiatives and the uptake of tools are unclear.**

While providing more extensive parental control tools has been a push within industry, little available research explores whether the tools are well used and accomplish the tasks for which industry and parents intend them. Young people and parents, in limited instances, welcome and use new tools like monitoring apps and support for digital well-being; yet the impact of these tools needs to be better understood and their value, if favorably determined, better disseminated. Similarly, industry has engaged in a number of education initiatives in recent years, but more work needs to be done to join-up and evaluate these efforts and better integrate them into on-going digital literacy interventions in schools.

- **Only a minority of children are engaging in creative digital opportunities, like producing their own content, either at home or at school, despite the fact that encouraging the development of digital media literacies (such as learning to code) and use of new technologies (such as 3D printing and VR), are popular amongst policy makers. Despite teachers reporting basic challenges, such as lack of connectivity, equipment or training, some teachers are interested in utilizing and implementing the use of new and emerging creative technologies.**

Some teachers are using educational apps, platforms and hardware in creative ways within their schools, but often they are the minority and face technical, bureaucratic, personnel and leadership challenges. If schools are to be capable of delivering digital literacy and digital citizenship education - as many hope they will be - significant resources need to be devoted to ensuring that the use of educational technologies does not simply replicate existing inequalities. Industry can be a key partner in this effort, both in supporting schools and in offering their own educational tools and outreach in order to help young people develop 21st century skills.

- **There is considerable confusion about why, in some countries, the adoption of the GDPR has led to a new digital age of consent. Young people (sometimes with parents' knowledge and support) easily circumvent age restrictions.**

Little rationale has been given to parents or young people about why the digital age of consent has been set as it has, and the current design and implementation of age verification is easy to bypass. Digital services are being specifically developed for children in order to present safe alternatives to lying about age, but these may also incentivise children to be online more than they already are.

METHODS

This report draws on three sources:

- **A review of the literature.**

This included: keyword searches of academic and grey literatures; research reports and publications already known to the authors; keyword searches of newspaper reports to capture public debates.

- **Interviews with representatives from six companies who are current members of the ICT Coalition.**

These 'industry stakeholders' were suggested by the ICT Coalition coordinator as representing different facets of the industry and different national and regional contexts. Interviews were held via video calls between November 2017 and January 2018 with six members of the ICT Coalition (Pedro Gonçalves, Altice Portugal; Julie de Bailliencourt, Facebook; Rachel Madden, Google; Anna Augustson, Telia; Paul Cording, Vodafone; Sandra James, Orange). These members were contacted via the ICT Coalition Coordinator, Andrea Parola (EU Strategy). Transcripts were made available to the interviewees in order to clarify points of discussion and provide further resources. All quotes have been anonymised.

- **Focus group discussions with young people, parents and teachers in five European countries.**

These focus groups were conducted in Belgium, Bulgaria, Germany, Ireland and Italy by a researcher with expertise in that country and in a local language. In Belgium all the focus groups were conducted in Flanders and, therefore, in Dutch. These countries were selected on the basis of regional diversity, and the availability of a researcher with experience researching children and media (most were former members of the EU Kids Online network, or recommended by someone from this network).[1] Each focus group had between four and eight participants, with 101 participants in total, roughly evenly spread across the five countries (for a breakdown of participants by age, gender and internet use see Appendix A). Parents had children aged 3-23, with most clustered between ages 8-16. For ease, and because we did not ask for ethnic or citizenship information, participants in the focus groups are referred to as from the country in

which we interviewed them - some came from migrant families and so may have had other national origins.

Focus groups were conducted in June and July 2018 in schools, at universities, and in spaces rented for this purpose. Participants were recruited in partnership with schools and local NGOs, with an attempt to recruit for diversity (indicated by the parents' occupation) and for teachers with a range of professional experience and subject matter expertise. Researchers made significant efforts to recruit using a variety of different outreach mechanisms which included: contacting schools serving a wide range of students from different demographic backgrounds, outreach with a diverse set of local parenting organizations and parent-led groups, and contact with professional teachers associations attracting a range of teachers with regard to level of professional experience, subject-matter expertise and experiences of technology use. In order to increase the diversity of participants we offered a small honorarium (ranging from a gift certificate to a cinema token). Although all efforts were made to ensure as diverse a sample as possible, this is an opportunistic sample and so should not be taken as nationally or regionally representative. However, we were struck in our analysis how often shared experiences, themes, questions and difficulties arose across the five very different country contexts, and how the experience of taking part in a focus group also enabled parents, young people and teachers to compare and contrast their own experiences.[2]

Throughout this report we use the terms 'child', 'young person' and 'teen.' When we refer to children we mean those up to age 18 (in keeping with the UN Convention on the Rights of the Child), although to reflect common use we sometimes differentiate between younger children or 'kids' versus older children or 'teens.'[3] The terms 'young person' and 'teen' are used relatively interchangeably here as those aged 13-17 (the age of young people in our focus groups), although in some academic literature 'young person' can include those well into their 20s.[4]

Separate protocols for young people, parents and educators were written in English, drawn from the literature review and initial interviews with stakeholders, and were translated into the local

languages. The focus group protocol included three visual prompts - an image of a reporting procedure on a popular video website, an image of a popular social network, and an image of a tweet that was intended (not always successfully) to raise issues about data collection. These images were selected on the basis of the researchers' previous experience, which had shown that visual prompts are useful in eliciting information about technological functionalities that are otherwise time-consuming to explain, especially if they are not processes with which most participants would be familiar.[5]

Transcripts, if in languages other than English, were translated initially through Google Translate, with researchers from each country correcting the transcript where necessary. This worked well in all cases except the Bulgarian transcripts, in which the translation was less comprehensive and required more careful attention (itself pointing to a problem that minority languages are less well represented online). Transcripts were then hand-coded according to emergent themes, and then grouped together inductively in conversation with the literature. We have lightly edited the transcripts for clarity and readability throughout, for example removing the word 'like' or smoothing translations when necessary.

SECTION 1 :
DIGITAL FAMILIES

Technology will continue to become embedded in the daily lives of families and in the physical infrastructure of their homes. While bringing new conveniences and forms of leisure, emerging practices and technologies also introduce concerns about physical and mental health, interpersonal privacy and family relationships.

CONVENIENCE

From planning vacations to ordering groceries, shopping for prom dresses to listening to music and checking recipes, focus group participants described the many ways in which digital technologies are used on a day-to-day basis. Here we consider how emerging technologies are being and might be used to make family lives easier and more convenient.

Internet of things

One area of particular interest for both industry and families are 'smart' or 'connected' devices - sometimes called the 'internet of things' (IoT). 'Smart' devices are in-built into existing physical infrastructure like cars or refrigerators but have additional enhanced interfaces, sensors and controls. 'Connected' services are those which connect to the internet, and may or may not have a physical form (they may be apps or platforms).[6] Many devices are both 'smart' and 'connected' - for example an Artificial Intelligence (AI) enabled 'smart home' device may be linked to music services or to a thermostat or security device. In our interviews with industry stakeholders, they expressed enthusiasm for how these technologies will integrate different services. They described:

> You get a new car, you switch on the screen and your music choices are going to be known by the car manufacturer, the journey details, the performance of the car, probably how many people are in the car, and what kids are watching in the back seat…it's going to be all around you.

> [We are] trying to achieve some kind of end-user simplicity so that you have everything connected in a convenient and practical way.

In our interviews, some participants were more interested in devices that were 'smart' but not necessarily 'connected.' Several people described how they would try a "vacuum cleaner robot" (Boy, Germany), given that these devices can clean while you are "out of the house… so [outsourcing] noisy activities, if you can set the times, is great" (Mother, Germany). These conveniences are welcomed because, in part, they replace an annoying task and, in part, because they don't (seem to) involve significant set up or sharing of personal data.[7] Some parents and young people noted their interest in self-driving cars (autonomous vehicles). However, as a Belgian girl described, "Some tests have failed hard so the confidence is low… I do not really trust sitting in a car [like that]. If something goes wrong…"

Several respondents mentioned the potential for unreliability, and related safety concerns, especially if 'smart' technologies fail. One Irish girl recounted how her 'smart' school had had issues:

> I feel like my school is running basically on technology, our lights are automatic, our doors, everything. There was a day when the power went off so we all just sat there - all the doors closed and then our light switched off and no one knew what to do. We all just sat silently until the lights and the power came on.

However, before we become too convinced of the convenience of smart or automated schools, we should remember that many schools struggle with much more basic levels of access. One Irish teacher reported how her colleague's school "hasn't had internet for the past month… she's at her wits end" because she couldn't submit her termly reports on time, and no one had stepped in to help.

Our groups revealed both excitement and suspicion (and for some, bemusement) about smart home devices, especially.[8] For example, a German father recounted how he had given his own father an Amazon smart home ('Alexa') device for Father's Day and that "he has been happy. It is funny, a bauble. Personally, I would not want it." On the other hand,

another German father disagreed, saying "in ten years [this will] just be normal." Several parents and young people wondered whether smart home devices functioned as a kind of "slave," while, at the same time, they provided an "incredible simplification of everyday life" (Father, Germany) and were viewed as "practical, but also kind of awesome" (Father, Germany). The example this father gave was the ease of setting your thermostat remotely from your phone before arriving at home.

Smart home devices are actively marketed to families, and some companies now offer kid-friendly versions of the hardware designs. These toy-like devices allow for children to effortlessly access their favorite content and provide child safety features, like filters and time-restrictions that parents can set. Particular AI functionalities have been developed for children, for example, to encourage them to "ask nicely" instead of commanding the device.[9] Manufacturers and parents hope that these devices allow children a measure of independence in their internet use; even very young children, who cannot spell words in a search engine, can ask smart home devices questions and receive informative answers. Many of these devices also can be used as a kind of convenient intercom – for example, to call children downstairs for dinner by 'dropping in' to a device in the children's rooms to call them to dinner.[10] This shows both the usefulness in family life, but yet is it simultaneously an intrusion for the child?

Given the newness of these technologies, a number of questions remain open in terms of the impact they will have on children and families. For example, how will children interact with and understand the technology itself? One US study examined how children engaged with smart home devices; the study found that younger children asked questions like "do you have any arms" or "can I eat you?" The same study found that older children were more likely to ascribe intelligence to smart home devices on the presumption that they had limitless access to information and therefore assumed their responses were always accurate.[11] This finding raises important questions about whether, given children (and indeed adults) have pre-existing difficulties with 'informational literacy' - e.g. understanding how and why search results are produced - they will come to rely on even more on results from AI devices as definitive.[12] Another set of questions derives from how the presence of these devices, especially when used by children, will impact family relationships. For instance, will these devices undermine relationships that support children's intellectual growth? If parents are not the authority figure who is the first port of call for curious children with questions? And what of children who may find their searching results in unwanted or inappropriate content, with no parent nearby to supervise? The possible risks to children's safety must be weighed alongside conveniences.

Although they were not raised in our focus groups or interviews with stakeholders, researchers have also begun to investigate new toys and devices that can be broadly thought of as the 'Internet of Toys.' These can include the additional category of programmable toys, since many connected toys are also marketed for their capacity to teach coding and technological skills.[13] At the same time, they enable the collection of data about the child user and may introduce new security risks within family homes.[14] The marketing of smart toys, like Hello Barbie and Cayla met with backlash from advocates, who argued that children have the right to data privacy, and these toys were later withdrawn, although others with similar capabilities remain on the market.[15] As with smart home devices, weighty questions remain about the extent to which children perceive internet enabled toys as human - and what that means for their social and cognitive development.[16] One study explored whether children thought of personalised robots as 'moral' actors. The study found that children perceived them as having mental states and that they could be 'friends,' but that they did not have 'rights' (e.g to liberty, so they could be put in a closet or sold).[17]

Privacy in 'smart homes'

Parents and young people alike raised concerns about the fact that the devices, by design, constantly audio monitor children's (and parents') voices, yielding vast amounts of personal data. For example, one German girl described the devices as "practical and kind of awesome;" yet she also described how "they all have a microphone in it and hear all that is said. Of course, everything can be used." While participants, to some extent, worried about privacy, they also valued the convenience of these technologies. One Irish boy said "while it's useful in one sense having a voice assistant there to turn on a telly or turn on a certain programme, it's collecting all that data and sending it …So they're making money off listening to you which is a bit bad." Although industry stakeholders expressed confidence, they nonetheless expressed concern that IoT devices, including toys, might be "vulnerable to hackers" and that this might result in kids speaking to toys but having their "personal information leaked to the internet." Although some companies have shown leadership in developing appropriate safeguards, there are not, as yet industry standards on how either data or interpersonal privacy are to be ensured on such devices.

Fundamentally, are interpersonal and/or commercial privacy inevitably the required trade-off for conveniences? For example, if young people's playlists or other content are automatically queued up by their parent's smart car, will they experience this as an invasion of their autonomy, or as simply a 'given' of this type of technology? And what might be the potential problems of this integration? One industry stakeholder wondered "Does a teenage boy want his devices to be fully connected and registered to a zone registry?... if everyone will see everything that he surfs or his Spotify list?" Although the participants in our focus groups had not directly confronted this question in their own lives so far, the use of AI-enabled devices also raises concerns regarding the commercial aspects of these devices, such as whether children easily, if accidentally (or even purposefully) could run up large bills via unsupervised purchasing. Families are balancing these pros and cons, in a rapidly changing environment in which they do not always have all the information nor the guidance they need to make informed decisions.

PHYSICAL HEALTH & WELL-BEING

Despite what is often assumed about 'digital natives' as enthusiastic adopters of technology, the young people in our focus groups were as skeptical (if not slightly more so) as parents about the ultimate outcome of the convenience of smart technologies.[18] Teens had many concerns, particularly about the impact that these conveniences would have on their own and others' physical health:

> Maybe I sound a bit old… [but if] the phone is connected to the coffee pot to make coffee… I'd hate to lose these little things in life, like making coffee. If you become more and more lazy then you lose the beautiful things that fill your day. (Boy, Italy)

> I think it's convenient, just because you can say, «Alexa, or Google, or whatever, google that,» and you'll find out what it's like without taking your phone out and looking for the right item. Somewhere, then, you get lazy, because if you always say: «Turn off the light,» «Put this on my shopping list,» then you do not do anything yourself. (Girl, Germany)

As is so often the case, both for the public and for technology designers, participants in our focus groups referenced stories from popular culture to imagine what the future might look like.[19] In the focus groups in both Belgium and Bulgaria, young people referenced the obese, hapless characters in the film Wall-E to describe how "if everything is done by robots, we'll have nothing to do" (Girl, Bulgaria). Imagining these bulbous characters fuels fears about technology making people ill or overweight - although in fact the relationship between 'screen time' and obesity has never fully been determined (given that changes in weight are unlikely to be caused by any one thing).[20] Despite fears about screen time and sedentary behaviours, some studies have shown the possibilities for incentivizing activity and spending time outside, for example the augmented reality game Pokemon Go.[21] A German girl joked that "my mother is very excited about her new AppleWatch… She [always] says: 'I've walked so many metres!' This is one of her favorite phrases."

Teachers were also concerned about the effects of digital technologies on physical health and well-being. Discussing how so often one now sees "a four-year-old with a tablet… [instead of] giv[ing] them a ball" (Teacher, Italy), another Italian teacher mused that children "do not know how to play anymore." One parent reflected on this as a response to the social "pressure" placed on parents, saying "we just filter it down to the kids… you see it in restaurants, I think it's a crying shame, they're here on [devices], to keep them quiet... I don't care if the child is running around, that means they're being a child" (Mother, Ireland). An Italian mother worried about the future ramifications, saying "If you put the phone in front of them when they are 18 months in order to get them to eat their baby food, when they are 18 years old they are like that." Inadvertently illustrating her point, a Belgian girl described "we [my family] never eat together, I eat alone. And I always have my mobile phone, without which I cannot eat. I have to watch something. Otherwise it is so boring." However, what these comments also demonstrate is how debates around technology sit within and reinforce pressures on families, and judgement from others. While many studies of the connections between digital technology use and physical health are correlational rather than causal, there is nonetheless compelling evidence that excessive technology use can have an adverse impact not only on obesity, but also on sleep, eye health and potentially physical posture and fitness.[22]

Mental health and 'addiction'

Debates about the impact of technology (in particular social media and gaming) on the mental health and well-being of children and young people are much in the news.[23] On the one hand, measures of time spent using technology has been correlated with negative mental health outcomes - although not in as clear-cut a fashion as is often suggested. One study found that

both those who spent comparatively little time online and those who spent comparatively excessive amounts of time online had the worst mental health (what the researchers called the 'Goldilocks Hypothesis' in which balance must be struck between too much and too little).[24] At the same time, other studies have found that when young people who already have mental (health) difficulties use social media, they may either find themselves becoming more depressed or anxious (for example, if they feel left out) or they may find social media helpful, by making them laugh, giving them practical support, or helping them feel less alone.[25]

Many young people and parents talked in terms of technology 'addiction,' even though this term is controversial.[26] This term was sometimes used as a judgement of others, For example:

> You know if you use like a phone or something, if you use it a lot you know you might get addicted, and you might start to neglect the people around you, you might not get as much work done as you want to. (Boy, Ireland)

> Me personally I can cut off when I want to...But yeah some people are addicted. (Boy, Ireland)

On the other hand, many young people also were concerned about their own addictive behaviours. When the researcher in Belgium asked a boy "are you addicted do you think?" he responded "Yes, I mean once I start playing a game I can sit there for hours because yes, you're sitting in your zone, doing your own thing." Likewise concerned about the time she spent on her device a Belgian girl said "if you're scrolling like that, Facebook or Instagram, you just keep on going. In the end it is 'ahh! So much time is already over!'" Whereas an Italian girl, in contrast, was more optimistic about her ability to disconnect, saying "I often switch the phone off, then there are those times when I forget. I see the notifications and I answer some messages too, I get distracted a bit. If not, I turn off the phone and study."

Although there are worries about the impact of the 'distractions' of the digital age, the popular use of the word 'addiction' is perhaps unhelpful in helping parents and professionals identify the young people who are genuinely in need of intervention.[27] 'Internet addiction' is not a formal diagnosis although this year 'gaming disorder' was classified as a disease by the World Health Organization.[28] Even with this new recognised disorder, some psychologists continue to question whether these labels are useful for separating out 'problematic' versus intensive but not necessarily abnormal use of digital media. Undoubtedly some

young people experience especially adverse effects from the time they spend online, researchers call this 'differential susceptibility,' meaning that while most children are resilient and can deal with difficulties others are more vulnerable and/or reactive, and therefore in need of extra support.[30] However, the assumption when policies and 'eSafety' interventions are developed is often that more children are the latter, rather than the former.

