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Potentially negative effects of internet use

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The past few decades have been characterised by political endeavours to maximise internet access throughout the European Union, in particular through the development of the digital single market. However, it is being increasingly recognised that the internet, in spite of all its benefits, can also have significant negative effects on individuals and wider society.

This analysis reviews a selected number of potentially negative effects of internet use, namely: internet addiction, harm to cognitive development, information overload, harm to public/private boundaries and harm to social relationships and communities.

Reflecting on these, policy options are presented for the prevention and mitigation of these effects.

This document presents the key insights and an update of the STOA projects 'Harmful internet use – Part I: Internet addiction and problematic use' carried out by Olatz Lopez-Fernandez and Daria J. Kuss, Department of Psychology, Nottingham Trent University (NTU), United Kingdom; and 'Part II: Impact on culture and society', carried out by Philip Brey, Stéphanie Gauttier and Per-Erik Milam, University of Twente, the Netherlands. The project was requested by the Panel for the Future of Science and Technology and managed by the Scientific Foresight Unit (STOA) within the Directorate-General for Parliamentary Research Services (DG EPRS) of the European Parliament.

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Executive summary

The internet has received increasingly negative media coverage in recent years. Numerous articles have reported on major privacy scandals and security breaches, the proliferation of fake news, harmful behaviours such as cyber-bullying, cyber-theft, revenge porn and internet addiction, as well as the negative effects that the internet can have on social relationships and social cohesion.

Although the social and economic benefits of the internet are undeniable, the way in which the internet has developed has also been detrimental to a number of core European values such as equality, respect for human rights and democracy. Due to this, technology companies are coming under increasing pressure to mitigate the harmful effects of the internet, whilst politicians and opinion leaders are advocating drastic measures to reverse such impacts.

This paper presents a summary and an update of some key findings of the two-part STOA study entitled 'Harmful internet use'. It does not cover all potential societal harms relating to the internet, which include – amongst others – negative impacts on privacy, harm related to cybersecurity and cybercrime, negative effects on knowledge and beliefs and negative effects on democracy and democratic citizenship.

Categories analysed in this report

Internet addiction and problematic internet use
A lack of control over one's internet consumption can lead to a decrease in physical and psychological wellbeing, with associated symptoms such as distress, anger, loss of control, social withdrawal, familial conflicts and others pushing people towards isolation. Populations with co-morbid psychiatric symptoms are at a greater risk of suffering from internet addiction, whilst cultural issues or use for media purposes can significantly contribute to the experience and severity of internet addiction.

Negative effects on cognitive development
There is evidence to suggest that children's cognitive development can be damaged by prolonged internet use, including the development of memory skills, attention span, abilities for critical reasoning, language acquisition, reading and learning. However, more research is needed to draw conclusions.

Information overload
Having too much information can make it difficult to adequately understand an issue or to make effective decisions. Information overload is associated with loss of control, feelings of being overwhelmed, reduced intellectual performance and diminished job satisfaction.

Impaired public/private boundaries
The way in which the internet and smartphones blur the distinction between different spheres of life – such as work and home – harms the boundaries between people's public and private lives. Negative effects that can result from such permeations include lower quality of life, lack of privacy, decreased safety and security and negative impacts on social relationships. Another negative effect can be when friends and family members feel that they are left behind by new technology.

Damage to social relationships and communities
Extensive internet use is correlated with loneliness and social isolation. Intimate relationships can be damaged by internet use, particularly due to viewing online pornography. Malicious online behaviour, such as cyber-bullying, cyber-stalking and online predation, affects a significant percentage of internet users. Many offline communities suffer from the partial migration of human activities – such as shopping, commerce, socialising, leisure activities or professional interactions – to the internet. Online communities sometimes extend and add value to offline communities, whereas at other times they replace them. In some cases, they are inadequate replacements as they do not possess some of the most valued qualities of offline communities. Online communities may consequently suffer from impoverished communication, incivility and a lack of trust and commitment.

Policy options

The study identifies a number of broad policy options for preventing and mitigating the negative effects of internet use. These include:

Theme 1: Prevention and health promotion - reducing risk and harm
Policy option 1. Initiate information and prevention campaigns.
Policy option 2. Increase education regarding internet use and its consequences.
Policy option 3. Stimulate employers to develop policies that protect workers against harmful work-related internet use.

Theme 2: Providing support services
Policy option 4. Strengthen the health and social services' support available for internet users that engage in harmful use.
Policy option 5. Support communities and networks affected by individual online users.

Theme 3: Governmental actions at EU and national level
Policy option 6. Establish governmental units to address the problem of harmful internet use.

Theme 4: Better protection offered by industry
Policy option 7. Promote technology that better protects against harmful internet use.
Policy option 8. Promote technology that better protects social institutions and social inclusion.

Theme 5: Research
Policy option 9. Promote more research into the effects of internet use and effective interventions.

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1. Introduction

Over the last few decades there has been considerable political effort put into expanding internet access throughout the European Union, through initiatives such as the digital single market (European Commission, 2019). However, the current rate of internet use signals the need to assess the potential negative effects it has on society. Concerns over privacy and security, crime and lawlessness, the negative effects on communication and civility, commercialisation of the public sphere and other impacts were highlighted at an early stage. In recent years, there has been increased criticism of the harmful social and cultural implications of internet use. Examples include major breaches of privacy and security, the proliferation of fake news, harmful actions such as cyberbullying, revenge porn, sextortion, internet predation and internet addiction, as well as the negative effects of the internet on social relationships and social cohesion.