At the same time, worries about 'addiction' often speak to deep-seated fears, including about how social reliance on technology will change culture and family interactions.[31] One Irish mother worried, "There was an old Irish thing where we had the 'gift of the gab,'... we are very good conversationalists traditionally... it'll be a terribly sad thing if kids grow up, and they don't know how to tap somebody on the shoulder and start a conversation with them because they're just too screen dependent." Yet parents sometimes noted when they, too, were dependent on their 'screens.' One Bulgarian mother described that when she returns home, one child "is on the Playstation or the computer, the other one is on the laptop and the tablet, mum and dad are on their mobile." Another joked that when the family became "zombified" she said "put this down, we are going out... Even as [technologies] are helping us, suddenly we become like strangers. We don't communicate, everyone is on their own device."

LEISURE

Digital technologies are often used as a way for families to spend leisure time. Established forms of media, like television, radio and video games, continue to predominate, but now accessed online.[32] New forms of digital entertainment like eSports, interactive games (and vlogging and live-streaming of gaming), have also gained significant popularity in recent years.

Keeping up with and controlling content

Parents often struggle to keep up with the myriad entertainment opportunities that seem to absorb their children. Whereas 'traditional' TV was subject to restrictions on content and on advertising, a more dispersed media environment and a lack of a ratings system or other forms of vetting means both parents and children struggle to find what they are looking for and avoid unwanted content.[33] One Belgian mother complained about the lack of ratings for online streaming, noting how unlike "in the TV guide, where you [can] click on more info and then you can just trust [the rating] if you do not have time and say [if your child is too young to watch] sorry no." On the other

hand, one of the benefits of a more distributed media environment, according to an industry stakeholder, is that parents can be more responsive to their children's interest and curate selections accordingly:

> We don't put an age label on [content] because a parent can decide – maybe they have a mature 11-year-old or maybe they don't and they want to keep them with a more limited experience [e.g. via a kid-specific site or 'safe search' mode]... I still don't think we're going to be able to please every parent – that's why we're building in these features where the parent can block specific videos they don't feel are appropriate for their child.

While many sites now offer similar levels of customization, parents often either were unaware of these capabilities or were unsure how to use them. Struggling with digital services which by-and-large have automated listing of content by default, parents discussed particularly the difficulties of knowing what their children were watching. For example, Belgian parents questioned how can you "arrange with your children [to stay] with the same interests ... with older children who are looking for themselves, how can you check?" Most platforms do offer functionality that can stop algorithmically selected content or automatic play, but as one Belgian parent said (summing up for others) "you can turn that off... but I do not know how."

Unwanted content was a problem across platforms. For example, one Belgian boy described how he thought he was clicking on a video on Facebook but instead "there are really dirty sounds, and I was just in the salon where my mother sat." An Irish father had given his son access to a school website with embedded video content thinking "grand, it's been vetted. It's safe." Leaving his son unattended, the father was unaware that additional content was being algorithmically suggested until his seven-year-old "came running into me crying [because] he had clicked on a link to an incident in Africa where a man had an open wound… he was really upset, and I complained to the website." A German father noted "you really always have to sit next to [the device] because you cannot guarantee what is being played." Other platforms present the child only with the pre-selected show but might automatically load more of the same until manually stopped. This led one Belgian mother to question how children would ever learn to "stop for themselves" given this enticement.

In addition to the measures platforms are taking to moderate content (see Section 3), parents also employ their own means of steering children towards 'good' content. Without question, parents could use more help in this regard. Parents often guide younger children towards brands with which the parents are already familiar, like public broadcasters (e.g. the Dutch-language Ketnet) or titles from their own childhoods (e.g. the Swedish stories of Pettson und Findus which have been adapted into both a show and an app).

With greater diversity in genres and breadth come valued opportunities for learning (see Section 2), and for shared entertainment with siblings or peers. However, parents are sometimes confounded by their children's interests. One Irish father whose son enjoyed 'unboxing' videos (videos of people, often children or close-ups of hands opening new toys) complained "when he was much younger he wanted to try out all these toys… You know there would just be loads of toy reviews because they're paid for it." These videos are immensely popular, especially amongst younger children, leading researchers to explore whether they afford children low-risk opportunities to explore feelings of ownership and control, since many of the videos feature children in positions of authority. However, these videos also contain only loosely concealed commercialism, which in other contexts would be subject to regulations on advertising. Speaking to the global presence of popular games and platforms, an Italian mother listed how her 10-year-old was in "the age of Musical.ly," the 12-year-old was obsessed with YouTubers and Fortnite, and her 14-year-old daughter was spending all of her time on Instagram. Thus many of the debates of parents in the digital age are shared on a global scale.

Video games

Although some parents lamented their children's interest in video games and social media, others found ways to join in or, at the least, understand their children's interests. One Belgian mother described how at first she worried about her son's love of Fortnite, finding it "aggressive." But after watching him play with friends she heard him:

> Working together with others. Like 'Come on we're going to find that treasure together'. He still has something sociable even though he is alone at the computer. Then I notice how he negotiates with others and has to communicate to play the game well. Even though it seems to a parent that is a violent game, he is still friendly in that game with his friends… But I can not play that game myself. (Mother, Belgium)

In contrast, a Bulgarian mother described how she played FIFA (which, as a football game and thus with familiar rules, has arguably a lower barrier to entry) with her son. She said:

I play football with him, I've been trained. He gives me the joystick - this is how you hit, this is where you push… [Interviewer] You beat him on FIFA? I can't just yet. I'm still a weak player and that's why he loves playing with me - because he can beat me. That's the truth. (Mother, Bulgaria)

Most of the parents who were interviewed experienced conflicts around the use of digital technologies (as families often do around sleep, food and homework), but sometimes they also found shared pleasures.[34] A UK study showed that playing video games together, in particular, was popular amongst fathers when spending time with their children.[35] Parents discussed video games in terms of their 'addictive' qualities but also in terms of how they provide a fun way to engage with peers - something especially valued now, given that the movements of children and young people often are more restricted than in generations past.[36] Since many children cannot independently meet up with friends, as parents might have done when they were children, sharing digital experiences together is a valued means to fill this gap.[37] Yet while some parents are beginning to embrace (some) video games, emergent genres of digital engagement such as competitive gaming or 'eSports' still often confound them, even while they gain popularity amongst young people. This emergent but intensively popular genre has many of the same properties of gaming, but in a competitive live environment which may serve both as a form of escapism for young people as well as introducing potential risks both for players and for audiences, for example by making gambling more accessible for youth.[38]

Virtual reality

Although emerging technologies used for entertainment are not necessarily (yet) widespread, they do raise particular promises and concerns when it comes to children and young people's leisure time. Virtual Reality (VR), for example, is seen as potentially valuable for learning and entertainment. One industry stakeholder described a project where "teenagers were asked to use VR to convey what it felt like to be bullied… some of the research has shown that people's ability to build empathy is far greater through VR than any other experience." One German boy discussed how he had used a VR headset at the "vocational and information center" and had watched a video about different professional pathways, allowing you to "immerse yourself in [a business woman's] day. As if you were just standing in the office next to her."

Although children's use of VR is relatively new, one study found that children need specific support, although they are often enthusiastic users.[39] The

authors explored how most VR environments were not created for children, so the dimensions may be difficult for children to navigate or the headsets cumbersome. Another study cautioned that while VR has enormous learning potential because it is so realistic, it can also therefore be especially traumatic, alarming or confusing for children.[40] Our focus groups showed mixed responses to the prospect of using VR. Some were skeptical. One German girl joked that her "grandpa got such a head thing [VR], which was pretty funny because he did not know what it was at the beginning and then he ran around Christmas Eve and said, «Oh look, look!» And we did not see anything." A Bulgarian parent said "I'm just not that interested," and an Italian girl mused "for all this virtual reality, I would like to dedicate myself to the true reality." Yet others were more enthusiastic, a Belgian girl who had tried a VR headset described how "when you take [the glasses] off, then the real world seems so boring when you are just with ordinary people." These responses indicate that while VR is seen within industry as offering great potential, it is not yet widely adopted by youth or families. We might also wonder about the conception of 'reality' that VR challenges, given both in the enthusiastic and in the avoidant quotes above there is a sense in which the 'real' world is differentiated from the virtual, rather than being enhanced by it.

KEEPING IN TOUCH

For today's families, digital technologies have become an intimate part of the work of keeping in daily contact – with friends and relatives both near and far away. As one industry stakeholder described:

Sometimes we talk about digital and online connections as something that is less worthy than face-to-face connections. But if you talk to kids... the life they have online is exactly as true and important as the life offline... For intimacy and connections, I think the industry will continue to play a great role.

Yet while the use of technology to keep in touch is relatively universally celebrated, there are also issues with how technology changes the nature of relationships, introducing challenges to how, when and why families and young people communicate.

Family communication

Now a daily part of family life, digital communication has extended rather than replaced 'traditional' means of keeping in touch - face-to-face visits, letters or phone calls.[41] For many, texting, video chat and free messaging services, especially, offer instant ways

of staying close to an extended circle, including transnational family and friends. One German father described "With our friends in Abu Dhabi. If you want to talk to them, the WhatsApp is very good. They can send a picture, since the contact is right there. We did not have anything like that before." A Belgian father used "Whatsapp just to call my parents in Nigeria, I save a little money" and an Irish mother used FaceTime to keep in touch with her son in the UK, "so you can still have them in the room you know which is great, and everyone is passing the phone around... it's good to have that... they're still there, you can keep in contact with them... Sometimes he'll send his own photo, what he's doing."

These generally free services are particularly important in the lives of migrant and refugee families in Europe, including parents who, of necessity, must live apart from their own children, sometimes across great distances and for lengthy periods of time.[42] While this contact is deeply valued, some families find these calls challenging. For example, a study of Polish immigrants in Ireland found that Skype calls meant that sometimes parents, grandparents and children felt pressure to "perform."[43]

In our focus groups, many reported using digital technologies as a means of keeping in touch much closer to home - children with parents and vice versa – in the ordinary course of the day. In the Italian youth focus group, when asked "How do you keep in touch with your friends, with your parents?" the respondents answered almost simultaneously "On WhatsApp." Parents and young people described how their smartphones allowed children to have more autonomy because both parent and child had peace-of-mind knowing that they could be in touch if they ran into trouble.[44] Yet while now well integrated into the communications patterns of families, the use of digital technologies has led to an expectation that both parents and children will be reachable whenever needed, potentially fueling unnecessary anxiety.[45] For instance, two Irish parents shared how they had observed a group of 'tween' girls spending a birthday party on their phones. Apparently the problem had partly arisen from "parents texting them during the party, 'where are you now, what are you doing?.'" One mother commented that for her own daughter's party, she had told the other mums (via WhatsApp), "'No phones please' out straight... And they all came back 'brilliant, thank you.'" An Irish father reflected on this story:

> I had given my daughter a [spare iPhone] phone a year ago... my idea was to track you now when you're at parties and I can keep in touch with you [everyone laughs]... it only occurred to me now

actually, do you know what, she can go to the party, I trust this person that my child is not going to get abducted. It's this fear that I need to be tracking my child and that I have to give up. She's okay to go to a party without me needing to track her electronically the whole time.

In this way, the technology has become a double-edged sword; once available it seems negligent not to use it, but can be all-consuming to keep up, in the word of an Irish mother with all those "pings and notifications." After her school had set up the electronic attendance record an Italian teacher complained, "In theory, it should facilitate situations, but practically it makes it increasingly difficult... [Parents] have to check the register, otherwise it's useless. Then they blame the teachers... but, sorry, there is the electronic register, you have to look at it!" So while digital technologies brought convenient opportunities to connect, there were also hassles and sometimes impeded opportunities when either services or social norms did not function as expected.

Peer communication

Via texts and messaging apps, social media posts, and comments, within games and while watching shared content, peer-to-peer digital communication (even when peers may be physically together) has become a feature of young people's lives around the world.[46] While parents sometimes found their children's reliance on technology annoying, they also understood that it was essential to social participation. One German mother acknowledged that taking away a child's smartphone was not an option because:

> If they are not in the group... they would not be able to do anything with their friends... They go out of school and ten minutes later they have to talk to each other. There they are ten meters apart, everyone is already hanging on his cell phone, and they are talking to each other again... everything is very spontaneous, or it is changed every five minutes.

One Irish boy who had temporarily deleted Snapchat found:

> It was great like for a little while.... [but] when I disconnected from that for the couple of weeks I missed out on so much over that time... see sometimes [my friends would] forget that like 'oh he's not on Snapchat I better text him about this to make sure he's available for it' and then I'd end up missing it... So it's kind of become an essential thing. I can't ignore it anymore ... but I just don't use it as regularly.

While young people are largely positive about their ability to keep in touch with friends using digital means and report myriad ways in which they support and encourage their friends online, they also encountered difficulties. Some young people talked about the "pressure" they felt to be available to friends; others seemed to take this within their stride. As opposed to others who found design features, like 'snapstreaks' (which incentivises keeping in daily contact via Snapchat) stressful, one German girl expressed a more blasé view: "yeah but you forget about it, you don't have time anymore." At the same time, our participant's comments suggested that digital communication pervades all aspects of peer life. One Irish mother reported how in her child's class they "have been checking about homework [assignments] on their PS4 when they are playing Fortnite," while a Bulgarian girl, explaining how she formed teams with her friends on video games, described how "your team is made of 5 people… You can talk, you can play with others, with your friends, you can play on your own." These comments demonstrate how integrated digital technologies are into young people's lives, but also how they influence how, when and with what outcomes young people interact.

Difficult experiences

The fact that peer communication is now substantively digital raises new issues for young people, especially since digital media can be recorded, duplicated, and circulated easily. An Italian teacher recounted how a younger boy at her school had been bullied by having "a sanitary pad stuck on his back." While that in and of itself would have been embarrassing, "we found out after Easter holidays that photos were taken and these photos were circulated in the class WhatsApp" to which the teachers were excluded. The bully's mother, perhaps not understanding the context, said "it's only a prank" whereas the teacher, who read the chain, felt they were "really disgusting, offensive things… at that age it can heavily traumatise." One Belgian girl, describing how a girl she knew had "shared a [sexy] photo out of trust with a boy who shared it with his friends, and then it is thrown on the internet" worried that "once you put something on the internet that keeps chasing you and everyone can see it."

Others felt that it was easier for people to be rude to each other online. Of comments on YouTube videos, an Irish girl said "Sometimes you forget other people, they have feelings as well… sometimes people can say really nasty things about people… sometimes you get caught up in it." A Bulgarian girl said that being online made people bolder or more threatening, adding "on Facebook everyone can say whatever they want." On the other hand, young people in the focus groups

came with their own workarounds for these problems. Another Bulgarian girl said that it was "better to have fake information" on Facebook "so for example, if people pop up who are not your friends [amongst your friend suggestions], you can decide if you like how this person looks and want to see where this person is." Young people are finding their own ways to manage potentially difficult experiences and their own 'digital footprints' online, even using currently available tools. For example a new type of Instagram accounts - fake Instagrams/ 'Finstagrams' or 'finstas' - are becoming popular, acting as a secondary account only shared amongst closer friends (and quite likely, not parents) to share 'ugly selfies' or other less carefully curated images.

Most troubling were reports from young people, especially girls, about unwanted contact from either from strangers or those that they loosely knew that they had received online. For example in the Belgian focus group we recorded the following exchange:

> Girl: I was once threatened by a guy [online], but I wasn't really afraid …
> Another girl: Yes, me too.
> Interviewer: And what did you do?
> Girl: Yes I had said something wrong and he was angry and he threatened: 'I will come to you. If you see a black car just step in' and that kind of things, but I was really not afraid… then after a while, he suddenly disappeared..
> Interviewer: You were friends?
> Girl: Yes on Facebook, yes on Facebook, I think. That was still on my old FaceBook, but I do not have that anymore.

This exchange highlights how common difficult or threatening exchanges are for young people online - including exchanges that can be described as 'grooming' (we do not know enough about this particular context to characterise this as such).[47] Although it is encouraging that this young person was able to remove herself from this situation, it is troubling that she did not seek help nor that it did not occur to her to report the threatening contact. Undoubtedly more needs to be done not only to put support in place for those who receive this type of contact but also to use the technology tools that are available - for instance the use of machine learning to identify suspicious behaviours that may indicate grooming.[48]

FAMILY RULES AND SUPPORT

Across Europe and beyond, parents and children are actively engaged in figuring out what (if any) rules concerning technology work for their children and

within their particular circumstances. How parents manage (restrict or encourage) children's media use is known as 'parental mediation' and is generally considered in terms of the following overlapping categories:

- Restrictive mediation - setting limits about time, content or context (e.g. no phones at the table or in the bedroom);
- Technical restrictions - limits that use hard or software (e.g. turning off router, using filters, parental control tools);
- Monitoring - Friending or following on social media, the use of technology to track or supervise (e.g. checking messages or browser histories, using geolocation apps);
- Active mediation - talking to children about how media and technologies are produced or helping them interpret them.[49]

We discuss the first three categories here, we will discuss active mediation in Section 2.

Limits and monitoring

In our focus groups with parents and young people, we heard them discuss the range of different 'mediation' practices their families undertook. Some parents relied on measures of time, for example a Belgian mother said "We set the kitchen clock… after 30 minutes, beep squeak beep and then stop" whereas a Bulgarian mother complained that time warnings did not work for her games-mad teen. Even though she/he told her son "'Look how little time is left, pull yourself together'… but I just can't reason with him."

Research on parental mediation has explored the impact of these kinds of restrictions both because they are popular amongst families as the most seemingly straightforward method, and because experts often recommend time restrictions to parents.[50] Overall, the data seems to indicate that parents who restrict their children's screen time do reduce exposure to risks, but rigid time restrictions may also result in limiting children's opportunities for learning and participation.[51] Some young people in our focus groups explained that their families relied on context- or content-based rules rather than time-based rules. One Irish boy "I'm actually not allowed to have my phone in my room. That's one of the main rules in my house, if the phone is in my room it's taken off me." A German girl said she had a private Instagram account otherwise her "mother would have beheaded" her.

Participants in our focus groups expressed little satisfaction with these rules. One Bulgarian mother ruefully commented "There are rules but nobody

follows them." Another Bulgarian mother had more success with monitoring her son's screen use after an incident in which she discovered that her son was watching pornography. For the next six years, she described how she monitored him: "I allow myself to log in, I know his password, all his passwords, I check everywhere - on the chats, I look at what is going on, and he knows that. He just knows that at any moment I can check his stuff."

According both to parents and young people, one of the difficulties with rules were that parents themselves sometimes forgot about or violated them. A Belgian mother noted "they see that we take our cell phone to the toilet, and then I see them do that too and then I think okay, so they have learned from us." As opposed to simply restricting technology use, parents also described how screen time could be given or taken away as a reward or punishment. Some parents found this a useful strategy to motivate children in ways that other incentives did not; but as one German mother put it, "you have to be very careful which penalties you think up, because you have to be able to comply with them."

Looking together at the focus groups of both parents and young people, we found that while parents had much to say about their individual approaches to rules, few young people mentioned them or were uncertain about whether their parents even had them. When young people mentioned rules, it was largely to say that they were ineffective. When young people in the Belgian focus group were asked about parental rules, few could think of anything to say, even about restrictions for their younger siblings. One Belgian boy finally came up with "actually, we can only go on our screens for school, if it's school tasks. But we are secretly on YouTube and stuff. [Also] do not read or be on the cell phone at the table… But for the [younger ones] not really rules." Complicating matters is that rules for one household or parent (if they are followed) do not apply in another context. A Belgian father who was separated from his ex-wife noted "[It] is slightly looser at dad's… it's a completely different situation," and others noted that the rules were often at least marginally looser with grandparents or other caregivers. One Irish mother said, "If you've contained it within your walls sure they've gone over to Johnny's house, and Johnny's mummy says 'yeah you can use the internet'" These kinds of insights suggest that, if rules are to be adhered to, they must be consistent and mutually decided-upon, even in a community of parents.

Parental control tools

Although the minority, some participants discussed parents using technical restrictions to control their children's access to the internet. For some, this was

as simple as switching off the WiFi at particular times of day, although this relatively blunt tactic was not generally utilised or viewed as achieving the desired aims, even by those who did it. One German father outlined how his family had started limiting access to WiFi, so that his/her young son would switch off at night; but after a short while, the father found that "the little boy has just cracked the WiFi from the neighboring house… [I saw from the garden] at two o'clock, the screen is bright." One Irish girl joked, "There was a time that my family tried to have a day like once a month where we like turn off the WiFi, and everyone had to talk to each other. But it never worked."

For industry stakeholders, there was an active discussion about making what one company referred to as 'parental controls' and another as 'child safety tools' available. One stakeholder, whose company provides both their own tools and makes available those of others, said:

> We've always been very cautious about saying that they are the solution. We think they are part of the solution. I think over the years the age of access to the internet has fallen, and the age of access to mobile phones has fallen. So when I talk about parental controls I'm talking about younger children, generally. I think if you start talking about 12- or 13-year-olds, at that point of time you've already lost them, they're too savvy. But there is still content and services there which they need to be supported in using or that they might not be old enough to use.

Another stakeholder described how his company had developed a family safety app that a parent can install on his/her own phone, which then would allow for some "localising facilities," for example geo-locating a phone, and therefore a user. This service mainly targets kids, but it can also be used for elderly people or people with disabilities. You can set and define safe zones for them to go, for example, from home to school." The app will notify the parent if the phone goes outside the safe zone. The same service could be used to 'wipe' or block a phone if lost or stolen, to "block sites, block the installation of new apps, and set times for them to use the internet."

At the same time, another stakeholder described how her company was actively grappling with whether to sell "child safeguarding tools" with similar functionality. This stakeholder also noted that many of these child safety apps come ready-configured with "geo-positioning services." In this example, the company decided "we don't want to resell those services, because we think it's going too much into the child's privacy and integrity." Although this discussion centered on specific products and apps, some families already use inbuilt services like FindMyPhone to monitor children, and the market for "tracker" apps is growing, including linking to wearables for children who do not yet have phones.[52]

Content filters and physical location monitors raise separate but related issues. The first is the question of surveillance, and raises the broader question of children's rights and whether the child has consented (or not) to being under their parent's or indeed the commercial provider's watch. Familial surveillance may foster harmful mistrust in the parent-child relationship, or it may help make a child feel safe and give them a more secure base from which to explore.[53] Location-data may be collected and used by companies for unclear purposes.

The second is the question of efficacy. The research on technical restrictions shows that, on their own, these restrictions generally are ineffective in reducing children's exposure to risks of harm online. One key reason is that (as the example of children and parents circumventing WiFi restrictions), children find ways around the restrictions, or families find them clumsy, cumbersome or unfair.[54] One Irish father described it this way: "I tried to use a thing before, OurPact or something like that to stick on my kid's devices so I could monitor it. But I'm quite savvy, and I just couldn't get my head around it, and then it seemed to be doing stuff on my devices that I didn't trust." A German girl described how her mother "thought we were overdoing it with YouTube or something" and so "installed an app on my phone without us knowing, and now I can no longer use certain apps." When asked what she thought of her mother's decision, the girl said "It annoys me, I find it exaggerated." On the other hand, the girl found a way to get around the app, a piece of insider information she asked the interviewer "not to tell anyone."

At present, despite the availability of these geo-location and filtering services, one industry stakeholder described that these controls generally have "low take-up," since as another commented "not all parents actually are so interested in these issues." In part this may be an issue of placement, in some cases technical filters are not well-integrated into the product or may sit on a hidden-away safety page that most parents neglect to access. As control and safety features become more sophisticated, some barriers to access will be reduced, but education and engagement is necessary to make users aware of them, and to raise the underlying issues about whether they are necessary and what the costs are – to privacy and to participation – of using them.

Screen time tools

Although control tools seemed controversial, more enthusiasm was expressed for services designed to improve consciousness about the amount and quality of time spent online. Several of our participants talked about their growing awareness of how technology companies themselves use different mechanisms in their interface design in order to 'hook' users since time and attention are the central components of many technological business models.[55] One Bulgarian parent talked about their child's interest in playing a 'farm' game on social media, and that the game is a "story and you collect points by playing," with the intent "to keep children online" so that they can "win financially… ads, that's what it is about." Some of the parents and young people seemed aware of the principles behind "persuasive technology," although they did not use this language.[56] One Irish girl described how the 'snapstreak' functionality "promotes the addiction thing of like you have to check into our app daily." An Irish mother commented that video games "are made in such a way that the children are sucked into it, they won't leave it at stage 5, they want to go stage 100." At the same time, some of our participants saw possibilities for the technology itself to help with the problem of time not being "well spent."[57] Although unaware that industry giants like Google and Apple actively are launching just such products, one German girl suggested that "it would be good if apps would tell you how long you've been on them."[58] An Irish boy concluded:

> Sometimes I just wish my iPad would shut off by itself... I don't realise but when I have to go to bed I'm like 'Oh what did I do today? I was basically on my iPad.' And then even when I have to go to bed I'm still on my iPad, so I wish they sometimes would just automatically shut off and be like 'give yourself a rest.'

However, time limiting services did not always work as intended. One Belgian mother had used the OurPact app to limit her children's screen time. Yet she ran into difficulty when she limited the playtime on the family gaming console, with her husband texting her, "Hey! We are in the middle of a match!" Another industry stakeholder, whose company was developing a communication product for children, described how difficult it was to determine how to build in 'screen time' controls. She described

> There are so many ways to do it. Do you do it by 7pm when the app shuts down? Or do you let the parents set a number of hours per day? Or is it the number of activities? These are some of the things we are working through and trying to get input on as well.

Although many different means, both social and technical, exist to restrict overall 'screen time' and particular activities, our parent and young people focus groups reflected few occasions when parents consulted with their children about what these limits might be. Older teens undoubtedly gave their opinion - in part through their actions to circumvent the rules - but it is notable that restrictive forms of mediation most often seem to be applied without the participation of children, even older children.[59]

While the framing of our question as asking about 'rules' led many parents and young people to discuss more restrictive forms of mediation, many parents were also engaging in more active forms of mediation as well. In the following section we discuss how this helps children and young people not only learn about technology itself, but also achieve learning aims through technology as well.

SECTION 2 :
DIGITAL LEARNING

Technology has become increasingly integrated into schools and as a link between home and school, enabling young people to learn about the world and to pursue their interests. In spite of this, only some children and young people have access to knowledgeable adults - parents and teachers - and the technological resources that can help boost their learning and creativity, and develop their digital skills. Without intervention, the promise of digital learning will continue to be unequally realised.

DIGITAL LEARNING AT HOME

Learning about technology

When it came to discussions of 'active mediation,' some young people were hesitant to describe their parents as a resource for talking about technology. When asked whether he/she went to his/her parents if "someone is bothering you," a Belgian girl said, "It does not work, I do not know... I usually solve it myself." An Irish girl described:

> Sometimes you might be going to your parents to talk to them about getting bullied on Instagram, but they don't understand the platform so they might not be able to help you much... I kind of feel like all parents should be educated to a certain level to be able to be aware and understand what happens on the internet.

On the other hand, some young people avoided going to their parents because they worried that it would occasion new limits or because they did 'not want to burden' them, as a girl in Belgium explained. A Bulgarian girl said, it's "you have to be careful because they see what you are posting and at some point they might have enough of it and delete your profile."

Young people were more likely to ask their siblings or friends for help when needed - or to offer help to others. For example, when one German girl saw a disturbing comment on another girl's Instagram, she said "I approached the person myself and asked if everything was OK." Notably, most young people agreed that they would not turn to their teachers for help, as they would not be "interested;" only one or

two mentioned guidance counselors or others in their school who could help with pastoral questions.

While acknowledging their own limitations, some parents, nonetheless, wanted to be resources for their children if they found themselves in trouble or with questions about their digital experiences. A Bulgarian mother said "It's happened that they ask me for help. I might not know the answer and have to ask someone else, but they do." Parents struggled with their responsibility for guiding their children's internet use, given it sometimes mystified or worried them. But one Irish mother said "Parents do have to take much more notice. [We] have more skin in the game because ultimately each one of us around the table is the person who will buy the device for the kids, whether it's an Xbox or a phone or whatever." Teachers were sometimes frustrated with what they considered to be parents' inaction or disinterest. One Irish secondary school had run an evening for parents about eSafety but were frustrated that "only 20% of parents turned up." An Irish teacher wondered how much, really, was teacher's responsibility, saying ""they are in our care for a small amount of the day... it's not enough [for parents] to say 'I don't get it. It's over my head.""

As one industry stakeholder noted, one issue is that parents may be "afraid to ask or don't know where to turn" when their children have questions. An Irish father described how his daughter wanted to "use this thing Roblox... and I just don't know anything about it. I didn't know whether it was appropriate or not, so I don't really know where to go, so you Google it." Eventually this relatively savvy parent decided he/she would rather trust "a reputable review from a newspaper" rather than "just a forum with parents chatting or things like that." But this requires parents to be invested in finding out the answers to questions that, unlike perhaps more straightforward parenting dilemmas familiar from parent's own childhoods, are difficult to find a 'correct' answer. Although there are a number of industry efforts to reach parents (see Section 3), one industry stakeholder active in parent education worried that "in lots of cases the people that you should reach or need to reach aren't the people you're reaching." When we asked parents who they went to for help with technology, several

interpreted this question as concerning the operation or use of technology, in which case they asked their teenage kids or turned to the internet itself for answers. However, parents found they had some strengths their children did not have; as one German father joked "She sure knows better in Snapchat. But with PowerPoint I have something more in store."

Some parents did have confidence in their own contextual, interpersonal or life skills, even if they had more limited technological knowledge. For example a Bulgarian mother described how she tried " to have this conversation that [what you see online] might not be true that someone could just have written it…that it should be checked..... I do not watch everything with them… [Yet] the interesting thing is that they ask me questions." Parents' openness to talking about issues that their children might come across online varied, also, by their own values and comfort level. Another Bulgarian mother described how "we are… still influenced by communism. We still cannot talk calmly with our children about sex." However, with her teenage son she still managed to tell him "it's better to ask me" rather than to try to access pornography online. Supporting children's interests in technology need not actually require much knowledge from parents, for example a Bulgarian boy had, with his mother's help, bought the equipment to assemble his own gaming PC, after investigating online "what parts it needs for the assembly, how much they cost, whether they match, whether it's creating a PCB or a processor and many things like that." Though this was his interest his mother had had to apply for a loan to facilitate it, showing him her support and encouragement. Thus, while there are some parents who are attempting to help their children as they navigate new digital worlds, not all parents are able to assume this responsibility and nor are many children convinced their parents are up to the task.

Learning through technology

Whether through apps, games or videos, in support of learning at school or to investigate interests at home, learning about the world through technology has become a daily part of family life. However, parents are not equally predisposed to children's digital learning and play; rather they are on a 'continuum of enthusiasm,' ranging from those who happily hand over their phones to look up information, watch and play, to those who see their main responsibility as restricting media use.[60] In families in which the parents used digital media and technologies to engage in learning, they expressed how valuable this experience was because a) it was immediately accessible, since unlike a paper encyclopedia, a phone is nearly always on-hand and b) it was visual or multimedia, engaging children in more captivating content or learning a skill

that could not be taught as easily through non-visual means (e.g. learning to knit, learning a hairstyle). A German mother used her phone if her young daughter "wants to dance. Or if a beetle walks past and she asks what's that?" Parents described how their children looked up and actually absorbed a range of information both independently and with help, often via videos. Looking at cockpit simulators for children interested in airplanes, learning how to do stunts or make slime, and finding out what happens when people have diabetes, parents and children valued the "knowledge" and "information" that children could easily and sometimes independently find.

Videos and games were valued by parents not necessarily due to their content but because they incentivised their children to learn different languages or about different cultures. A Belgian mother described how her children watched "YouTube videos and listened to stories in German, English or Dutch." A Bulgarian mother loved that her daughter "browses YouTube and very persistently listens to other kids, for example, from America, from Finland, from who knows where, kids of her age what they do, what is their lifestyle, how their life goes by day by day." The same mother explained how she had been shocked at her son's advanced level of English after listening to him chat while playing the game Overwatch "with children from all over the world." Online explorations and learning also could foster cultural pride. For example, a Bulgarian boy talked about his pride in "a YouTuber who makes videos about Bulgaria, tells about the good things, what sightseeing spots there are," and a Belgian girl described how she and her immigrant parents would watch a Slovakian TV series together.

Some young people and parents mentioned using the internet to assist with schoolwork. One Belgian mother used an online test called 'Quiznet' to encourage her daughter who was bored by studying European capitals, and her daughter found that it "seemed so much more than just to learn on paper." An Italian teacher, discussing her own son, described how he would get frustrated when he did not understand his schoolwork; she tried help him understand his computer as a "wonderful tool" that he could use to "get help." She reflected, "It took us years to get there, but now he is in his second year of high school, and he has learnt that he has a powerful computer that lets him do anything." One industry stakeholder described his/her own excitement about how new technologies, enabled by machine learning and AI, will be able to personalise content so that "the device will also learn what is the best way to teach to that particular person."

Growing up

The ways in which parents support learning about and through technology changes considerably as children grow up. In a study of parents of under-8s in Germany, Latvia, Belgium and Portugal, researchers found that most parents of young children saw their primary responsibility as being 'gatekeepers' - restricting their children in order to protect them from perceived harms of digital technology. However, the researchers also found that some parents acted as 'scaffolders,' helping structure a task (intervening where necessary) to fit the needs of their growing child.[61] Even though some children now have access to mobile technology almost from birth, there are considerable differences in how a two versus seven or eight-year-old will use technology - and again a younger versus older teen. British and Dutch studies of young children found that the majority of children, by ages five to seven, will have mastered most of the basic skills needed to independently operate touchscreen technology (swiping, tapping, navigating to desired apps) - sometimes much younger.[62] This capacity does not correlate, however, with children's ability to independently interpret what they find. Even when children are able to play independently with a touchscreen, a significant role still exists for parents to 'scaffold' their interests in order to help them learn.[63]

Parents described a variety of ways in which they did this scaffolding, calibrating their support to children of different ages and granting gradual independence. An Italian mother of six and eight-year-old boys mentioned how her older son had developed an interest in Pokémon. She described how "I used to sit there with him because when he starts, he opens one page, sees that other ... So he follows the thread [of links] to see in a very innocent way, but I realise that there are points that deserve attention. This is why I am always there. With my oldest [I] check, and teach him, explain to him what he is looking for." For her six-year-old, this mother did not yet trust him even with that measured independence.

Although these scaffolding practices were common amongst parents of younger children, they were often complicated by practical realities. Given that children are easily absorbed into their digital activities, parents of young children often use the time to accomplish other necessary tasks, like cooking, cleaning or working.[64] Of course, this common situation is often unavoidable. However, the fact that some children are left unattended for extended periods of time with media means that opportunities for what researchers call 'joint media engagement' are more limited. Joint media engagement happens when parents, siblings or friends engage with media together, giving it their shared "attentional focus;" this allows for asking follow-up questions or supporting play and can serve as a "powerful interactional resource."[65] This joint focus does not necessitate watching every moment of a child's television programme together; rather, it can include guiding a child towards an approved resource or using it as a 'conversational prop' later.[66] For example, children are not equally inclined to initiate educational searches; as one Belgian mother described it, her daughter looks at a lot of biology videos about how everything works and for chemistry for example.

> Those movies that are there are fantastic. The only problem is, one finds the way to
>
> those movies easier than the other... It is also dependent on the child. For my son, it is
>
> sometimes too much. He will not search, while my daughter will look up.

This comment underscores that children of all ages have diverse interests, dispositions and capabilities; parents too have varied values and skills and, as a result, engage in different strategies to help children learn.

No matter the age of their children, parents can act as a 'media mentor,' not only helping children find resources but also modelling good digital behaviours themselves.[67] Accomplishing this, however, is highly problematic, as it requires an investment of the parent's time and potentially financial resources. One vexing problem is that apps and websites marketed as 'educational' are themselves highly variable, with some developed by teachers and linked to research-based evidence, but many not.[68] Indeed, some digital opportunities may have so many 'bells and whistles' that they actively detract from children's learning.[69] So, within the reality of the restricted time parents have to engage with their children's learning at home, they have the additional problem of receiving confusing, and sometimes contradictory, information.[70] Although some websites provide further information for parents about children's content - learning and otherwise, these sites are not necessarily accessed by all of the parents most in need of guidance through the thicket of choices.[71]

While parents of younger children are more likely both to restrict and guide children's media use, as children mature, parents generally perceive them (and they perceive themselves) to be less in need of support, especially when they own their own digital devices.[72] For example, when asked whether at their current age or younger anyone had instructed them on the use of Wikipedia or looking up information online, one Bulgarian girl answered, matter-of-factly, "In this case,

I know more than my parents." Parents often turned to their children for help with technology, especially setting up new devices or troubleshooting issues. A German mother of an older teen described how her children "help me a lot… I often have to ask because I'm too lazy to look it up."