This paper summarises and updates some of the key findings from the STOA study entitled 'Harmful internet use', which was published in two parts. Part I, entitled 'Internet addiction and problematic use', which was carried out by the Nottingham Trent University (Lopez-Fernandez, 2019) and part II, entitled 'Impact on culture and society', which was carried out by the University of Twente (Brey, 2019). For a deeper understanding of these issues, we suggest consulting the STOA reference studies mentioned above.

The purpose of this in-depth analysis is to provide an overview of a selection of ways in which the internet can have a negative effect on society and culture, as well as to provide numerous policy options for mitigating these effects. We define 'harmful or negative effects on society and culture' to include i) harm to the interests, wellbeing, health, social status or civil rights of large groups of people in society; and ii) harm to the proper functioning of social structures and practices, such as communities, cultural practices and social institutions.

This in-depth analysis summarises and updates the most relevant points from the previous STOA study in a single document, introducing updated bibliographic appraisals in different parts. Each section is accompanied by an infographic encompassing the most salient aspects in order to aid consultation.

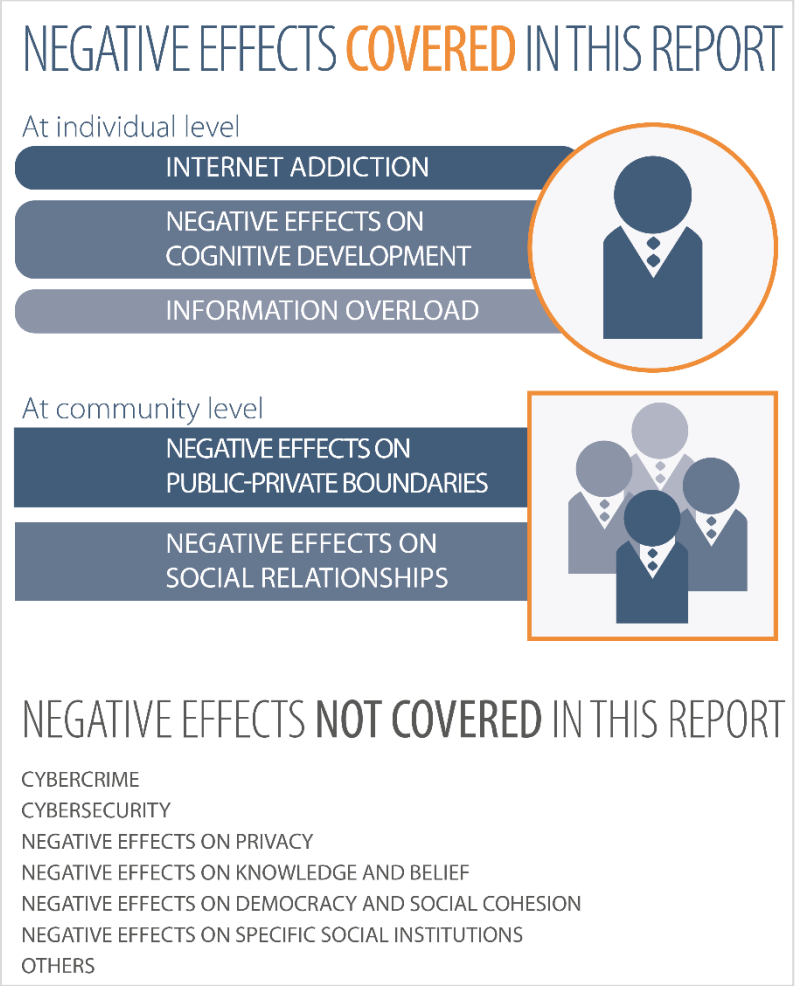
In relation to Part I of the STOA study (internet addiction), this report mainly focuses on prevalence data of internet addiction both within and outside of Europe and on different forms of internet activity addiction, namely: gaming, gambling, online social networking and cybersex. In relation to Part II of the STOA study (impact on culture and society), the report focuses on the harmful social and cultural effects of internet use, which have generally gained less attention and are therefore less well known.

Finally, updated policy options have been grouped into five thematic areas and new ones have been added. Comparative examples of legislative actions recently introduced in several EU Member States and further afield have also been included and discussed.

Figure 1 describes an overview of categories covered, as well as the negative effects of internet use which are not covered in this report. The five broad types of negative effects identified were: 1) Internet addiction; 2) Negative effects on cognitive development; 3) Information overload; 4) Negative effects on public/private boundaries; and 5) Negative effects on social relationships.

It is important to remember that the negative impacts reported and discussed in this analysis must be considered alongside the significant benefits of the internet, whilst maintaining that education regarding the safe use of the internet and internet-based devices is paramount.

Figure 1. Potential negative effects of internet use covered and not covered in this report



1.1. Factors shaping internet use

The social and cultural harms related to internet use are the result of multiple factors (Figure 2). Internet technology pertains to both hardware and software. In addition, there are companies that offer specific online services (search engines, social media, e-commerce, entertainment, etc). The functionality of internet technology influences how the technology is used and what effects it has on users and society. Notably, the companies that provide this technology can have a significant impact its functioning.