Given teenagers seeming confidence with technology, parents may assume that all young people are 'digital natives,' thereby conflating technological skills (the ability to use technology without help) with critical or interpersonal skills (the ability to interpret information and navigate social contexts online).[73] This assumption is problematic, not least because what children and young people are capable of doing online is distinct from how they respond to difficulties. The differences are the result of a host of factors, including age, gender, cognitive abilities, social maturity, access to resources and digital skills and interests.[74] In a survey of British 11-16-year-olds, for instance, researchers found that 15-16-year-old girls were over twice as likely as 11-12-year-old boys to have taken action like blocking or reporting someone who was bothering them online.[75] While not startling that older girls would engage in this action more than younger children, the survey reveals both that there are important differences (e.g. not all 'young people' are the same) and how common it is for those younger than the 'official' age of social media consent to access social networking sites, and how underprepared they are to deal with the consequences if they run into trouble (see Section 3). [76]

Our findings do not indicate that all parents are leaving children unsupported online. As one Bulgarian mother described it, "it is important to have trust…. Even about something that has frightened him, even about something that he liked, just to come and share it, because that, I think, is very important." This parent's ethos is in keeping with more up-to-date research and suggested interventions. The latest thinking reflects that, rather than a focus on risks, rules and restrictions, especially for older children, parents should focus on active strategies that emphasise building their child's 'resilience' through shoring up their relationship and communication.[77]

Special educational needs

Some parents, teachers and young people saw technological tools as especially useful in supporting children with special educational needs (SEN) learn and participate. An Irish primary school teacher recounted:

> I have worked with kids with dyslexia who when they were handed a pen and paper to write a

story, the barriers to the curriculum were massive and [they became] frustrated… so you never got to see their creativity… by handing them a tablet or whatever with the likes of ToonTastic or Video Creation [another teacher interjected: 'even just voice recognition']… Now suddenly the barrier is removed, and they're engaged.[78]

This teacher, in her early 30s, contrasted herself with others she described as "really fearful" about technology; she successfully had used a children's coding language with a child with selective mutism, who "was actually speaking through Scratch." Another teacher in the same session, who worked with slightly older children, described working with a nonverbal child "who was communicating with us through Stop Motion technology with Lego characters. That was the only form of communication that that child had with us."

As discussed in the section on physical health in Section 1, digital technologies may be prescribed as health supports for children with SEN diagnoses. An Italian mother of an eight-year-old boy with ADHD described how his education specialist had assigned a digital learning programme of "neuronal exercises" and games "for attention, for improving concentration." Digital apps based on 'picture exchange communication' have now become commonly used for children with communication disorders, including autism.[79] New and emerging technologies are being studied to support the communication and social and emotional participation of children with SEN; for example, AI-enabled toys are being examined to determine if they might improve the interactions of children with complex learning difficulties with their families and peers.[80] One Italian teacher had used a VR headset to support a student with SEN and "enhance their learning experience" by exploring his "particular interest in penguins and the Antarctic." She said "I'd never seen this child smile… You're transporting [him], you're taking him further than a book might." As some young people with autism, in particular, gravitate towards digital technologies, their parents may come to see that their interest in technology might help them pursue a future career.[81] Microsoft, for example, has recently launched a scheme specifically to recruit and hire people with autism.[82]

However, researchers have cautioned against the assumption that technology, in and of itself, might be capable of or responsible for alleviating the effects of disability. Access to technology does not erase disadvantage or discrimination, young people with SEN and disabilities receive very different levels of support in how they are supported to get the most out of whatever access to technology they may have.[83] Additionally, ensuring that technology use does not exacerbate

existing problems - for example, social isolation, bullying, or difficulty disengaging from restricted interests – is of paramount concern in this context.[84]

Digital creativity and participation

While most young people use digital technologies, only a smaller number reported pursuing creative digital interests. One mother in Belgium described how her eight-year-old son loved making stop motion animations using his tablet and that "he takes photos of cars, Legos or things and he makes a movie." As children grew up, their creative interests became more sophisticated. An Irish boy described how he had bought an "underwater housing for my 360 camera" and was creating videos while scuba diving. An Italian girl described how at night she would read and write "fantasy stories" on the application WattPad, while a Belgian girl discussed how he/she "wrote movies" using the Notes app on his/her iPhone. A Belgian boy was teaching him/herself photo and video editing software and "following challenges" on websites for professional photographers.

When we analyzed the results of the young people vs parents focus groups, we noticed that parents, in general, had little to say about children's digital creativity. We recognise that the children of the parents in our focus groups simply may not have been those who creatively used technological tools; this may be particularly true because there is a "ladder of opportunities," meaning fewer children create their own content in comparison to those who engage with that created by others.[85] However, we also recognise that these parents' children were engaging in some form of creativity online but either had not discussed it with their parents or their parents had not interpreted what they were doing as creative or educational. While our focus groups were limited, the findings suggest that additional support is needed to enable parents and children to talk together about what they are doing online and whether it might be used as a form of 'connected learning' to link with other areas of their lives.[86]

Although many young people and parents discussed the use of digital technologies for social participation and learning, with some referencing creative communities, few discussed the use of technology for political participation. A number of studies demonstrate how young people use digital opportunities for civic engagement, even if they may avoid the term "politics."[87] Some forms of digital civic engagement are time- and resource-intensive, such as creating vlogs or radio shows about identity or civic issues.[88] Others are easier to do, such as 'liking' or commenting on a news story.[89] The evidence indicates that some young people (although still a minority) use digital technologies for civic purposes, although often in ways not necessarily familiar to adults.[90]

Issues of inequality

An important part of encouraging and supporting the contributions that digital technologies make to learning is acknowledging that children, young people, families and schools have access to vastly unequal economic, cultural and social resources. Some families are under greater pressure than others in terms of parental capacity to give the time and energy to engage in the media 'mentorship' and curation activities, as described in an earlier section above. For example, a Spanish study showed that working mothers, across income levels, allowed their children to watch more television because they viewed this as a necessary part of how the family functioned. Likewise, if low-income parents feel their neighborhoods are unsafe such that they cannot allow their children to play outside, they rely on digital media as a means of keeping children safely occupied. There are correlations, too, between increased screen time (and, relatedly, sedentary behavior) in young children who are cared for by family members or friends (common amongst low-income families) as opposed to paid-for care in childcare centres or nurseries.

We did not study inequality systematically in our focus groups; however, we noted moments in which issues of equality were raised in our discussions. For example, an Irish girl noted that some of her peers had school-issued iPads while others came from families able to purchase their own. The school-issued devices "[have] a lot of restrictions… like if you download certain apps they tell you that you can't download. It automatically goes to the school and then they come and they confiscate your iPad and during class." Since her family was able to purchase her device "There is usually not that much restriction so…. we get more freedom than they do." This anecdotal insight is in keeping with wider concerns about lower-income communities being subject to greater degrees of digital surveillance than their high-income counterparts.

Differences in the capabilities of different devices or in internet access are relevant here. For example, although most young people have access to smartphones (although these in and of themselves have highly different capabilities - for example some can much more easily be used for creative production than others), many low-income families do not have computers or high-speed broadband at home (now

generally for reasons of cost rather than physical infrastructure). This means that what young people from low income homes can do outside of school is more limited. Even in places where school districts provide broadband and/or computers to families, wider contextual issues, such as parental fear of the school's surveillance may lead to limitations on their child's digital activities and open-ended, online creative play. In the past, the 'digital divide' primarily referred to differential access to technology and broadband itself. Now a new form of 'divide' is widening, less about access and more about how tools are used.[92] One recent report on educational technology found that even when schools have the exact same equipment, more privileged students are encouraged to use the "same technology in more progressive ways than schools serving less privileged students."[93]

Many of the same issues surfacing at schools apply at home. With the increased affordability of technology, many low-income homes have much technology; yet inequality persists regarding parents' abilities to or interest in intervening in their children's media use.[94] Fundamentally, engaging with children and young people requires resources of both time and knowledge. A recent survey of 6400 European parents found that significant differences existed in terms of whether parents engaged in mainly 'active' versus 'restrictive' mediation.[95] The study found that the greater the restrictions parents placed on children's digital use, the less likely were children seek the parents' input when they had questions. The biggest difference revealed in the study was that the parent's own digital skill levels - more digitally skilled parents and those who judged their child to be more skilled (often but not always higher-income) - were more likely to be open to active mediation strategies. As a result, more opportunities for children to participate online were available. The messaging to parents that predominantly emphasises risk and safety, as opposed to messages encouraging parents to identify positive content and learning opportunities, exacerbates the inequities.

DIGITAL LEARNING AT SCHOOL

In recent decades, digital technologies have become increasingly integrated into schools serving not only as means to facilitate learning but also as platforms that link home and school. The benefits of teachers' use of information and communications technology are well documented. They include, enhanced learning outcomes, increased pupil engagement, and more efficient management and organisation of learning.[96] There is also worldwide consensus about the importance of developing digital skills, ideally from an early age, as workplaces have become and will be increasingly digital, requiring more sophisticated competences.

Readying for the jobs of the future

A recent report by The World Economic Forum suggested while millions of jobs will be lost through automation, these will be partially offset by the creation of new jobs in more technical fields.[97] Understanding this changing economy is a task both for policy makers and parents, both of whom see digital skills as key to preparing young people to face these changing prospects. Not surprisingly, most countries are actively incorporating specific educational strategies into their wider digital agendas to better prepare children and young people for the labour market.[98] At school level, there is also widespread awareness of the importance of preparing children and young people for a future in which digital skills have become the norm rather than an exception. Many of the parents we spoke with believed that education must prepare kids for the digital future. As one German father put it,

> Being social is definitely important. A basic knowledge in Writing, Spelling or Mathematics. School promotes togetherness. But one should promote the digital and, above all, knowledge in Computer Science. Because, if I think that you do not continue, and do not build up on it, then the students are left behind. You see that in other countries! If you want to gain a foothold in careers of the future, then you have to know how to program.

Emerging technologies such as 3D printing, artificial intelligence (AI) and the Internet of Things are expected to be well integrated in industry in the years leading up to 2020. There is evidence that the next technological revolution will be primarily driven by digitally-enabled automation and AI, both of which will bring significant benefits, including new jobs and increased productivity. As can be expected, such an important transition will not be straightforward.[99] Parents do not know how to conceive of these changes, as one German father said:

> Because if I look at it this way: 50% of the jobs that exist there today will no longer exist in 10 years' time. Because that's what machines do. That's just the way it is. It's also a challenge for parents to say where my child is going. What's the future anyway? (Father, Germany).

The skills necessary to realise these new digital opportunities are unevenly spread, even within Europe. Currently, 45% of people in the EU do not have basic digital skills, and ICT professional skills are lacking in many countries. Unequal access remains an important issue. The majority of people in the EU now use the internet

regularly and only 16% have never gone online, but in some countries, like Bulgaria and Romania, as much as half of the population are still digitally excluded.[100]

Schools are well-positioned to reach every child and their parents, meaning it is natural for them to take a leading role in supporting children and young people to develop the necessary skills they will need as adults. At the same time, there is little agreement about how this should be achieved. For instance, some schools prepare students for digital jobs by teaching them digital skills (e.g. coding) while others emphasise communicative and 'soft' skills, 'design thinking' or 'computational thinking.' Concerns persist that new digital jobs will perpetuate, rather than erase, existing inequalities, meaning that the same blue-collar jobs will exist but they will now be in Amazon dispatch centers instead of manufacturing. In sum, we need to ask ourselves: Are schools preparing children for '21st century skills' and the jobs of the future? And if not, what needs to be done? As one industry stakeholder stated it, the problem is "21st century students, 20th century teachers, 19th century methods."

The participants in our focus groups also understood that schools bore an enormous responsibility to prepare children for the future, but they also felt its pressure. As one teacher highlighted "we're supposed to correct all ills in society apparently and the demands are huge, but I just think this is such a big area you can't get away from it. You just can't." Focus group participants also acknowledged that the school system is ill-prepared to accept this huge challenge on its own. As one Irish teacher expressed:

> We need to prepare our children for the future. We need to prepare them for the dangers. We need to prepare them for the good things, give them the 21st century skills, all the different things. So while it's brilliant that we've got teachers and it's brilliant that we're taking care of this end, you need to take care of the other end as well. I don't know how it's going to be done, you know. It's above my pay grade [laughter].

Using technology at school

Teachers, parents and students in our focus groups reported that digital technology provided significant benefit to teaching and learning, in particular the access technology granted to a wide range of content and resources.[101] For instance, even a Bulgarian physical education teacher mentioned that before starting new sports, she showed students videos of real people playing those sports. She also defined this as an "advancement" because "a physical education teacher cannot be a specialist in all kinds of sports!"

Teachers in different countries referred to a wide range of tools employed at school to support and facilitate learning. These included devices and tools specifically designed for educational purposes (e.g. interactive whiteboards, school platforms, e-learning platforms, educational Apps or games such as Kahoot, Socrative, Google Classroom) and other not specifically educational devices, platforms or Apps (e.g. Laptops, tablets, Smartphones, search engines, YouTube, or Wikipedia). These were used for educational tasks ranging from researching for information to translating or making presentations and videos. New and emerging technologies (e.g. VR and AR) are sometimes used in schools but this usage is uneven. Despite their benefits, teachers remain concerned about how much time they take to set up and utilise properly; as a result, they are not embedded in everyday teaching practice.

Apart from the availability of technical resources, teacher's own skills, experiences and interest in digital technologies were crucial factors in determining how much and to what extent technologies were incorporated (or not) in class. More knowledgeable and skillful teachers took greater advantage of the opportunities technologies offer to support learning and seemed to be able to engage students successfully in these positive learning experiences as reported by some of our participants below:

> I would have started off first myself creating instructional videos to support teaching new Maths concepts using a tool called Explain Everything but there's other whiteboarding tools to use where after we would have in class taught the Maths concept initially I would have created support videos where they would watch and they would watch them for homework and they do that using a tool … at the time I would have used Ed Puzzle but there's like Google Classroom as well… Then they became the teacher. I'd ask for volunteers in the class for them to create the material. Their own videos would then be put up for homework, so it would become a complete peer learning environment and with using the Ed Puzzle you had that feedback loop where the kids could actually answer questions on it". (Teacher, Ireland)

Others referred to the benefits of educational apps because "the kids would get instant feedback based on the assessment that they were doing: while teachers would get "a good space for formative assessment to guide your future learning in the class."

Some teachers also referred to technologies as tools that help give students the chance to "become creators." Two Irish teachers argued that students

should be given the opportunity to experiment with new technologies: "it's about getting the technology in the hands of the kids not from the teacher standing up and the thing that's so important just to get it into the kids' hands and they're the ones who actually become creators, using the technology." One mentioned that they used technologies for creative writing "where the students make a video of how to create a good character and it's all filmed and then that's put onto the shared drive". In these new contexts, teachers have to take on the role of curator/mentor, not currently a skill or responsibility that is emphasised or given much attention.

Bring your own device

While some schools encourage their students to bring their own digital devices at school (BYOD), others had strict policies in place forbidding the access to mobile phones and all types of connected devices. This was as the public debate about banning mobile phones in schools has raged on, with France acting to ban devices altogether.[102] Even though the use of phones in the classroom is sometimes done informally (e.g., for quick calculations or translations), it is uneven and often actively disallowed by school regulations. This was, indeed, a common challenge referred to by our participants. For many teachers, mobile phones are perceived as problematic because they disrupt the 'normal' flow of classes, students get distracted and, ultimately, they have a negative effect on pupils' discipline. For this reason, most participants indicated that mobile phones were either completely forbidden at school or during classes as pointed out by this Italian computer science teacher: "In my school, we confiscate the phone, especially to first year students who are more phone-dependent. Otherwise, they are more interested in what is on the phone than in following the lesson" (Teacher, Italy). In some schools, mobile phone use was only allowed under exceptional circumstances, for instance in case of an emergency (e.g. an accident) or if a parent needs to contact a child during school.

Few teachers mentioned that mobile phones were employed as learning tools. When this happened these were exceptions rather than the rule. For instance, when students used their own devices to set small challenges or tasks that allow teachers to get instant feedback on their knowledge levels such as the game-based learning platform Kahoot or the on-the-fly assessment App Socrative as an Irish teacher explained "the kids would get instant feedback based on the assessment that they were doing but you as a teacher really got a good space for formative assessment to guide your future learning in the class."

Even in those cases where mobile phones were allowed in class, teachers had to ensure that the phones were used only for educational purposes:

> We have school policies. You have to look there, because you are actually not allowed to use it on the school premises. But you are allowed to use it for teaching purposes! If you explicitly say what you are going to do with it. But the general credo at school is that the mobile phone is not allowed to be out. (Teacher, Germany)

Because managing the use of mobile phones is challenging, schools feel they need to set up strict policies as regards mobile phone use (or non-use) at school. An Italian teacher described, how "after several episodes [of cyberbullying]… we decided to withdraw the phones. No one complained, not a single parent came to the school… we thought that we would get like thirty parents the next day telling us "how dare you!?"

On the other hand, one might argue that using students' own devices could be a way forward for those schools who lack enough equipment or struggle to access the equipment they do have. Perhaps this was partly a problem of communication, as teachers and schools had few models of what high-quality learning experiences using students' phones as a resource might look like. In spite of the challenges related to smartphone uses and the general prohibition to use them during classes, teachers sometimes welcome its use in school-related activities, for instance during school trips, as in the case of this German teacher "It's the same with us. As soon as the mobile phone is allowed on a class trip, if one drives from A to B, it is a pleasant ride, everyone is busy!"

eSafety at school

Teachers also referred to problematic situations related to the (mis)use of digital technologies and the need to better prepare educators to deal with these challenges. Some teachers blamed their school leaders for not being "realistic about what's going on in school" and for "running away" from this responsibility. One teacher described, "they don't want to acknowledge things like social media in the classroom, in the context of the children using it outside of school because it's just going to open up this Pandora's box." Others referred to the fact that even though "digital citizenship and internet safety" are subjects which are dealt with during initial teacher training they are "not permeating into other subject areas… We still see it as a separate module. It's an aside." Another teacher suggested, that digital citizenship "should be part and parcel of the Maths

lectures, it should be part and parcel of the literacy lectures and that is not happening."

During the focus groups teachers, parents and students referred to a number of incidents related to potentially risky or harmful online behaviours involving pupils. These included cyberbullying peers but also sexting, being contacted by strangers online, or being exposed to inappropriate or potentially harmful online content, among others. Teachers had similar concerns about their own online lives. One said "we could all share many anecdotes of Snapchat conversations gone wrong… I could tell you experiences where teachers were taken advantage of and images of teachers and stuff would be distributed by students online, all of that." All teachers agreed that more eSafety training was needed, appropriate school policies were lacking, clear and consistent rules about the use of digital technologies at school were missing and open communication was needed to discuss these problematic situations within the whole school community. When asked if teachers were well-prepared to deal with these issues a Belgian teacher said:

> No. Not really. From my discussions with colleagues not really. In my Informatics hours in the 4th, 5th and 6th grade, I try to give as much as possible information about privacy, the consequences of what you do online and everything. But it is only my students. It is limited but they find it very interesting, everyone learns. And often I let them search for information in groups and then they present this information to everyone. That's really interesting and important, but I am not a specialist.

Teachers also sought the active involvement of all educational stakeholders, including parents, higher school authorities and colleagues because, in their words, "child protection" is a "huge" issue which can only be tackled when responsibility is shared and when the whole school community is actively involved both in preventing incidents as well as in adequately and constructively reacting when they take place.

Home-school links

Even though most school use traditional ways of keeping in touch with parents such as face-to-face meetings, telephone or email, more and more school communities have started to incorporate other types of digital platforms to connect home and school. One teacher mentioned that their school was "constantly trying to source new and innovative ways to reach out to the home and to celebrate the work of the school so for us social media did" (Teacher, Ireland). Nowadays, many children and parents connect with teachers, classmates or other parents through digital

homework platforms, behavior management and parent engagement platforms but also increasingly through associated technologies like WhatsApp groups and social media to coordinate parents' groups or schoolwork: "We have a hub. We call it a hub with a Twitter feed that we call the hub, and there's lots of examples of students in their work and parents can log on and see what they're doing as well and online notes, online tutorials, the flipped classroom." (Teacher, Ireland)

This helps teachers make use of scarce resources and connect to children's outside interests and can help create a sense of community, continuity and accountability. During our focus groups participants reflected on the many other ways in which home and school are now being linked. In these evolving and ever more digitised school and family contexts, parents and teachers welcome the introduction of tools which help them formally link home and school such as the popular, although not yet widely implemented, digital school platforms.[103] Participants usually referred to them as practical communication tools and appreciate the fact that important information is readily made available to them (e.g. school reports, students' absence records, school diary, announcements, teachers' messages, etc.). In general, such platforms are perceived as increasing transparency and efficiency.

Nevertheless, some parents also referred to some drawbacks related to their use. As pointed out by some, if not used cautiously, parents may feel bombarded with information from the school, especially if the information shared is not relevant to all. As a Belgian mother explained "Sometimes it becomes too much. I also think that teachers too quickly think: 'I am going to send a 'quick' message' with the consequence that when you have three children you end up getting 10 messages per day via that platform! And sometimes they just put as subject: 'Important message' and, of course, you have to click to open that 'important' message and when you do it just says 'Tomorrow don't forget to wear your boots'. Sometimes I think it can be used much more efficiently. There is a platform so use it efficiently."

Other parents complained that because these platforms are controlled by the school, not all schools offer a two-way communication possibility and, therefore, when parents want to communicate with the school they have to use traditional means of communication such as the telephone or face-to-face appointments.

> At our school we use Smartschool [a school digital platform], as in many other schools. I think it is a good channel. But the school can determine what

can be communicated. For example at school X, as parents, we cannot communicate directly with the teachers (via that platform), because they think that it would be too much interference. I sometimes find that impractical. (Mother, Belgium)

In spite of the apparent benefits of these types of platforms, their increased transparency also poses new challenges particularly as regards children's privacy (e.g. visibility on platforms of students' registers and behaviors, parental monitoring) but also as regards accountability. Children's privacy is an area of potential concern because, on the one hand more and more data about children's behaviour (and misbehaviour) is being collected (e.g. have they missed any classes? Were they late? Have they done anything silly? Have they been reprimanded?). This raises obvious questions as regards how children's personal data is being collected, stored and processed but also as regards who has access to such data today and who may have access in the future.[104] On the other hand there is the risk of excessive parental monitoring and control as parents may start getting more and more detailed information about their child's behaviour at school: "I control everything of my two sons through the mobile app [of the school platforms]. During the first hour of school I immediately check. If I see my child marked as missing, I pick up the phone and call to ask "where are you?" "I am at school" "No way! I'm here in front of the app and it says that you're not there".

Challenges to using technology in schools

Although technology use at school is now moderately well integrated, our participants identified several areas of challenge. Firstly, the described technical and bureaucratic challenges which included basic lack of access to equipment, but also administrative challenges in accessing the equipment that was already there.

Most teachers in our focus groups had a positive attitude regarding technology at school, and they seemed genuinely motivated to incorporate more technology in their classrooms. In spite of their enthusiasm, many referred to the technical barriers which hinder the smooth implementation of digital technologies at school. For instance, several complained that not enough computers, tablets, whiteboards or other digital devices were available at their schools. Others referred to the lack of access to electronic platforms which could facilitate school administrative procedures. Some schools even seem to struggle to get access to basic digital needs, such as access to the internet or WiFi. Important differences were observed in different countries and even among different schools in the same country with some schools incorporating technology while others lagged behind, as illustrated by the reality of these two different schools:

> For the last 10 years I have been asking for WiFi at my school, but it is only since this year that we have a room, a place with WiFi at school, but there is only WiFi at that place, nowhere else in the school. (Teacher, Belgium)

> In the school itself there was interactive white-boards. We had a set of laptops for the junior end, a set of laptops for the senior end. We had a school server that the children kept their work on and then also you could build digital portfolios or e-portfolios of their work and they could build it up over their lifetime in the school and at the end when they leave the school then they get a folder with all their work in it and projects on Scratch and whatever else. The administration side of the school was run with Aladdin and that was used as a communication tool for the parents as well, so you could send out mass messages. With technology in the classroom we used to bring ... we didn't have a computer room because of room constraints so we had a trolley so we used to bring the laptops in and do the learning in the classroom as well. (Teacher, Ireland)

In some countries, regional differences also were mentioned. For instance, both Belgian and German respondents referred to the fact that schools were better equipped in certain regions, such as Flanders in Belgium and Bavaria in Germany.[105] Nevertheless, even within these regions often there are differences between better and under-resourced schools, as illustrated below:

> We also have a digital overhead projector and a laptop, a projector and a whiteboard, etc. in every classroom. That is standard. (Teacher, Germany)

> For two years, the Bavarian Teachers Association has been writing about digitalization. In our school - and I think we are certainly not the only ones - you could start renovating the toilets. Very simple things... And now constructs are being built again and everything is supposed be really great, but the foundation is missing completely. Or an energy-efficient renovation of this house - zero. With all the advantages that I see, it, however, lacks completely different things. (Teacher, Germany)

> For instance, in our school we must register all the children who miss any classes in the computer. I mean on Smartschool. So, every class must have a computer and the teachers who do not have a particular class, they have a special iPad and Wi-Fi so they can use it, for instance, in the swimming pool or at the gym. (Teacher, Belgium)

If I tell that in Brussels they would say it is science fiction! I am really not exaggerating [everybody laughs]. They don't even know that this exists [referring to the digital platform Smartschool]. (Teacher, Belgium)

According to the participants in our focus groups, the reasons why some schools lack technical resources are varied, the lack of financial resources being one of the most prominent ones. One Italian teacher said "the only problem, I have to say, concerns the contract for the WiFi connection or something. It seems to me that my school has it with [name of Italian ISP]. At least until last year it was so, this year they had to change because of the high costs." Digital technologies are expensive, and they quickly become obsolete. Therefore, it is difficult, if not impossible, for many schools to keep up with technological developments. In other cases, even though schools may have the capacity to afford digital devices, resources are not always allocated in the most efficient way, as a Belgian teacher described, "the headmaster makes bad decisions sometimes because he doesn't know. For instance, he is going to buy three interactive whiteboards. That's the price of...who knows? Probably twenty projectors!"

Yet when teachers are motivated to use technology, they find ways to cope with these challenges and devise creative ways to deal with them, for instance by making use of their own or the student's personal devices. One German teacher, in a resource-constrained school, said:

Today in Year Four I had Catholic Religion and we are currently doing ancient Egyptians and Israelites. That's when the topic of pharaoh came up and I think I could have explained it myself, but then I said, 'now we'll have a look on the internet'. But for that I look on the internet on my mobile phone and then read it out loud to the children. We are also only eleven children, therefore we can look at a picture together. That's how I help myself until every classroom is equipped.

In some cases, roadblocks to technology were not technological nor financial but are rather bureaucratic. For instance sometimes laptops or other technological devices are available at school but the procedures to access them, such as booking equipment or computer rooms are intricate, requiring significant effort. Teachers mentioned that these bureaucratic procedures make them lose time and motivation and, therefore, even though they want to use technology in class they sometimes opt for not doing it, as explained by this German teacher:

3D printer is of course great for technology subjects, for example, you can certainly use it

well there. But VR glasses? I guess you would use that once or twice, then it's the next thing, it will be hidden in vaults. Besides, you have to borrow them first, but there are so many hurdles until you can borrow them. And then they do not work, or you cannot use them because they are not charged, etc. You just don't have that extra time. If you dare trying to use something new, then you also have to invest time for it. And that is a barrier. Then you need somebody again who will service it for you, but you will not have anyone for that. But of course it is nice, you can do a lot with the VR glasses, also in foreign language lessons. That would be good. You could you do it, but as I said, it is just too complicated in everyday life.

In addition, teachers described personnel challenges, for instance that teachers lacked the knowledge, skills and/or the time to meaningfully integrate digital technologies in the classroom, or strategic and leadership challenges, that the school lacked a clear vision, policies or strategies at school and/or lacked school leaders who could push forward such policies/strategies.

As described above, digital media and technologies are already being used widely by children to learn at home with their parents, friends or on their own. Given that young people can be so self-directed while using technology, schools are often perceived as lagging behind, resistant to change and innovation while teachers are "blamed" for the restricted use of digital technology in schools.[106] One Irish teacher, herself proficient with technology, said of her colleagues:

There is a lot of resistance towards technology, there's a lot of fear, there's a lot of no confidence and the professional development is not there. So I think that it's just really important that we're aware of there's pockets of highly, highly effective practice taking place and there's other pockets that it's not.

Even academic literature tends to portray teachers as reluctant to incorporate technology for a number of reasons, including the perceived "threats" of technology to "teachers' existing practices or the perceived maintenance of control."[107] In our discussions with teachers, some mentioned that they did not feel well prepared to deal with certain types of technological developments:

That is my personal problem, I know very little about it. I am dragging behind this development and always look which courses are available. You can create great worksheets and all these things and this is where I am totally lagging behind. I have

three children. In the past, when I had no children, I had time to get my head around these things. But the technology from then is already outdated. This would be my biggest wish, that us, teachers, would be trained in that. (Teacher, Germany)

Teachers are often underprepared and under-resourced to utilise these new tools and so the hype often does not match with the reality. Parents and young people complained about the perceived 'generational divide' amongst teachers in terms of how they incorporate technology (or do not). An Italian father said, "The vast majority of teachers do not master the new technology. If they use the interactive whiteboard they only use it to watch movies." However a German boy distinguished between older and younger teachers, saying "we now have older teachers who can not handle the boards themselves. They ask the students how to do that. And there are younger people who are just getting into work. They are taught this on such technologies as the elders who started with chalkboards back then. The younger ones can then teach or help rather than the elders."

Even though formal training is sometimes available, training is not always accessible to all and, therefore, many teachers acquire new technical skills and competences, such as learning to use interactive whiteboards or learning platforms, on their own or on an ad hoc basis. A female German teacher explained, "I had introductions at university. Someone came and explained the whiteboard to us. Although I had the feeling that this happened because of the person's passion, and not because someone provided funds for this. He was just nice and showed it to everybody."

Even when they know how to operate the technology, some teachers seem to prefer "traditional" class styles and are not particularly enthusiastic about "assimilating" technologies or new media into the curriculum.[108] Some of the participants in our focus groups also were critical of colleagues for failing to see the "obvious" benefits of ICT, even in conditions of high technological provision and support.

> Interviewer: Is it difficult to persuade your colleagues?
> Teacher, Germany: Yes, some are reserved. "Hmm, something new again, we have never done it like this!"
> Interviewer: They are satisfied with a blackboard and chalk in class?
> Teacher, Germany: Yes, exactly. But there are the young ones… they have an affinity with media.

I think that many of my colleagues would like to use more technologies but they don't know yet what possibilities are out there, what they can do or what would be interesting to use in class. (Teacher, Belgium)

Nowadays teachers are expected to incorporate digital education into their curriculum and to embrace the use of digital tools in their daily practices. However, most schools lack a clear vision as to the purpose and usefulness of incorporating digital skills; as a consequence, many schools lack meaningful, sustainable digital strategies adapted to their school reality. Therefore, the incorporation of digital technologies or lack thereof often depends to a great extent on individual teachers. As an Irish teacher described, "I know that once I left my school the Scratch club stopped. The laptop trolleys haven't been used, 16 iPads which had been purchased haven't left their boxes."

However, some teachers did not find such substantial challenges. Not coincidentally, this was usually teachers of younger children who did not yet have their own devices and who were more inclined to listen to their teachers. An Italian primary school teacher said "It seems I'm in an oasis because we do not face all these issue… We use our interactive whiteboard a lot for exercises, for dancing and songs, everything is under control."

On the other hand, some schools did achieve success when they had leadership that was able to harness strategic partnerships and contacts to support digital learning. One Irish teacher explained, "I was teaching in an [affluent] primary school, we had a lot of funding and on top of that the principal was very proactive so like he wanted to kind of invest in technology and he was very open to ideas of what we could invest in the school." Moreover, school-level policies are generally top down, often lacking consultation with students, parents or even teachers. Using positive examples of technology use to inform this discussion was even more rare. A notable exception was a description by one Irish teacher who was particularly interested in "the policy side of things in the school." He explained that at their school, they had an acceptable use policy that was specific to their school, including an 'I will' policy that was written in child friend language. The policy was sent home for the parents and the children to sign. They also had an 'acceptable comments' policy, in which they explicitly taught the children how to leave positive comments online, how to validate work online and the consequences of their words online.

SECTION 3 :
INDUSTRY

In the previous two sections, we have addressed a number of issues that have implications for industry and policy-makers. In this section, we discuss how industry is currently approaching the provision of tools, services and appropriate content for children, young people, families and schools and how these practices might evolve in the future. We also draw on our research to examine how public perceptions of industry are changing, necessitating new approaches and forms of support.

QUESTIONS OF AGE

Since the adoption of the General Data Protection Regulation (GDPR) across Europe in May of 2018, all stakeholders are paying considerable attention to understanding the age at which children and young people should have independent access to the internet and how industry should work to restrict access based on age. As readers are no doubt aware, Article 8 of the GDPR mandated that some services for children under 16 will require parental consent, in particular services which involve the sharing of sensitive personal data. At the same time, the GDPR allows member states to lower this threshold. At present, the five countries where we conducted focus groups have varying ages of consent: in Belgium, the age is 13 and Bulgaria 14; Italy, Ireland and Germany adopted the set age of 16.[109]

This fragmented landscape has caused practical problems, given that most companies operate in multiple markets. As one industry stakeholder described, "Everybody was expecting that it would be 13 years and then they put it 16 years by default, and the possibility to states, to the member states to decide… I would prefer that it would be the same age for all the countries, so it could be really a single market." In addition to the practical considerations, this stakeholder also expressed concerns about a new form of the "digital divide" concerning ability to participate – in which "the opportunities will be different for the kids in different countries." In addition to the practicalities of implementation, additional questions, about the rationale for and consequences of the set age have surfaced.

Setting the 'age of consent'

Despite the statement from one industry stakeholder that the age of 13 was previously set because it was "considered by medical community and teachers and everybody as the important age, because after that kids [are more aware] about privacy," this apparent consensus seems less rooted in conclusive evidence and more an example of the interplay between policy and practice. There is some evidence that between 13 and 16 young people come to understand more about the commercial environment of the media. For example, a British analysis showed that while children had a "marked increase" in their understanding of the commercial media environment between 12 and 15, bigger differences remained between teens vs younger children and teens vs adults (many of whom still lack digital and commercial literacy themselves). [110] Further research is underway to understand these differences, with the hope that better evidence will be available to underpin such significant policy changes in the future.[111]

While on the basis of digital and commercial literacy some rationale exists for increasing the age of consent to 16, some argue persuasively that doing so is both practically difficult and ethically challenging. A Belgian researcher, who has been studying the ways in which young teens gain moral agency within their families, argues that raising the age to 16 likely will negate young teen's burgeoning autonomy within their families and cause them to circumvent restrictions, essentially giving a (big) incentive to lie.[112] Given that 13 has been the digital age of consent for nearly 20 years, millions of 13-16-year-olds across Europe may lose (or in some cases have already lost, if they were honest about their age) access to sites from which they have benefited, as the previous sections of this report describes. Fundamentally, then, the age of consent change has clear implications for children's rights to participation and information.[113]

Some also argue that changing the age to 16 will, in practice, make young teens less safe online. If the assumption is that everyone on the internet is 16+ (or, if younger, are supervised by parents, a major, and unsupported, presumption), then, in the words of one industry stakeholder, "It will legitimate sexual

predators, because they can say, no, no, I thought she was 16 already." If one considers that even with a digital age of consent of 13, a substantial proportion of under-13s use services not meant for them, then the raised age of consent becomes even more problematic.[114] For example, an 11 or 12-year-old representing that he/she is 13 is quite different, in terms of the potential content or contact with which they will be exposed, than lying to say the young person is 16. However, an Irish teacher made the point that whether children are 13 or 16, they still need additional protections online, and they "should not be treated the same as people who are 18 or over." This remark underscores the point that the 'age of consent' debate does not fully answer the broader questions about how all children can and should be protected online.

How do parents and children view the age of consent?

In focus groups, parents, young people and teachers varied greatly as to their thinking about the age at which children should have greater independence online. Many young people made comments along the lines of "I think it should be less about age and more about how you're educated to use it" (Boy, Ireland), and "it depends, for me there is not a stable age" (Boy, Italy). Both young people and parents agreed that the amount of freedom should be tied in some way to "maturity." For example, a German girl described how "my mother does not control me now, whether I do my work first and then watch TV" - which she and other young people characterized as an example of "adulthood." A German father of nine and 14-year-old girls also said "It just depends on the child, how that is, how they pick it up, how they use it. I think you cannot set an age." This type of individualised discretion is not captured by giving states the ability to lower the GDPR-mandated 16-year-old cut off age.