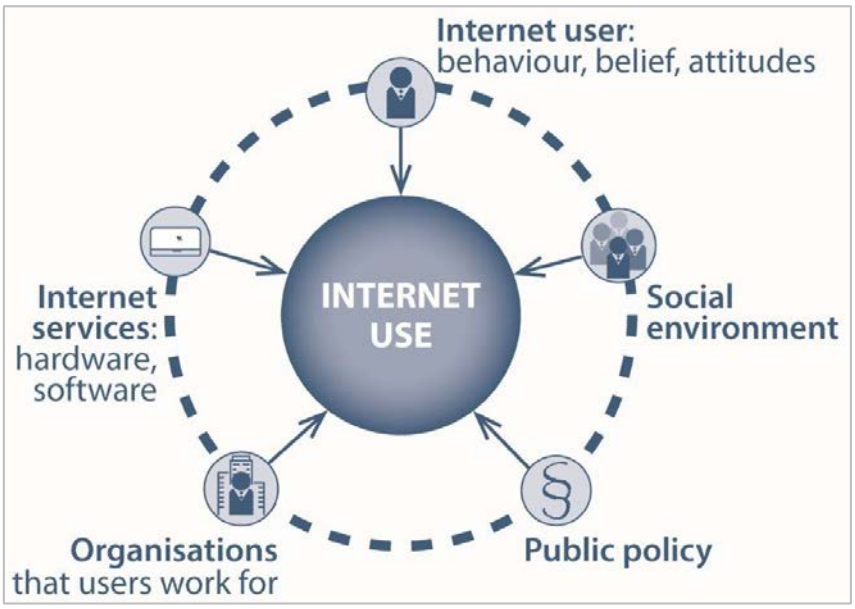
Also, internet users naturally have a major role to play in shaping the social and cultural consequences of internet use. Ultimately, they determine how the technology is used, how often, for how long, in which contexts and to which ends. User behaviour is certainly influenced by several factors such as educational level, attitudes, age, family context, habits and personality traits. For example, several psychiatric disorders – including depression, anxiety disorder and attention-deficit/hyperactivity disorders – are conditions that may be predisposing factors for the development and maintenance of problematic internet use (Brand, 2016).

User behaviour is constrained and regulated by the social structures, practices, and expectations imposed by the social environment. Private and public organisations tend to impose particular regimes of internet use on their employees, whilst peer groups, families and communities may encourage or

discourage certain user behaviours. Moreover, organisations, peer groups, families and communities are also the social contexts in which the impacts of internet use beyond the individual user are first felt.

Ultimately, such negative effects add up to a societal harm that can become the subject of public policy. Regulations, laws and other policy responses to regulate the development and use of the internet constitute an additional factor that shapes the impact it can have on our culture and society.

Figure 2. Factors that shape internet use



2. Internet addiction

Over the past decade or so, the term addiction has been mainly used in relation to the poorly controlled use of psychoactive substances, however recently behavioural addictions have begun to receive more attention. Core aspects of addiction, according to the fifth diagnostic and statistical manual of mental disorders (DSM-5; APA, 2013) include impaired control (e.g. unsuccessful attempts to reduce intake), craving (e.g. strong preoccupations or motivational drives that lead to behavioural engagement), impairment (e.g. neglect of other areas of life that may lead to occupational, relational and other problems), risky/harmful use (e.g. persisting intake despite awareness of damaging psychological or physiological effects or other negative consequences), and physiological features (e.g. tolerance, withdrawal).

A spectrum of internet utilisation, from controlled and "adaptive" to uncontrolled and "maladaptive", is nowadays well recognised. Disordered online behaviours have been associated with marked functional impairment, including loss of productivity (or reduced scholastic achievement) and mental health sequelae such as mood and anxiety disorders (Fineberg, 2018).

The first research on addiction problems relating to internet use emerged two decades ago in the UK and the USA (Griffiths, 1995; Young, 1996). Since then, research has enabled the field to advance considerably, resulting in clinicians and researchers recognising internet addiction problems across different online activities (Griffiths, 2016). Starting in the mid-nineties, scientific articles on internet addiction focused on computer use. However, from the mid-2000s, research has also investigated mobile internet use with a focus on mobile phones, which later quickly evolved into a focus on smartphones (Lopez-Fernandez, 2018). Recently, there has been an emergence of research regarding

excessive use of tablets (Leung, 2016), as well as a focus on virtual reality technology, which is starting to be seen as potentially addictive when used for engaging in cybersex (Dryer, 2007).

The WHO's 11th international classification of diseases (ICD-11) defines disorders due to addictive behaviours as recognizable and clinically significant syndromes associated with distress or interference with personal functions that develop as a result of repetitive rewarding behaviours other than the use of dependence-producing substances. Disorders due to addictive behaviours include gambling disorders and gaming disorders, which may involve both online and offline behaviour (ICD-11; WHO, 2018). In 2013, the American Psychiatric Association already introduced 'internet gaming disorder' in the appendix of its fifth diagnostic and statistical manual of mental disorders in 2013 (DSM-5; APA, 2013).

Similar to other addictive behaviours, internet use can activate a combination of sites in the brain associated with pleasure, known as the 'reward centre' of the brain. When activated during prolonged periods of internet use, the neurochemical dopamine is released in the *nucleus accumbens* (Ko, 2009), along with opiates and other neurochemicals. Over time, the associated receptors may be affected, leading to the development of tolerance or the need for increasing stimulation of the reward centre to produce a 'high', whilst at the same time producing craving in order to avoid the experience of withdrawal.

This leads to the individual seeking highly potent rewards (i.e. stronger than common rewards, such as food, water, and sex) in the form of internet use to recreate a balanced reward and pleasure state. On the level of neural circuitry, internet addiction can lead to neuroadaptation (i.e. changes in brain functioning) and structural changes which result from prolonged increased activity in brain areas associated with addiction. Internet users experience multiple layers of compounding reward and reinforcement loops when they use various online applications (e.g. web-surfing, pornography, chat rooms, message boards, social networking sites, video games, email, texting, cloud applications and online gambling) (Cash, 2012).