Some parents and children had strong feelings about a lower limit to independence, for example one German mother said, "after puberty," and a 15-year-old Italian boy said "under 12-13 it's a bit too much… to give them all this freedom." However, a Belgian mother questioned whether it "depends on child to child;" for example, she noted that younger siblings may be ready for independence earlier since they have observed and learned from their older siblings as they confront and overcome issues online. Some parents mused that girls might be ready for greater independence earlier than boys. While some parents were ready to grant children independence as soon as possible, a teacher put the decision in more protectionist terms, arguing that teenagers should only have limited independence online because if "I'm

targeted with an ad [as an adult] I can make an informed decision of whether I want to buy something… With children it's completely different. Their minds aren't fully formed. They're not fully developed. They can't make the same informed [choice] that's why we don't let them drink alcohol or drive cars or vote."

While understandable, companies and policy-makers cannot implement these kinds of contextual and case-by-case approaches regarding age of consent. Fundamentally, both industry and governments must use the blunt instrument of age to draw a line in the sand. Perhaps illuminating, then, is the quantitative survey of two thousand British parents who were asked about their views on the appropriate age of independence for children using the internet. Of parents of children aged 0-17, the overall average response was that children could be independent online at age 13. However, for parents of teenagers - closer to putting these determinations into practice than parents of young children - the most common answer instead was 16.[115] Although these statistics are telling, they do not resolve the argument for setting the age at 13 or at 16. Rather they demonstrate that a stronger case needs to be made to parents and children about why the ages have been set as they have, given that neither group was much consulted nor addressed in the GDPR consultations and roll-out.[116] Further, parents and children need guidance and advice on how to navigate the real implications of the increased age of consent, given that for some services the age of consent is used to determine access to the service itself, while for others it is used to determine where parental consent is needed to share certain sensitive personal information.

Age verification

At whatever age the age of consent is set, a number of challenges affect enforcement of the age verification. First is the practical reality that most age verification mechanisms are easy to circumvent.[117] Two British internet safety experts attempted to sign up for an Instagram account to analyze how easy it would be to avoid the age restriction; they found that they could use the platform without having to lie about age at all. Instagram, like many other platforms, is set up so that when users set up accounts, they initially are informed of and either explicitly (by ticking a box) or implicitly (in the act of setting up the account) agree to the terms of service (which, if read carefully, indicate the user must be over whatever age is set).[118] No proof of age is required; a simple click on "agree and accept terms of service" is all that is required. An Irish girl experienced this same process, saying "like with the terms and conditions they don't give you much of a choice. If you don't accept you can't actually use the app or the website." The incentive to use the app or

the website is too great a pull to overcome the minor fib of signing onto terms of service that do not apply to, but do not prevent, those under 16 from accepting.

As discussed in Section 1, the free messaging app WhatsApp has become one of the central ways in which families keep in touch. However, WhatsApp was one of the first companies to determine, in accordance with the GDPR, that it would set its age restriction as 16 across Europe.[119] Given that many parents and young people in our focus groups had specifically mentioned their use of WhatsApp, we raised the question as to how they had felt about WhatsApp's new age restrictions (the focus groups were in June and July 2018, not long after the adoption of the GDPR). A German boy said "Many make this age limit, but nobody cares. You just change the age, then you use it anyway. That's not really effective… but if you look at who has WhatsApp, even though it's supposed to be 16, there are so many already out there." After this remark, the transcript indicates that others in the group murmured surprise at the new age limit; the group was of mixed age, including two 13-year-olds who, presumably, might have been expected to be notified of the change. The Italian focus group included the following exchange:

> Interviewer: I want to ask you… the general regulation says that for under 16 parental consent is needed to use Facebook and WhatsApp… I wanted to ask those of you who are not yet 16, what happened?
> Girl, Italy: I have already said that I am 18 years old
> Girl, Italy: I did that too...
> Interviewer: and you did not receive any notification from WhatsApp?
> Boy, Italy: I received a notification from WhatsApp; then I indicated 18 years as my age
> Girl, Italy: Well, I always tell that I am 18 years old. On WhatsApp, I saw a screen where I was asked to flag if I were over 16 years, and it was enough to flag it in order to continue use it.
> Interviewer: Do your parents know that you pretend you are over 18?
> Together: Yes
> Girl, Italy: My father and mother know it… they know what I do online. That I no longer jump into things accidentally as it happened at school. I do not look at anything bad, that is.

Although some young people were confused about the restrictions, many had noticed the post-regulation message asking them to verify their age. However, most reported that if they were under 16, they had simply ticked a box that they were older and been done with it. No obvious means existed for a parent to verify consent for under-16s.

From our interviews with parents, at least some gladly would consent to their younger children using services like WhatsApp, given they have already become so embedded in family life. At present, however, the mechanism for age verification on WhatsApp does not invite this conversation. Rationalizing her acceptance of her 'underage' children using WhatsApp, an Italian mother (of a 10, 12 and 14-year-old and, thus, presumably well-experienced in these issues) said:

> Banning children under sixteen from WhatsApp is exaggerated. First because it simply takes an 'ok' to keep on using it. Also because, if used in the right way, WhatsApp is a good tool. It is not by forbidding the use of WhatsApp that you keep your child safe because then there is all the rest. If they go to www.YouPorn that's far more serious than WhatsApp.

Teachers, especially, were suspicious of companies' contentions that they cannot implement procedures to accomplish a task such as age verification. One Irish teacher said, "I've heard Facebook say they can't do it, the technology isn't there. It is there definitely. Age verification and verification of identity... That needs to be sorted out and they do have the technology to do that and they do have the power to do, whether they have the will is the other thing." A Belgian teacher described how "if you create an account with Facebook, you have to say in which year you were born and so they check whether you are a child or an adult. So you can create an account or not based on that single question. I think that is really important. Why don't they make it much harder?" A representative from Facebook recently confirmed that they do not "have a mechanism" to block underage users nor identify them once they have opened accounts.[120] This is not a problem specific to Facebook, as the issue of 'invisible' under-age users is common across all platforms frequented by children.[121] From a technical standpoint, one industry stakeholder described how the only viable way to restrict users by age is on sites for those over-18 since these sites require the user to "present a credit card, because to have a credit card you have to be 18. That is the only functional way of ensuring the age."

Although acknowledging that age verification mechanisms are easily circumvented, the industry stakeholders we interviewed also worried that if they were to make procedures too complicated, it might cause children and young people to "go more and more underground; they will go to the disreputable sites that don't want to be worried about or probably never heard of the GDPR… and are not going to have any age verification in place." Embedded within the question of how industry should address this issue

are privacy and data collection concerns; from user behaviours (e.g. what is being watched/said, how profiles are set up etc), theoretically, at least, it should be possible to determine who is and is not young online. We know that targeted advertising algorithms accomplish a similar task. Would using these means be practical? Or would they exacerbate already existing issues around children's privacy? Should companies have the responsibility to ensure, to the degree possible, that under-age persons are not using their platforms? And what about young users whose parents are happy for them to use particular services? How could a mechanism for more honest 'opting-in' be developed?

The difficulties concerning age verification raise overlapping questions for which we do not have ready answers, nor could we without further research. First, is having an age verification process in place that is legally meaningful and required for companies, but usually ignored by young people and parents, the equivalent of having no age verification process at all? Does it become a process in name only? Or, would having some sort of age verification process in place – with an explanation of why it is necessary - remind users of risks and encourage users to take personal responsibility? One of the reasons that consent procedures remain so opaque is that company's terms of service are often, in the words of one Irish teen, "filled with tons of links and then if you click onto those they've got more links.... If you were to print off all of the links it would be stacked up to the height of the table." A German father described how in order to read the "terms of use," you would "have to become a lawyer first. Meanwhile, you just click it away like everyone else."

Looking into the future, it seems timely for companies to spend serious time developing both interface design and legal procedures that support the development of more meaningful age verification procedures. If opting-in to terms of service becomes the consent procedure, then the burden to create easy-to-understand terms of service (a requirement of the GDPR) is even more urgent.[122]

Services for children

One of the ways in which industry has begun to deal with the quandaries of age verification has been to create ring-fenced platforms specifically for children, either as standalones or add-ons to existing services. Industry stakeholders were highly aware of the problem of children on their services, a problem not introduced but complicated by the fragmentation of age restrictions in the GDPR. Industry stakeholders described this solution not only an implied legally-

mandated remedy under the GDPR but also as a design requirement which responds to the fact that many services used by children are "not really designed for a young child" and might introduce unwanted risks as well as missed opportunities for creativity and play. One industry stakeholder described how their new service for children and families came from the recognition that "a lot of people were saying yes my child is under 13, but I as a parent authorised them to have an account and I have control over it." Another stakeholder described wanting to:

> Develop something that would provide a safe space for parents to connect with their kids… a space that would be fun, creative, with still a lot of privacy and safety features built in… recognizing that the relationship between the parent and the child is critical and that we had a role to play in managing this relationship.

These services are designed explicitly to cater to children who are old enough to want to have some independent access to contacts or content but not old enough for their own social media or messaging accounts. Facebook's Messenger Kids, Google Family Link, Altice Portugal's SAPO Mail Kids or PopJam (an 'Instagram for kids') are all examples of ring-fenced messaging and/or social media services aimed at under-13s (not all are available in all markets). These services are distinct from their non-kid specific counterparts because they have more extensive on-boarding procedures that usually have to be initiated by parents. Family Link and SAPO Mail Kids are mainly email programmes that are connected to parents' accounts, while Messenger Kids and PopJam have some social network capabilities.

The aim is to respond to the reality that younger children already are on social networks by creating 'training wheels' that provide children with the ability to communicate in more controlled environments than other popular services not designed for under-13s.[123] These services are distinctive because they offer social functionalities, but they build on the growth of kid-specific content streaming services like YouTube Kids, Disney Kids, cBeebies, MEO Kids, Hopster or Azoomee, all of which similarly market themselves as being 'safe' or 'safer' platforms.[124] Of the motivation to develop this 'kids' service, for example, one stakeholder described wanting to create a place "dedicated for children between 4 and 10 years old, where they can learn and play in a very easy, fun and interactive way. Kids can access entertainment and educational content tailored to different age groups."

Another motivation for creating child-specific versions of more open platforms was to allow for content of a

more constrained scale to be both vetted by AI and human moderators, and to give parents more control over what their children watch. For example, YouTube Kids has recently announced that it will offer parents the option to turn on a 'whitelisted' version of the app.[125] This means that all content will be pre-selected and monitored by human moderators, but on the other hand will be more limited in scope.

While many of these services were created with the specific aim of child-safety, critics have noted that by creating services that kids really want to use (and that parents might assume are safe and, therefore, about which parents might be less vigilant), these services might actually serve to amplify some of the problems that children already face online.[126] For example, will kid-specific social media services lower the age at which children begin to feel pressure to be available to peers?[127] Although most of these services do not collect or monetise children's data in the same way as services for over-13s, some have advertising or use data to 'optimise the service,' potentially priming children to become adult customers later on and digital consumers earlier on.[128] There is an additional problem of reaching an audience of children who may not want the services designed for them. Older children (for example 9-12 year olds or 'tweens') are not yet old enough for adult services but often feel themselves to be too old for services they deem to be for 'kids.' This presents a challenge to content creators – how can media and services for older children be more enticingly, and yet also safely, designed?

A tension exists about within services used by children about who is the primary consumer of the services - the parents versus the children. For instance, some services allow parents to "lock down" the internet by pre-approving particular sites or apps, setting time limits, or giving parents the ability to approve contacts - essentially creating user-friendly forms of parental controls. These limitations can serve the principle of child safety well, given (as discussed above) that parents, rather than companies, know a particular child's needs and interests best. However, these restrictions may also limit children from activities that might otherwise be natural for them to pursue; for example, a child may want to explore an interest or a friendship that the parent does not approve of, or their restrictions inadvertently prohibit. Given the newness of many of these services, more research is needed on how children and parents experience the in-built tensions between participation and protection.

Children's data

In previous sections, we discussed how digital technologies impact children's interpersonal privacy rights vis a vis their families and friends (Section 1) and institutional privacy rights, *vis a vis* schools (Section 2). A lively debate currently is underway about the extent to which children should be protected from the collection of their online data for commercial purposes and the extent to which children should be made aware of or be able to object to these practices. Based on research that her company had conducted with young people, one industry stakeholder described, "children are quite mature in their online behaviour and well-aware of risks. But one thing that we saw is that they don't care so much about privacy - either they don't know what it is about or they don't care."

Of course, in many respects, this potential lack of regard for privacy does not necessarily differentiate children from adults. Both adults and young people do not understand the increasingly complicated "value chain" in which there may now be "100 different companies" involved in collecting, holding and utilizing the data of users. Teachers also wondered whether children understand the "business model... or why are Google and Facebook free, for example?...I think that many people, many adults and the pupils often have no idea about how data works" (Teacher, Belgium). In addition, have intrusions into one's privacy via data collection become so pervasive that children of the "digital age" will not even recognise this as a problem to address? However, there is evidence that, as children gain greater maturity so too do they gain capacity to understand the commercial context of the internet, and the collection of data, although in both they are limited by the complex interdependences of the digital eco system.[129]

Although we cannot assume our focus groups are representative, we found that many parents, teachers and young people had a basic awareness of issues concerning data collection and privacy. This awareness may have been heightened, given our sessions were conducted not long after the Facebook/Cambridge Analytica scandal dominated headlines. Many of our participants were aware of the basics of how free social networks generate revenue, if not the detail. For example, one Italian father said "The company must make money. So when they say that everything is free, in fact, just as it has been shown [referring to Cambridge Analytica] they are stealing data, everything you leave online they sell it to third parties." A Bulgarian mother noted that websites need you to "stay on the website [so they can] benefit from it." Other parents understood but were not especially worried about data collection. A Belgian mother said "Yes, I suffer from advertisements, but I do not find that a breach of my privacy" and expressed her appreciation for personalised advertising (e.g. from

the local grocery store) if they are things that "interest me, then I do not mind. But if they overwhelm me… then it bothers me."

Young people liked that most services they used were free and were pragmatic in acknowledging, as did one Irish boy, "there's no other way to make money so a few are fine but like pop up ads are annoying." Yet, they also expressed concerns. They distinguished between identity data given directly and data inferred from user behaviours. For instance, one German girl decided that "collecting data is okay, [but] it depends on what data. If they collect everything about you, your age, phone, address where you go, then that's not good. If they collect a bit of data, something like which series you've been watching lately, it is OK." This critique dovetails with recent recommendations that propose the principle of data minimization – or the minimal collection of data necessary to optimize the service rather than to support personalized advertising – as the proposed default for children's content,[130] While targeted advertising was the most obvious way that parents and young people observed the impact of how their data was collected, some also had broader concerns about online surveillance. Irish and Belgian participants mentioned how they covered their computer's webcams with stickers to avoid hackers, and one Irish teen mused "It doesn't affect me when I don't know about it but when I do it's kind of like I become more conscious to watch what I'm saying, like turn off my iPad… when I want to have a conversation with somebody." Whether or not particular safety concerns were widely shared, there was an overarching perception that new technologies were "cool, but dangerous" (German boy).

To an extent, the concerns raised here about children also are true for internet users in general, except that a defined burden to protect children, under the terms of COPPA, the GDPR and the Convention on the Rights of the Child, exists.[131] Given the rapid evolution of this sector, we have yet to learn what impact the personalization of online environments will have on young people, who may wish to change their tastes and identities as they grow up, rather than potentially be locked into predetermined 'data footprints.'[132] Much about the practices of collecting user data and how data is managed, packaged and transmitted is not transparent, but one industry stakeholder was largely hopeful, saying:

> If the data is anonymised… and doesn't actually put any individual at risk, it seems scary but when you think about it, does it really matter?... at the moment it's all a bit of a mystery as to how data is transferred between players and so on… perhaps it will become more transparent [and more

regulation will] encourage de-risking... in the end I think things will settle down.

While all users need more information and assistance to understand the ramifications of the ways in which they generate data and how that data then is used, for children, this is particularly acute, as they may be less aware of or responsible for the generation of the data that concerns them online. Further, children's privacy more easily may be infringed with longer-lasting consequences.[133]

CONTENT

As children participate more online, the likelihood grows that they will encounter content that they find upsetting. A recent study of Italian children found that overall, 13% of 9-17 year olds had been 'bothered' by something they'd seen online in the last year (up from 3% in 2013), and 51% of 11-17 year olds had been exposed to at least one form of negative user-generated content, including violent and hateful content.[134] Industry stakeholders in our focus groups uniformly were concerned about the question of content, but saw their role in addressing these concerns very differently. In our interviews with stakeholders representing network operators, we often heard a variation on the statement that "we are not responsible for the content that is accessible through our networks. What is important is that we promote an informed use of ICT and we develop and offer safe and good networks, quality content and services."

One network operator differentiated their service from platforms who must "take some responsibility for what is published on their platform." The network operator distinguished these companies from her own, which is "strictly regulated by net neutrality laws and regulations and should strive not to interfere with the content that is transported through our networks."

Moderation & reporting

In the case of content that is found to be illegal, including child sexual abuse material (CSAM),[135] platforms and network operators work together to, in the words of one stakeholder, "voluntarily block websites that the police have defined as containing child sexual abuse images… But that must be strictly governed by law enforcement." Many of the industry stakeholders and members of the ICT Coalition have been proactive in working with law enforcement to address CSAM and, in some cases, developing new tools and procedures that have changed how these images are identified and abusers pursued.[136] This has and should continue to be a major priority

for industry, including the development of new tools and mechanisms to identify CSAM as soon as it is uploaded, or in situations where CSAM is live-streamed.[137] However illegal content, as deeply traumatic though it may be, is, in some respects, more straightforward to deal with than content which is not illegal but is potentially troubling. One stakeholder summed it up by saying "something that's illegal sure, we have to block it and we do that...but who decides what is objectionable – it is not clear-cut. It's certainly not down to an access provider to decide."

Other stakeholders were representing companies actively involved in grappling with how to identify and deal with content that may be accessed by children that has unintentional or intentional negative effects.[138] One industry stakeholder described how moderating content at scale takes both people and AI working in tandem, in part by having human moderators and 'trusted flaggers' not only "review the content [but also] train the technology... [to] make it all more efficient going forward." Companies grappled with balancing content moderation with 'free speech' and protection versus "content that may be shocking but still have important value and that become newsworthy in themselves." For example, concerns have been raised about how live streaming may expose users, including children, to traumatic images.[139] Yet, industry stakeholders also were aware that live streamed videos have brought to light significant human rights abuses (the example cited was of a live streamed police murder that galvanised the Black Lives Matter movement in the US).[140] One stakeholder described how "in abstract it's actually quite easy to have some strong principles. The difficulty is that every piece of content is different… sometimes a video will challenge the whole policy or how it's applied."