2.1. Prevalence of internet addiction

Table 1 presents the results of a number of epidemiological studies carried out in Europe on the prevalence of internet addiction. The table collates studies on problematic internet use, online gaming and online gambling, and includes studies that were carried out between 2010 and 2020 with a cohort of >2000 participants. A full systematic review was not performed, therefore this table is not fully representative of all available published literature. The prevalence changes considerably amongst studies, with percentages that change on the basis of geographic area and on the basis of the population studied. This may be attributable to the fact that diagnostic criteria, definition of internet addiction, population analysed and assessment questionnaires vary between countries and studies. Overall, it can be noted that a minority of populations display problematic internet use, although this varies widely, with some groups showing higher proportions. Risk factors associated with problematic internet use that were identified in these prevalence studies included: lack of parental control, substance use, emotional and behavioural difficulties (e.g. missing school, worrying a lot), and increased use of online gaming and social apps (Kuss, 2013; Rücker, 2015; Blinka, 2015; Gómez, 2017). Both online gambling and gaming addiction were consistently more prevalent in males than females (Rehbein, 2010; Müller, 2015; Strittmatter, 2015; Andrie, 2019).

Table 1. Prevalence of internet addiction in Europe (list of selected studies)

Reference, countries studied* and population	Reported prevalence
Andrie, 2019; DE, GR, IS, NL, PO, RO, ES; Adolescents, n=13,284	Overall, 5.9 % reported gambling online (higher risk amongst males), and 48.4 % of these were reported to have problematic gambling. Overall, 13.9 % showed problematic internet use.
Lopez-Fernandez, 2017 Northern: FI, UK; Southern: ES, IT; Eastern: HU, PO; Western: FR, BE, DE, CH. Young adults (18-29 years), n= 2,775	The study examined mobile phone use and dependency. Populations from the Northern and Southern regions reported the heaviest use of mobile phones. The proportion of highly dependent mobile phone users was more elevated in Belgium, UK, and France.
Gómez, 2017; ES Adolescents, n=40,955	The prevalence of problematic internet use was found to be 16.3 %.
Macur, 2016; SI Adults, n=6,029	3.1 % of the population were found to be at risk of becoming problematic internet users, which increased to 11 % in those 20-24 years, and 14.6 % in those 18-19 years.
Strittmatter, 2015; EE, DE, IT, RO, ES Adolescents, n=8,807	3.6 % demonstrated pathological internet use and were online gamers, whilst 3.1 % demonstrated problematic internet use as non-gamers.
Müller, 2015; DE, GR, IS, NL, PO, RO, ES Adolescents, n=12, 938	1.6 % of the population were identified with internet gaming disorder, with a further 5.1 % being at risk.
Blinka, 2015; 25 countries [a] Adolescents, n=18,709	1.4 % were identified as highly excessive internet users.
Rücker, 2015; CH Adolescents, n=3,067	11.7 % were identified as problematic internet users.
Rehbein, 2015; DE Adolescents, n=11,003	1.16 % of respondents were identified as having internet gaming disorder.
Kaess, 2014; AT, EE, FR, DE, HU, IE, IT, RO, SI, and ES, and Israel. Adolescents, n=11,356	Overall prevalence of pathological internet use of 4.2 %, slightly higher amongst males than females.
Cheng, 2014 Northern and Western: AT, EE, FR, DE, IE, NO, SE, UK; Southern and Eastern: BG, CY, CZ, GR, HU, IT, PO, RO, SR, SI, ES. Age range 12-41 years, n=43,785	An average of 2.6 % of users were considered with internet addiction in Northern and Western Europe, and 6.1 % in Southern and Eastern Europe.
Tsitsika, 2014 GR, ES, PO, DE, RO, NL, and IS. Adolescents, n=13,284	1 % of adolescents exhibited internet addictive behaviour (IAB) and an additional 12.7 % were at risk for IAB, resulting in a total of 13.9 % displaying dysfunctional internet behaviour (DIB). The prevalence of DIB was higher amongst boys and varied widely per country.
Rumpf, 2014; DE Ages 14-64 years, n=8,132	Overall, problematic internet addiction was reported in 1 % of the population. This proportion increased to 2.4 % within 14-24 year olds, and to 4 % in 14-16 year olds.
Kuss, 2013; NL Adolescents, n=3,105	3.7 % were classified as being potentially addicted to the internet.
Rehbein, 2010 ; DE Adolescents, n=15,168	3 % of the male and 0.3 % of the female students were diagnosed as dependent on video games.

*Abbreviations: AT, Austria; EE, Estonia; FR, France; DE, Germany; HU, Hungary; IE, Ireland; IT, Italy; RO, Romania; SI, Slovenia; ES, Spain; NO, Norway; SE, Sweden; UK, United Kingdom; BG, Bulgaria; CY, Cyprus; CZ, Czech Republic; GR, Greece; PO, Poland; SR, Serbia; NL, the Netherlands; IS, Iceland; FI, Finland; BE, Belgium; CH, Switzerland. a Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Netherlands, Norway, Poland, Portugal, Romania, Slovenia, Spain, Sweden, Turkey, UK.

A selection of large, recent epidemiological studies outside of Europe presenting internet addiction prevalence in the general population is presented in Table 2.

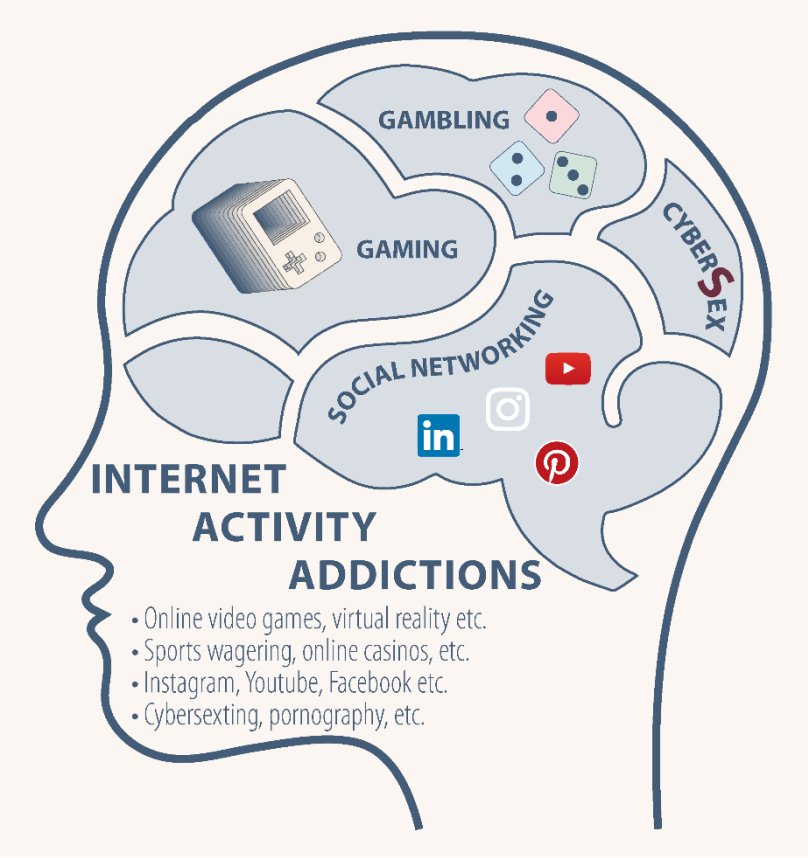
Table 2. Prevalence of internet addiction outside of Europe (list of selected studies)

Reference, country studied and population	Reported prevalence
Lee, 2016; South Korea Adolescents, n=221,265	2.6 % were identified as being at high risk of internet addiction.
Morioka, 2017; Japan Adolescents, n=100,050	Internet addiction prevalence was 8.1 %; excessive internet use was reported as 12.6 % for the population.
Li, 2014; China Children and adolescents, n=24,013	Internet addiction in the total sample was 6.3 %, and amongst internet users was 11.7 %.

2.2. Internet activity addictions

The activities commonly associated with addictive internet use are gaming (Lemmens, 2015), gambling, online social networking (Müller, 2016), and engaging in cybersex (Giordano, 2017) (Figure 3).

Figure 3. Different types of internet activity addictions



Gaming addiction or gaming disorder is the problematic online behaviour which has seen the largest evidence base across all addictions related to internet use. It has been argued that online video games are one of the most widespread recreational activities irrespective of culture, age and gender (Király, 2014). As mentioned, in 2018, the WHO decided to include gaming disorder in the ICD-11 (WHO, 2018) (an excerpt is presented in Figure 4).

Figure 4. Definition of gaming disorder from the WHO (2018)

In addition to excessive and pathological online gaming, research has also emerged regarding online gambling. The definition of gambling disorder as a basis for problematic online gambling is presented in Figure 5.

Furthermore, research has increasingly looked into excessive and pathological use of social media and online social networking sites (Andreassen, 2014), highlighting the existence of different usage motivations and user profiles across different types of problematic media usages. Symptoms include salience, mood modification, tolerance, withdrawal, conflict and relapse.

Finally, online sexual addiction (i.e. cybersex) has also been considered as a specific problematic online activity. Anecdotal data and clinical cases of cybersex addiction have been covered by the scientific literature (Cooper, 2000), but more research is needed in this field to provide definitive conclusions.

3. Negative effects on cognitive development

In this context, cognitive development refers to the evolution of skills related to perception, thought, memory, language, reasoning and intellectual development. With the rise of the internet, the way in which people process information has changed drastically over time. At any time, up-to-date information is available and easily accessible. Visually, the internet presents texts in a non-linear way through separate web pages stemming from a plethora of sources. It requires, therefore, new patterns in the development and execution of mental processes for learning and making decisions. The internet has thus introduced a new form of organisation and memorisation of information. Whereas biological memory is organised in an integrative, constructive and interlinking way, computer memory allows only for information retrieval (Heersmink, 2016).

Figure 5. Definition of gambling disorder from the DSM-5 (APA, 2013), as a basis for problematic online gambling

3.1. How the internet affects cognitive development

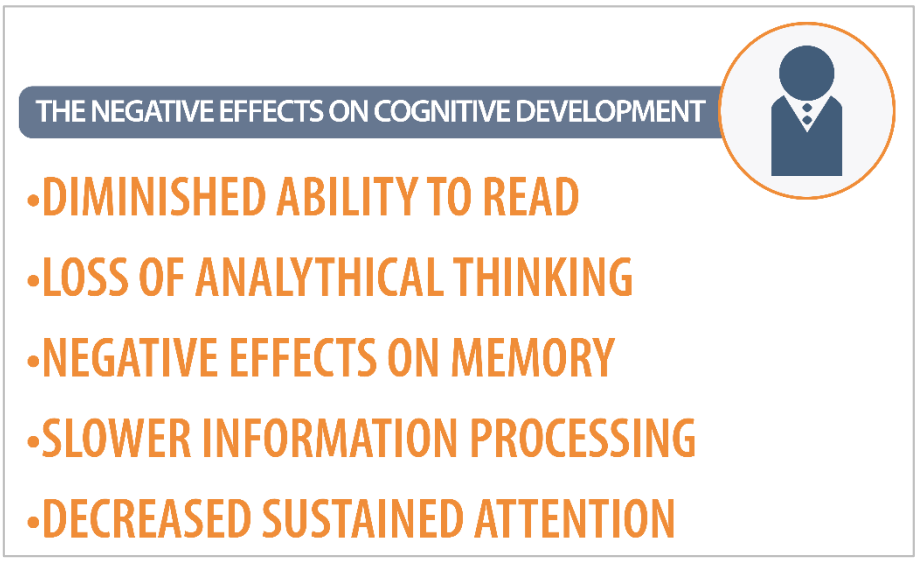
Most of the research on the impact of the internet on cognition has focused on children. Whilst some research shows that internet use, including specific uses such as gaming, can enhance certain cognitive skills, others suggest negative consequences, including structural changes in the brain (Loh, 2016). A recent meta-analysis of cognitive performance in people with problematic internet use showed that