Companies, therefore, constantly must revise policies and develop new ones; for example, they must engage with stakeholders to understand how to deal with people sharing thoughts of suicide or how to pursue those who share 'revenge porn.' Content moderation will always require a combination of 'community' and 'technological' solutions, both of which will need to be continually iterated to keep up with the scale and nuance of evolving platforms.[141]

One way in which these two means are combined is in user reporting of objectionable content.
In our focus groups, we asked parents and young people if they had ever reported content or if they understood the mechanisms for reporting. In the Bulgarian group, a girl explained how you can "make a screenshot of a page and upload to your profile, and you can ask others to report." However, in Ireland, a

girl complained that even if she reported content "like 100 times, I'd be waiting for them [to give me] some type of response, but nothing ever happens." An Italian girl concurred, saying "they do nothing. You can report as much as you want but there are too many requests."

It was difficult to tell if young people's perceptions of reporting were based on experience, or on their assumptions about how responsive social media companies might be. An Italian boy said he had never reported anything though he had "meant to, but then… I thought 'they won't do anything.'"[142] A German girl remarked on the scale of the task of content moderation, noting that "the internet is big and there are always some who post junk. And you can't do anything to keep it completely away." Yet one Belgian boy did have the experience of reporting an inappropriate video which was "taken off… within two days… people can actually post really sick, dirty things online that other people do not really need to see and that's good that you can use that to check them out. [Reporting was easy], three clicks or something."

A live issue is how companies can deal with requests under the 'right to be forgotten.' Belgian teachers, for example, recommended that young people should be able to "delete it directly from the platform" if they had shared content that they later regretted (e.g. sexts). The teachers suggested that this capability should have its own procedures within social networking sites, with a dedicated person to "help you," as opposed to requests being made to "robots." One teacher worried that if a young person's content was shared, it might be taken out of context and follow them in later life, "when they might turn 18 or 20, and need to find a job and the first thing that will appear about them when their potential employers Google them" might be something they regret having shared when they were younger.

Finally, as we have discussed in Sections 1 and 2, in myriad ways, children and young people, families and educators are accessing and making use of the positive, prosocial entertaining and educational content available on the internet. The POSCON (Positive Content) network of the European Commission's Safer Internet Programme, for example, aimed to gather examples of content that was age-appropriate, allowed children to learn and develop, gain skills, stimulate creativity, enhance social and cultural understanding and enhance their participation in society.[143] Although this content undoubtedly exists, parents often find it difficult to locate, especially amidst crowded markets. In addition to filtering out unwanted and inappropriate content, therefore, industry also need to support efforts that highlights the content beneficial to parents

and children. This could mean working with content curators to assemble playlists or designing new ways to search for desired content or creators. At bottom, it necessitates educating parents and young people to ascertain for themselves what they find 'good' or beneficial in the first place and then create ways to share this information with others.

Regulation

Given the fast-paced world in which the tech industry operates, industry stakeholders were mixed about government regulation, particularly when it came to content. One stakeholder said, "We can think about next steps on our own, without regulation being the driver... if you just operate in a pure notice and takedown world, then it makes it difficult for us to consider other harms and develop solutions that we think could mitigate this harm." Other stakeholders felt that the "private sector" could not be solely responsible for regulating issues of wider political impact, for example determining what is 'fake news,' an example of "something that governments need to deal with in some way... yet still keeping the right of freedom of speech and the right to express yourselves." Another stakeholder agreed but argued that "it's still very hard to find what that regulation looks like."

Others felt that the imperative to regulate could be bolstered by commercial pressure. One stakeholder felt that the forces of the market would help ensure that companies would be proactive in dealing with controversial content, since "advertisers [have] started saying, we don't want to be associated with these types of content... I think money talks." Ultimately, ICT industries are made up of businesses and, in the words of one stakeholder, "we want our clients for the next 200 years, so we want people to be safe... The industry is part of the solution, not only part of the problem." Although regulation was not a focus of our group discussions, one Irish father volunteered that he believed self-regulation rather than government regulation was the way forward, so that companies "should run with some ideas themselves because sure as hell freezes over the Government is not going to do it."

Undoubtedly, any solution to the problems of this magnitude will need to involve industry as leaders or partners in developing solutions. However, based on our interviews with young people, we queried whether current reporting procedures were appropriate to the scale of the task and to ensuring that young people were aware of and engaged with a process that seemed overwhelmingly enormous or unresponsive to their input.

POSITIVE ROLES FOR INDUSTRY

As many of the quotes from young people, parents and teachers throughout this report have indicated, understanding the appropriate role of industry is a current preoccupation. On the one hand, technology (and by extension industry) is now so integrated into daily life and learning that users consider them to be essential services. On the other hand, technology companies are private (even if publicly traded) entities, with their own evolving sets of policies and priorities. When asked what were the biggest issues facing one stakeholder's company, she responded:

> Balancing privacy and safety, for sure... I think especially when it comes to discussions on the rights of children, you kind of have those two topics coming together. There are important children's rights like the right to participate and not having filters and enabling kids to connect freely with content but, on the other hand, there is an expectation that children will still be shielded from a number of undesirable things... The expectations that have been placed on us as a technology company have been increasingly hard over the years. Some people almost wish that the technology was magical and taking care of it when in reality it's far more complicated than this.

Representative of others, one Irish mother described herself explicitly as "suspicious of big corporations [who] maybe are interested in their shareholders a bit more than they are with the user." However she, like others, also saw some scope for industry to work in good faith to "project a different image... [by] genuinely pursuing what they believe to be right in terms of the general welfare of children." There are a number of ways we believe this might be achieved.

Safety by design

The principle of 'safety by design' is to embed concepts of child safety, but also child rights, into the design, before they are brought to market, not only of digital services that are directly aimed at children but also services that might be used by children. Safety by design is a way of prioritising the need to 'bake in' these principles from the very outset of the design of services and products, whether companies are start-ups or technology giants, including involving children and young people (and families and educators, we would suggest) in developing policy and in design research.[144]

The ICT Coalition and, in particular, the adopted principles that all members must adhere to (and against which they are evaluated) are an example of putting safety by design into practice.[145] In our

interviews with stakeholders, we learned how, since the members of the ICT Coalition are generally held some key responsibilities for child safety within their companies, they were involved in the design and implementation of services. For instance, one stakeholder described how:

> For every new feature… we always try and consider all angles…It's much easier to work with our teams from a very early stage to make sure that things are built-in rather than someone having a great feature idea, the engineering teams working on this on their own and then coming up for review, for approval at the very end and realising that it doesn't meet our standards in a number of areas… There have been cases where we have stopped the launch of features that we were not happy with.

This statement demonstrates how efforts now being made to put principles of safety by design into practice confront the reality that this goal may not happen or products have to be halted or re-engineered in order to 'retrofit' for children. In addition to the ICT Coalition principles, a number of guides (some in development) can help developers support safety by design, either in the design of content or in the design of services. These include:

- Child safety online: A practical guide for providers of social media and interactive services - UK Council for Child Internet Safety (UKCCIS)
- Industry toolkit for children's online privacy and freedom of expression - UNICEF
- Designing for children guide: Integrating children's rights & ethics into the design process - developed by a group of children's media researchers and developers
- Guide for making family-friendly videos on YouTube - YouTube
- Checklist & concrete criteria for positive content - POSCON/European Commission
- The Tech and Play project recommendations for apps that promote play and creativity
- Toolkit for designing for trust, transparency and control - TTC Labs
- Ethical OS: A guide to anticipating the future impact of today's technology - the Institute of the Future/Omidyar Network (not child specific)
- Council of Europe - Recommendation CM/Rec(2018)7 of the Committee of Ministers to member States on Guidelines to respect, protect and fulfil the rights of the child in the digital environment

- GSMA Mobile Privacy Principles – has general application but includes specific recommendations for children's privacy

Given that these resources are available, the next challenges are to disseminate, implement and evaluate them. As necessary, the guides and principles should be revised. Best practices and industry expertise should be shared between companies of varying sizes, resource levels and at different points in the value chain.

Supporting digital literacy

In the previous section we discussed the role that parents and schools have in supporting how children learn about technology - from eSafety to digital learning and creativity. Industry has a role to play in supporting these efforts, primarily through supporting the other institutions in children's lives and meeting children and families where they already are. Many of the members of the ICT Coalition are already active in supporting digital literacy education in their respective countries. Appendix B includes a list of some of these initiatives.

Many companies also provide a combination of online resources (often via a safety center on their website) and in-person talks or webinars, often led by employees who volunteer their time. For example in Lithuania, employees from Telia made live presentations and gave webinars that reached 35,000 children in 2016. Most companies in the ICT Coalition also support the work of NGOs working on issues of eSafety either through financial contributions or in-kind expertise and support (often both). Some examples are participating in, resourcing and promoting Safer Internet Day and Safer Internet Centres across Europe.

These efforts are admirable, but one stakeholder described them as fragmented, noting "whenever someone decides that awareness isn't working, they create another awareness campaign which fragments it even more." Promotion and uptake is an ongoing challenge. As with parental control tools (see Section 1), determining if the resources that are currently available are well-used or how they are used can be difficult.[146] Very few initiatives are independently evaluated, and as a recent evidence review from UKCCIS found, when evaluations have been done, they have tended "to focus on immediate outcomes (reach, appeal, etc.) rather than a long-term reduction in harm or improvement in wellbeing."[147] Although it is easier for industry to create and promote their own materials, parents expressed that that they prefer to find out information about digital literacy and eSafety from schools, and overall "awareness-raising campaigns rank quite low in terms of parents' sources of information about their child's online safety."[148] That being said, parents do seem to favour tech companies helping schools teach about how to use

technology itself (e.g. coding).[149] In the Irish teacher focus group, in particular, we also heard about successful partnerships with Industry - facilitated by the teachers being located in Dublin which is also where many global companies have European offices. An Irish teacher spoke about how because her school had run successful digital literacy schemes they had had "so many opportunities afforded to us... We won the Eircom Junior Spiders. We got to visit Google. We got to visit Facebook. You know all those amazing things." Seeing themselves in this context was transformative for these students, but she also recognised that this was exceptional, and partly due to a particularly "innovative teacher." Partnerships with industry can increase this reach, making in-person visits to tech centres or visits form tech employees to schools part of their programme of outreach. However, these relationships need to be fostered not only with the schools who already have proactive teachers.

Relationships with industry have, historically, be used to teach technical skills and eSafety. However, given the evidence, digital education must also include critical, commercial and contextual media literacy as well. This wider language is now included in the revised Audiovisual Media Services Directive (AVMSD) which reads:

> In order to enable citizens to access information, to exercise informed choices, evaluate media contexts, use, critically assess and create media content responsibly, they need advanced media literacy skills. This would allow them to understand the nature of content and services taking advantage of the full range of opportunities offered by communications technologies, so that they can use media effectively and safely.[150]

As we have seen in Section 2, schools currently are significantly under-resourced and under-prepared to successfully deliver meaningful, well-integrated digital and media literacy programmes; at the same, we recognise that every day good and new efforts are being undertaken. Therefore, we suggest that, along with the greater promotion and integration of industry's own educational resources on the platforms themselves (for example, linking them directly from within products rather than in safety pages, for example), there also needs to be a) more evaluation of the short- and long-term impacts of these awareness-raising campaigns and b) more supportive efforts to integrate digital literacy education in schools, supported by industry where possible, but avoiding undue influence on the content.[151] After all, investing in the digital skills of future generations should also be seen as a return on investment, especially for ICT companies who will require and benefit from highly skilled workforce in the near future.

RECOMMENDATIONS & SUGGESTIONS FOR FUTURE CONSIDERATION

Based on the above findings – drawn from our analysis of our focus groups with youth, parents and teachers in five European countries, our interviews with industry stakeholders and our review of the existing evidence – we have determined a series of both *recommendations*, and *suggestions for future consideration*. The recommendations can be put into place in the short- to medium-term, in some cases with resources that are already available. Although we make these recommendations, we are aware that some members of the ICT Coalition are already engaging in some of the practices we suggest as recommendations here. We nonetheless reiterate these suggestions in order to ensure that shared good practices continue to be embedded, and more widely spread.

Our suggestions for future consideration, on the other hand, are issues that will require more in-depth deliberation and planning within and beyond industry. We suggest these as key strategic planning questions, for the medium- to long-term. At the end we provide some recommendations and suggestions for future consideration geared towards advocacy-groups, educators and policy-makers, noting that many of the questions we raised here need to be meaningfully answered through consultation and partnerships with policy-makers, industry, educators, parents and children and young people themselves.

New tools & services

As described, there are a number of initiatives already underway to build new products and services either directly serving children and families (e.g. youth-focused social networks and messaging programmes), or that might be used substantially by children and families (e.g. digital wellness and 'screen time' tools).

In the near-term we *recommend*:

- All new tools and services for or used by children should be developed with the principles of safety and privacy by design embedded from the outset, with the participation of children and parents in the design and evaluation of tools
- New tools and services should be evaluated and iterated with regard for children's rights - both positive rights of participation, expression and knowledge-seeking (therefore not unduly limiting) and protection from potential risks and harms (including their physical and mental health and safety and protecting their data)
- New services should disincentivize 'always on' use, encourage joint-use (including amongst parents, siblings and peers) and establish features that also incentivize and place value on time away from platforms and services.
- Platforms should provide intuitive and accessible products and tools that allow parents, children and teachers more easily and proactively to curate the content with which they engage.
- The development of new tools and content created for or representing families needs to consider user diversity in terms of varying levels of literacy, digital skills and confidence, physical or cognitive impairments, gender and age, languages and family compositions, and ethnicity.
- Children's services should not just be for the youngest children; new content models and services need to be developed to reach older children who may be less likely to seek out platforms and services for 'kids'.
- Partnerships between industry and educators, experts and influencers should be pursued in order to assist in the discovery of positive and educational content.

We suggest that those creating new tools and services *consider*:

- How can new tools and services for children allow them access to new content and staged autonomy as they grow up so that they are more prepared for eventual independent access?
- How can industry, including commissioners and developers of children's media and EdTech, and the platforms on which they are promoted, provide leadership to incentivize the development of high-quality, diverse and safe content and services for children, not only those that meet minimum legal standards?
- How can parents and teachers be supported to understand and assess what types of media and technology can have a positive impact and/or an

educational value for children? Better guidance in this respect will allow them to make more informed decisions as regards children's media and technology consumption

- How can creators who are doing due diligence in developing high-quality, evidence-based educational content be better supported and promoted?

- How can tools that control or limit children's access to technology ('parental control' or potentially 'digital wellbeing' tools) be better designed in order to build on the evidence that active, rather than restrictive, approaches to children's media use are more likely to be successful in helping children develop digital resilience, critical thinking, and healthy media habits?

Supporting digital literacy

As we have discussed, provision directly within schools and on an ad hoc basis by industry or NGOs has made initial strides in terms of introducing digital literacy and digital citizenship within and beyond formal education. However, our research has also indicated that the current level of provision is inadequate to the task of substantively embedding these issues in the curriculum. We therefore recommend:

- Industry- NGO- and government-led digital literacy intiatiives should be independently evaluated against not only only short term indicators like reach, but also longitudinal impacts including behaviour change or building of organisational capacity.

  ° Key evaluation indicators could be drawn from existing evaluations of digital literacy or analogous (e.g. bullying, STEM) educational interventions. A coordinated evaluation toolkit could be developed in order to assist in complementary on-going internal monitoring and evaluation.

  ° New digital literacy and citizenship interventions should be informed by insight from previous and existing interventions, in addition to developing new content.

  ° Evaluations should be made public and both difficulties and best practices transparently shared amongst industry, NGOs and government, in order to avoid duplicating unsuccessful initiatives

- The provision of online resources, awareness raising campaigns and in-person interventions (in multiple languages) should be better coordinated, within industry and in collaboration with policy-makers and educators, so that parents, teachers and young people are receiving better integrated,

more coherent and better promoted messaging.

- Industry digital literacy interventions should be developed with an awareness of equity and access, including outreach to and partnerships with schools and NGOs in under-resourced communities beyond those who make proactive requests and/or are located near technology hubs. This could be done in partnership with organisations working to advance media literacy efforts across Europe including Safer Internet Centres, parent advocacy organizations and ministries of education, in order to ensure resources are equitably accessed.

- Members of the ICT Coalition should work towards greater coordination, in order to avoid the duplication of efforts – for example in the preparation of parent-facing resources and materials.

We further suggest that the design of future digital literacy initiatives should *consider*:

- What is the best way for industry to support future digital literacy interventions, within and outside of school, that combine components of technical skills, eSafety, digital citizenship and critical and media literacy, given that none of these alone are sufficient to support children's safe digital participation, nor prepare them for an increasingly digital future?

- How can industry support the efforts of policy-makers at the national and international level (for example as a condition of the AVMSD) to ensure that digital literacy and critical media literacy are more substantively embedded in schools?

- In resources for parents, how can they be encouraged to engage in 'active mediation' rather than simply receiving the message that 'good digital parenting' is to focus on monitoring and restriction? How can parents be educated to consider the quality and not just the quantity of time spent online?

Industry responsibilities

Our research has detailed the ways in which children, young people, families and teachers are putting digital tools to good use, and the ways in which they sometimes feel unsupported by industry when they run into difficulty. Particularly with regard to children's data, and in relationship to current and potential reporting structures, we *recommend*:

- That steps are taken to produce age-appropriate and more child-friendly terms of use and privacy policies for services directed at or substantively used by children

- That users, including parents and children, be informed in a timely manner of data or security

breaches, including updates for steps taken to ensure security in the future

- That measures to avoid monetizing or misusing children's personal data must be put in place, and heightened oversight measures must be implemented for any devices, tools, platforms or services (including physical toys) that are used by children.

- That technical moderation tools (including AI) alongside human moderation, continue to be iterated, aimed at identifying and taking down illegal content (in collaboration with law enforcement) and prevent access to objectionable content to children

  ° Platforms where illegal or objectionable content first appears have the primary responsibility, but any company who facilitates access to content for children must have their own procedures in place to report illegal content and easy-to-access options filter or otherwise limit access to inappropriate or objectionable content

- That platforms develop more simplified reporting tools for children and young people (which will, in turn, benefit all users), and that users are made aware of their functionality and what actions are taken (or not taken) as a result of reporting

- Follow up explanations for the rationale for actions taken (or not taken) following user reporting must be more widely available and more transparent.

  ° Companies need to conduct regular audits to ensure that reporting tools are being promoted, and that those who use them are satisfied with the resolution of their complaint.

In addition, we further ask industry to *consider*:

- Together with policy-makers how can industry communicate about the rationale for new age restrictions (especially when they have changed in accordance with new regulations) such that users have ethical incentives to adhere to restrictions?