this condition was associated with significant cognitive deficit in attention inhibition, motor inhibition, decision-making and working memory (Ioannidis, 2019). However, results of other studies have been inconclusive (Orben, 2019).

Prolonged internet use has potential effects on different interrelated features of cognition, namely memory, analytical thinking, metacognitive judgement, exploration (curiosity), and reading (Carr, 2011; Danovitch, 2019). Consequently, human beings are becoming cognitively lazy and superficial thinkers (Greenfield, 2015). A summary of potential negative effects is shown in Figure 6.

Studies show that fewer efforts are put into storing information in memory when using the internet (content), as one can instead memorise where to retrieve the information (access) (Sparrow, 2011; Dong, 2015). If one knows the information will not be available, then one puts more effort into encoding it and has a better recall of the information (memory). This may be conceived as a negative effect of the internet, however others have suggested that this can allow for the reallocation of cognitive resources for different information, such as creative thinking or problem solving (Danovitch, 2019).

Figure 6. Potential negative effects of internet use on cognitive development



The issues are not linked to memory alone, but also to analytical thinking. Carr (2011) pursues the argument that the use of the internet – i.e. the permanent access to information – leads to shallower information processing, which is essentially quicker and non-linear, including reduced contemplation and decreased information retention. Other researchers show that browsing and scanning behaviours lead to keyword spotting, non-linear reading and decreased sustained attention (Liu, 2005; Nicholas, 2011).

Another highlighted area of concern arising from internet use in children and adults is metacognitive judgement, leading people to inflate estimates of their knowledge and understanding. In children particularly, this could potentially impact curiosity and motivation, and thus learning, but more research is needed in this area (Danovitch, 2019). Related to this, with such ease of access to information, one may have an increased tendency to give up when faced with challenges and complexity (Danovitch, 2019).

According to Wolf et al. (2009), one of the dangers of cognitive laziness and shallow information processing is that it can prevent the development of deep reading skills (e.g. inferential reasoning, critical analysis, reflection, etc.) and writing skills. Loh et al. (2016) argue that if one indulges in shallow information processing, there is a risk that these skills and their corresponding brain structures will not develop properly. Studies aiming to test whether typing or writing has an impact on how information is learnt showed that writing by hand leads to higher performance in terms of language acquisition and reading (Kiefer, 2015).

Other studies have shown that the characteristics of the learner, such as one's cognitive style, prior knowledge on the topic and motivation, can mediate the effect of internet use on cognitive development (Niederhauser, 2000; Shapiro, 2004), even potentially increasing learning performance. On the other hand, internet users tend to engage in multitasking, which has been shown to be associated with increased distractibility, decreased classroom learning and lower academic performance (Loh, 2016).

On the positive side, for certain population groups such as the elderly, the internet can lead to improved cognitive skills by giving them easier access to a means of cognitive training (Klimova, 2016). For younger audiences, specific formats of online text presentations can lead to better reading, comprehension and academic performance (Walker, 2005). Johnson (2006) postulates that playing online video games can result in improvements in visual memory, attention and simultaneous processing, whilst web browsing can enhance the user's visual perception, knowledge base, language related skills and meta-cognitive abilities through the development of search strategies. Additionally, social media users may develop better social competencies, even if communication in online environments involves social cues that are different from those present in real life (Mills, 2016).

3.2. Changes in cognitive ability over time

There is a methodological difficulty with regards to evaluating which kind of cognitive abilities are most important (Heersmink, 2016). It can be argued that in an information society, having the skills to navigate, evaluate, compare, and synthesise information online is more valuable than being able to store such information in one's biological memory. However, the tasks we face in a decade from now may be drastically different to those we face today, and one needs to have the ability to develop the skills that may be required in the future. There is a friction between a cultural-historical approach to cognition, whereby one is sensitive to changes in the environment and accepts cognitive changes as an adaptation mechanism, and a biological approach, where these changes are seen as detrimental, for example the notion that such changes are to blame for the loss of certain skills.

It is difficult to assess harmful effects of information and communication technologies because of their multifunctional character. Different functions and uses of the same technology do not have the same potential benefits or the same harmful effects, and it is inappropriate to generalise their impact on cognition (Heersmink, 2016). Moreover, different designs of internet technology (for example web pages and texts) can have different effects on learning and cognitive development, and as stated, individual differences can also play a role in whether cognitive development is impaired or aided. Therefore, there is considerable complexity and uncertainty regarding the impact of internet use on cognitive development and functioning.

Based on current evidence, it seems reasonable to conclude that internet use can have both positive and negative effects. Nevertheless, caution is advised before giving children extensive access to the internet at a young age, as well as before utilising the internet as a key learning instrument in a child's education, as there is some evidence to suggest that the cognitive development of some children may

be harmed by prolonged internet use. Overall, more research is needed to draw more precise conclusions.

4. Information overload

The concept of information overload did not begin with the internet and can actually be traced back to literature from the 19th century, although with the internet the concept has gained a contemporary meaning. Information overload has also been described as 'info-stress', 'information obesity' and 'information fatigue syndrome' (Oppenheim, 1997). Simply put, it is the condition of being unable to adequately understand an issue or to make effective decisions due to having too much information. A comprehensive definition suggested recently by Roetzel (2019) reads:

> *Information overload is a state in which a decision maker faces a set of information (i.e. an information load with informational characteristics such as an amount, a complexity, and a level of redundancy, contradiction and inconsistency) comprising the accumulation of individual informational cues of differing size and complexity that inhibit the decision maker's ability to optimally determine the best possible decision. The probability of achieving the best possible decision is defined as decision-making performance. The suboptimal use of information is caused by the limitation of scarce individual resources. A scarce resource can be limited individual characteristics (such as serial processing ability, limited short-term memory) or limited task-related equipment (e.g. time to make a decision, budget).*

Whilst no reliable data could be found regarding information overload in Europe, a survey in the United States found that 20 % of respondents reported feeling overloaded with information (Horrigan, 2016). Another U.S. report found a much higher prevalence within young people (18-32 years), with 41 % reporting that they suffer from information overload, compared to 31 % for older generations (Cornerstone OnDemand, 2013). Information overload stemming from communication can be the result of a permanent influx of messages, emails or information, which happen in the background of the individual's tasks. This form of information overload is perhaps the most frequent and can derive from both a high influx of business emails and social media use (Bawden, 2009; Sasaki, 2015).

4.1. Objective and subjective factors of information overload

Eppler et al. (2004) classify the determinants of information overload as the information itself (quantity, frequency, intensity, and content characteristics), the tasks to be performed, characteristics of the person, organisational elements and the information technology involved. Other authors argue that information overload can be classified into two different groups of elements. The first includes the complex and ambiguous character of information (Li, 2017), the diversity of formats and perspectives according to which information is delivered (Bawden, 2009) and the quantity and quality of information (Eppler, 2004). The second group is linked to information processing styles, the motivation to process the information (Li, 2017) and the time available (Eppler, 2004). According to Kirsh (2000), cognitive overload also occurs when information overload is combined with multitasking and interruptions.

Roetzel (2019) elaborates on these concepts by proposing three different trends or viewpoints that been have presented in the last decade or so within information overload literature: 1) information overload can be considered a design issue arising from the misuse of computers and information systems, to which the advancement of 'intelligent' information systems may offer relief, however this would also require users to simultaneously adapt to such systems; 2) one may consider information overload as a virus and the spreading of a disease, as users propagate the sending of messages and notifications to other users, which additionally impacts on working behaviour; and 3) information overload may be circumvented or relived by three different approaches, namely: human-centric

approaches (e.g. time management or withdrawal strategies), information processing approaches (e.g. reduction in complexity or mass of information by better email management) and technology centred approaches (e.g. filter algorithms).

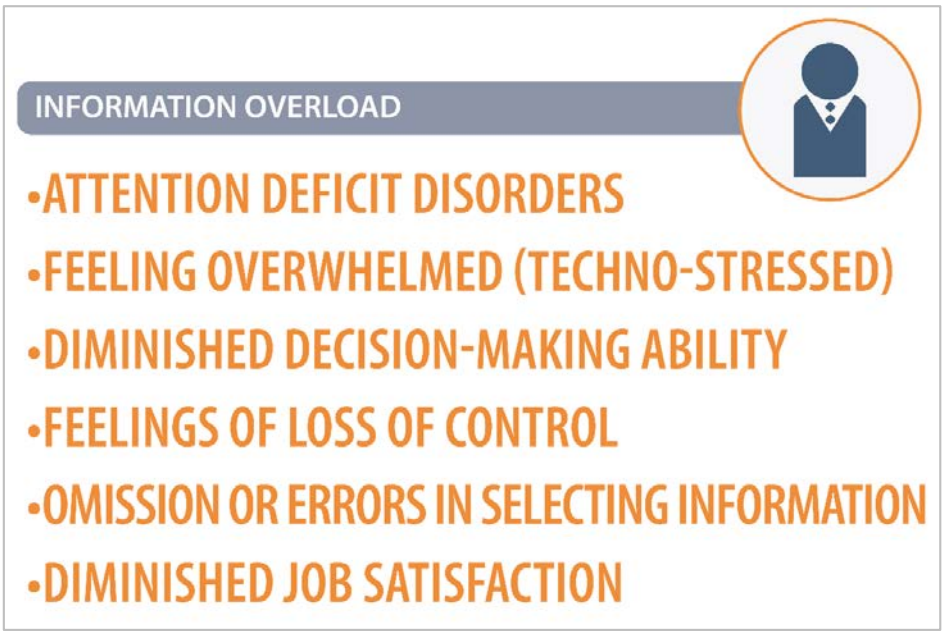
Sasaki et al. (2015) have shown that having a higher number of contacts on Twitter increases the risk of information overload. For example, if one has more friends online, this means that one also has more people and more sources of information to keep up to date with. The way that social media services are premised on the idea of a continuous stream of news and other content to keep up with can also be seen as causing an overload.