  ° How can age-restriction ('gating') tools be made more robust? How can parental consent procedures be designed that allow parents to meaningfully consent when required? How can such consent procedure invite conversations between parents and children about appropriate use, and privacy, at the point of onboarding?

- How can both easier-to-use and more granular tools be made available for parents and children to restrict unwanted content (by their own criteria), reducing the burden on parents and on children to be constantly vigilant for potential harms, while

encouraging active approaches that also enable children's freedom of expression and accessibility of information?

- How can researchers working within industry share their insights and coordinate with academic or third-party research? Key topics that would benefit from such research-practice partnerships include:

  ° To what extent are new tools, resources and services for children and families, including digital well-being and 'screen time' tools, digital literacy and citizenship resources, and parental control tools, taken up by users? Are these tools accomplishing the tasks for which they are designed? How might they be better refined and promoted?

  ° What are the short- and long-term impacts that new digital tools (for example geo-location and child tracking) have on safety, privacy and well-being, on user behaviours, and on interpersonal relationships?

- How can all users, but especially children and young people, be supported to take an active role in reporting inappropriate content and contact? What can industry do, in terms of the transparency of reporting processes and in terms of marketing and communications, to overcome the widespread skepticism about whether industry has young users best interests at heart?

- How can young users' views and experiences be better communicated within the design of both services and policies? How can industry communicate policies, including with regards to data privacy and content moderation, to children and young people in a more transparent, while still age-appropriate, way?

For policy-makers:

Given that many of the recommendations and areas of consideration above also require the involvement of policy-makers (and in terms of practical application of educators and parents) we also *recommend* the following:

- Teachers and senior leadership in schools need significantly increased training and resources to enable and access to good practice examples of a) positive uses of digital technologies (including using smartphones) in the classroom and b) the integration of digital literacy skills into diverse areas of the curriculum (e.g. 'fake news' could be taught in citizenship, history or english lessons).

  ° Teachers and schools need more training and support if they are to help support children towards more advanced forms of online participation including digital content creation

or digital making that require equipment, alongside advanced digital literacy and skills

- Existing centralised resources and centres (e.g. Safer Internet Centres) need an expanded remit, and greater resources, in order to:
  - ° Facilitate more equitable access to industry partnerships. Industry can support but cannot lead the further integration of digital literacy in schools
  - ° Share and coordinate digital literacy, eSafety and digital citizenship initiatives in order to reduce duplication
  - ° Coordinate parental outreach based on current evidence that a range of approaches (including active and restrictive mediation, rather than restrictive mediation alone) are more likely to have impact on children's safety and their ability to realize digital opportunities

- Work with industry to more clearly communicate to parents and young people why the age of consent has been set as it has (depending on the country context) and why they should adhere to it.

We believe the above recommendations can be initiated in the short-term, whereas the topics for consideration can be initiated now but will likely have impact in the medium- to longer-term. We further recommend that future research commissioned by the ICT Coalition report on progress made in accordance with these recommendations and areas for future consideration.
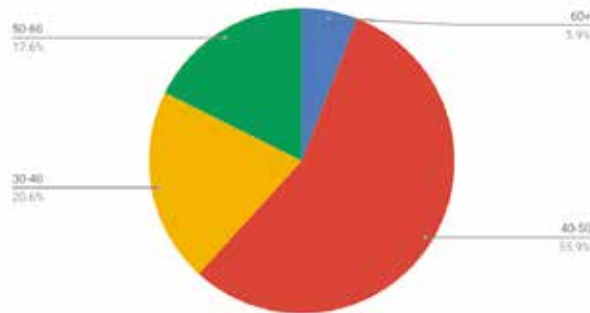
APPENDIX A
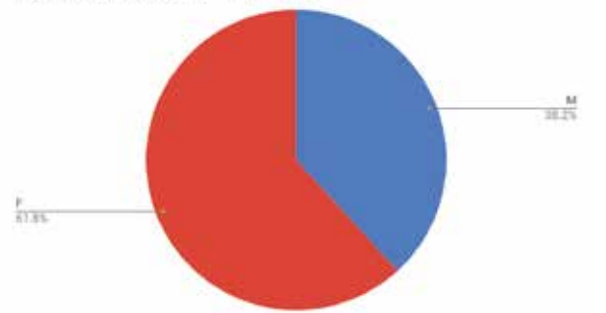## FOCUS GROUP PARTICIPANTS

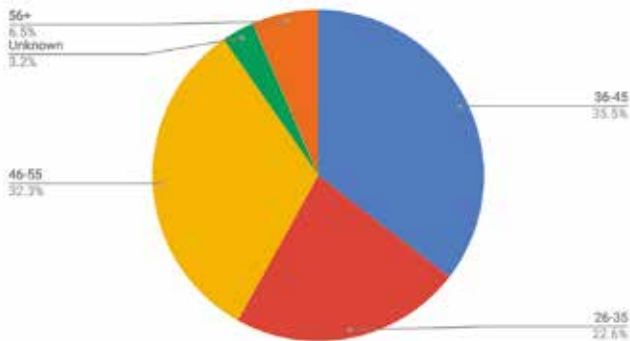Age of participants - YOUTH
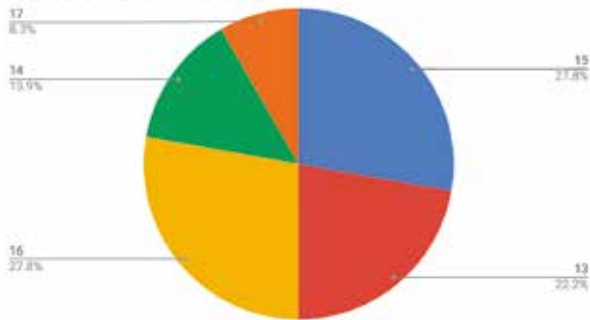
Gender of participants - YOUTH
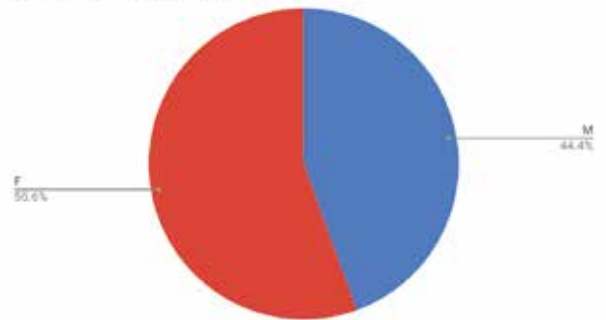
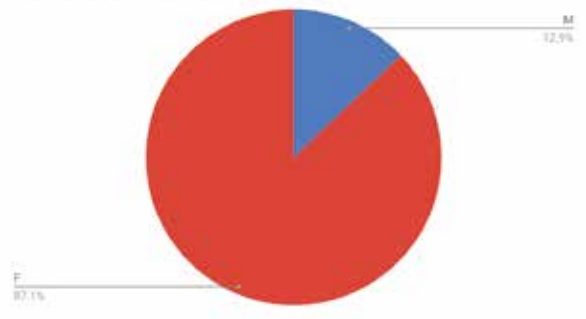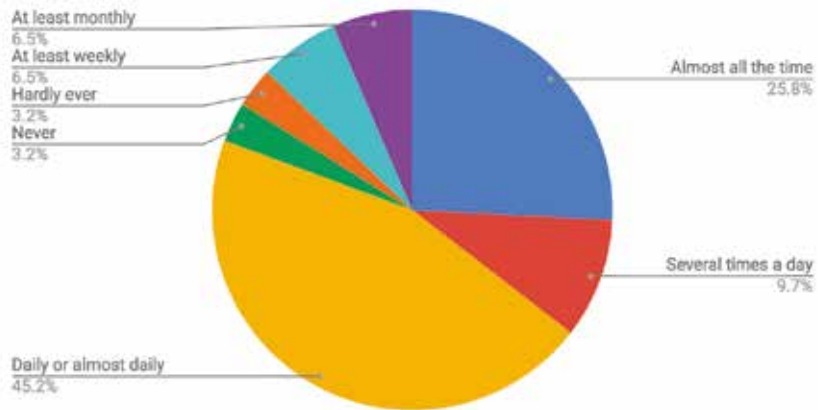Age of participants - PARENTS

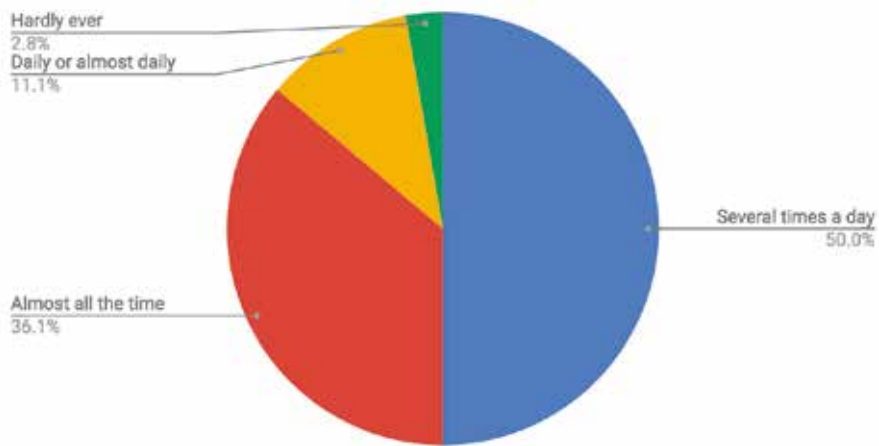Gender of participants - PARENTS

Age of participants - EDUCATORS

Gender of participants - EDUCATORS

How often do you use the internet in your teaching (on any device)

At least monthly
6.5%
At least weekly
6.5%
Hardly ever
3.2%
Never
3.2%

Almost all the time
25.8%

Several times a day
9.7%

Daily or almost daily
45.2%

How often do you go on the internet (at any time and on any device) YOUTH

Hardly ever
2.8%
Daily or almost daily
11.1%

Several times a day
50.0%

Almost all the time
36.1%

How often do you go on the internet (at any time and on any device) PARENTS

Daily or almost daily
17.6%

Almost all the time
5.9%

Several times a day
76.5%
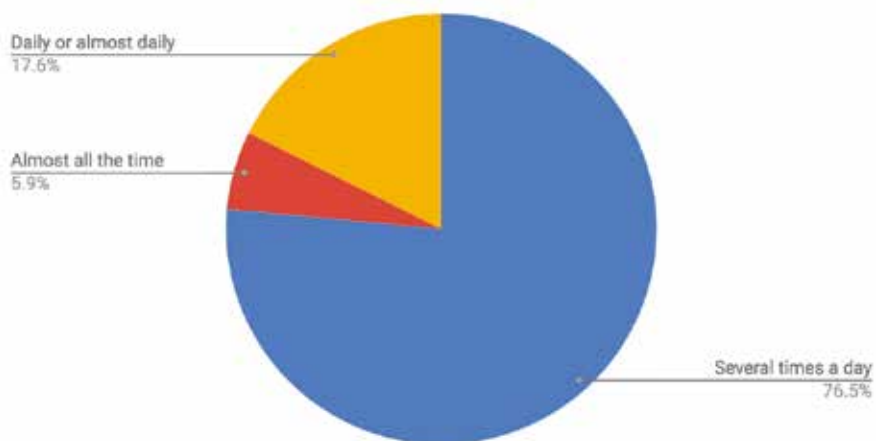
APPENDIX B
INDUSTRY EDUCATION EFFORTS

Many of the members of the ICT Coalition have led efforts to create digital literacy and eSafety resources and campaigns. Some of these include:

- Vodafone's Digital Parenting magazine which is distributed in the UK via schools and is produced in collaboration with the NGO ParentZone to help parents and teachers "give children the life skills they need to thrive in the always-connected digital world."

- Orange's Supercoders scheme which organises free coding workshops for 9-13 year olds with the aim of "making children more aware of digital culture by offering them an easy and fun introduction to computer coding" in France and in 16 other countries in Europe and Africa.

- Altice Portugal's Comunicar em Segurança programme which runs educational interventions in schools for children 6-18 to "raise awareness in schools and promote responsible and safe use of ICT tools". The programme also includes a theatre play for young people 13 -18, offers online resources and is being extended to parents and seniors.

- Google's Be Internet Awesome/Legends programme which includes an interactive game and teaching resources to help support children and young people online. Google's Family Link also has resources and activities for parents. YouTube has resources for parents, teens and educators in their safety resources.

- The BBC has created the Own It resource to help give children tools to "make the most of their time online"

- Deutsche Telecom co-founded FragFinn.de a safe search engine with editorially tested results for children. They also run the Teach Today resource.

- Facebook launched a Parents Portal with advice for parents on how to navigate issues online and has assembled a Digital Literacy Library with lesson plans and tools for educators that will be available in 45 languages. Instagram also has a parent's page with conversation prompts for parents and children.

- Telenor launched the Nätprat resource, an interactive guide to help parents talk to their children and "become more involved in their digital life."

- Telcom Italia gives parents information on "10 rules of safe browsing" on their Navigare Sicuri website.

- Telefonica has created the Think Big initiative which helps "helps young people between the ages of 14 and 25 develop key skills for the increasingly digital world"

- Telia Company has set up a series of workshops for schools, with the aim to support children to acquire digital skills for a safer behavior online, through interaction and participation.

- Many companies provide safety tools and resources for young people and/or parents in their 'safety centre' for example: Ask.fm, Club Penguin Island, KPN.

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[56] Fogg, 2003

[57] Newton, 2018

[58] Apple Inc., 2018; Google, 2018

[59] Parents who heavily restrict rarely involve their children in making decisions. This is a missed opportunity to build a sense of trust and ownership over media use within the family, Evans, Jordan, & Horner, 2011.

[60] Barron & Levinson, 2018. Plowman (2015) differentiates parents as being either 'guarded' or 'well-disposed'.

[61] Dias et al., 2016

[62] Nikken & Schols, 2015. J. Marsh et al. (2015) research in Lauricella, Barr, and Calvert (2009) explores how the use of computers (e.g. operating and clicking a mouse) takes longer for young children to master.

[63] Neumann & Neumann, 2017

[64] Livingstone, Mascheroni, Dreier, Chaudron, & Lagae, 2015

[65] Takeuchi & Stevens, 2011

[66] Barron & Levinson, 2018

[67] Radesky (2016) includes the idea that acting as a media mentor includes modelling good digital behaviors like putting phone away (Donohue, 2014).

[68] Hirsh-Pasek, Zosh, Golinkoff, Robb, & Kaufman, 2015

[69] Radesky & Christakis, 2016

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72 Ofcom, 2017; Zaman, Nouwen, Vanattenhoven, de Ferrerre, & Van Looy, 2016

73 Hargittai (2010) points out that inequality also patterns skills themselves too.

74 Görzig, 2016

75 Lilley, Ball, & Vernon, 2014

76 Lilley & Ball, 2013

77 Przybylski, Mishkin, Shotbolt, & Linington, 2017; UKCCIS, 2018

78 ToonTastic is an app by Google that allows for animation, voiceovers (Google, 2017).

79 Alper, 2014

80 Chapman, 2013

81 Livingstone & Blum-Ross, Forthcoming

82 Microsoft, 2018

83 Alper, 2017; Ellcessor, 2016

84 Buijs, Boot, Shugar, Fung, & Bassett, 2016; Mazurek & Wenstrup, 2013

85 Livingstone & Haddon, 2009

86 Ito et al., 2013

87 Soep, 2014

88 Jenkins, Shresthova, Gamber-Thompson, Kligler-Vilenchik, & Zimmerman, 2016; Literat, Kligler-Vilenchik, Brough, & Blum-Ross, 2018

89 Christensen, 2011

90 Cohen & Kahne, 2012

91 Katz & Gonzalez, 2015; Tripp, 2011

92 Warschauer & Matuchniak, 2010

93 Reich & Ito, 2017

94 Clark, 2013

95 Livingstone et al., 2017

96 Perrotta, 2013

97 World Economic Forum, 2016

98 European Commission, 2016

99 Bughin et al., 2017

100 Kiss, 2017

101 Perrotta, 2013

102 Corbett, 2018

103 These are sometimes referred to as 'school information management systems' and can include information about student behaviour, discipline, attendance and more. (Livingstone & Sefton-Green, 2016)

104 Lupton & Williamson, 2017

105 European Commission, 2017

106 Perrotta, 2013

107 John and La Velle, 2004

108 Perrotta, 2013

109 Milkaite & Lievens, 2018

110 Livingstone, 2016; Livingstone & Ólafsson, 2017

111 Carr, 2017; London School of Economics and Political Science, n.d.

112 Mostmans, 2017

113 Richardson, 2015

114 Lilley & Ball, 2013

115 Livingstone & Ólafsson, 2018

116 Savirimuthu, 2016

117 Livingstone, Ólafsson, & Staksrud, 2013

118 Livingstone & Carr, 2017

119 Gibbs, 2018

120 Sweney, 2013

121 Aiken, 2016

122 Donoso & Wauters, 2014; Macenaite & Kosta, 2017. This blog post from a media literacy educator gives some suggestions for how students can be taught to understand terms of service (Davis, 2015).

123 Blum-Ross, 2018a

124 Whyte, 2018

125 Beser, 2018

[126] Blum-Ross, 2018b

[127] Twenge, 2017a

[128] Blum-Ross, 2018b

[129] Livingstone, Stoilova, & Nandagiri, 2018a

[130] 5Rights, 2018

[131] Livingstone, Stoilova, & Nandagiri, 2018b

[132] Leber, 2016

[133] Abel, 2018

[134] Mascheroni & Olafsson, 2018

[135] Greijer & Doek, 2016

[136] O'Neill, 2014; Thorn Staff, 2015; Todorovic & Chaudhuri, 2018

[137] Croll, 2016; Quinn, 2018

[138] Birdle, 2017

[139] Croll, 2016

[140] Berman & Lowery, 2017

[141] Morris, 2018

[142] Efforts to increase transparency in reporting include YouTube's Community Guidelines Enforcement Report (YouTube, 2018) and Twitter's safety handle: (Twitter Safety, 2017).

[143] Positive Online Content and Services for Children in Europe, 2014

[144] Grant, 2018

[145] O'Neill, 2014

[146] Livingstone, Blum-Ross, et al., 2018

[147] Livingstone et al., 2017

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[149] Sparvell, 2018

[150] Celot, 2017; Council Directive 2010/13/EU of the European Parliament and of the Council on the coordination of certain provisions laid down by law, regulation or administrative action in Member States concerning the provision of audiovisual media services, 2010

[151] Livingstone, 2018