4.2. Negative effects associated with information overload

Information overload frequently results in omission (i.e. in selecting information for cognitive processing, one passes over the more difficult aspects, even when they are relevant) or error (Vickery, 1987). Information overload is also associated with a loss of control and a feeling of being overwhelmed (see Figure 7). This perception of overload is linked to 'techno-stress', since it induces a perception that one is being controlled by technology. Information overload can also lead to continuous partial attention, for example a focus on being in touch and connected that can cause stress. It can also lead to attention deficit disorder, such as distractibility and impatience as a result of too many mental stimuli. Carlson (2003) argues that information overload can cause diminished decision-making abilities and poor judgement skills, whilst Bawden et al. (2009) show that information overload can also result in decreased job satisfaction.

As Roetzel (2019) mentions, different strategies can be implemented in order to combat information overload. For example, one can minimise the number of information sources by adopting filter strategies. One can also adopt a strategy of defining in a rational manner the levels at which one has just enough information to make a decision. Technologies – such as artificial intelligence – that help to improve the selection, organisation and processing of information can also be employed. Fundamentally, however, cultural changes may be needed to address the way in which people produce and communicate information on a daily basis.

Figure 7. Potential negative effects associated with information overload



Flayelle et al. (2019) call for greater recognition of the complex nature of information overload and emphasise certain intervention measures that should be considered. The authors also convey the idea that the medium of the internet should not necessarily be the sole focus in determining the cause of information overload (Kumar, 2017), as this is rather simplistic and does not recognise the fact that underlying psychopathological factors, such as anxiety and depression, may precede or predispose individuals to problematic internet use and information overload.

5. Negative effects on public/private boundaries and spheres of living

The spheres of living are the activity domains in which people segment their lives (Van Dijk, 2012). They traditionally include spheres of work, home, travel and leisure, as well as a distinction between the private and public spheres. The spheres of living are traditionally bounded by time and space. Work traditionally occurs in a workplace and during fixed working hours, and home life, leisure time and travel similarly have their own time and space. However, the internet and mobile media can blur these boundaries, given that any activity can now be performed in any place and at any time.

The internet has the ability to permeate private spaces due to the fact that it serves as a platform for information, communication and services that people consider, or previously considered, private. More people are now sharing personal information on public platforms like Facebook and Twitter, meaning that our private lives are increasingly open to the public and our expectations about what others can know about us are constantly changing. For example, employers now are able to know much more about their current or potential employees. In addition to concerns about data mining, surveillance and targeted advertising by governments and corporations, the blurring of our public and private lives also raises the possibility of more prosaic, but still significant, harm.

5.1. Potential negative effects

Briefly, a number of potential negative effects can be highlighted (see Figure 8). Firstly, we should consider how the internet exacerbates the problem of competition for our limited attention and engagement when spheres blur into each other, such as when work bleeds into domestic life (Brey, 1998). Secondly, assuming that certain shifts in these boundaries are inevitable, one potential harmful consequence is the difficulty in transitioning from one conception of the public/private distinction (or the spheres of living) to another, with all the changes in behaviour and expectations that such a transition entails.

The internet and social media have created forums for presence competition that are both novel and potentially harmful. The clearest case of presence competition occurs when internet technology allows for the blurring of work and home life. A person who works from home is, in some sense, always in his or her office. This is especially true as more and more people are employed in the 'sharing economy' made possible through digital platforms, with jobs like this potentially demanding a convergence between work and leisure time. The number of such independent workers is increasing, both in terms of those working independent jobs full time (35+ hours/week) and those using these 'gigs' to supplement other full-time positions (MBO Partners, 2017).

However, in addition to these economic concerns, there are worries concerning the social and cultural effects of such work. For example, a person cobbling together full-time work from a number of independent sources may not be able to take weekends off. Whilst this cost may be balanced by the

benefit of greater independence, it may nonetheless interfere with the person's ability to socialise with traditionally employed friends, or with their ability to spend time with family. Even more problematic is the increasing number of people who are supplementing their full-time jobs with occasional gig work, thereby diminishing their leisure time. A substantial minority (at least 13 %) of independent workers in the United States are currently in this position (MBO Partners, 2017).

In addition, the internet and social media can invade our private lives in unwelcome and harmful ways. McDonald et al. (2016) describe how employers can use Facebook and Twitter to gather information about prospective employees that in the past would have been unavailable, and in some cases may be illegal to ask about. Such profiling is just one example of how social media opens 'new terrains' for employees and management to contest their respective interests.

Another area of concern about the blurring of public and private spheres is safety and security, especially with regards to children. As internet and social media use increases amongst younger cohorts, primarily for the purposes of socialising and entertainment, children are beginning to enter the public sphere earlier. In particular, there is concern that greater information and communication technology use is leading young people to engage in consumer spending, public identity creation and the acquisition of sexual knowledge and experience much earlier (Livingstone, 2005).

Finally, many concerns have been raised relating to the phenomenon of publicly shaming strangers online for their private behaviour (Ronson, 2015). It is increasingly feasible that a tweet or a Facebook post has the potential to seen by thousands or even millions of users, whilst there appears to be widespread agreement that public shaming as a form of social punishment is morally problematic (Radzik, 2015).

Figure 8. Potential negative effects of internet use on public-private boundaries

6. Negative effects on social relationships and communities

One potential negative effect of increasing internet use is that it will undermine and degrade social relationships and reduce the quality of social interaction. Early critics worried that increased internet use would lead to diminished participation in various local community organisations, resulting in the deterioration of these communities (Kraut, 1998). A community refers to any group of specific members who have formed networks of personal relationships by means of shared history, values, and norms (e.g. social clubs, neighbourhood associations, office sports teams, volunteer organisations, etc. (Brey, 1998).

Concerns about how communities could be harmed by increased internet use seem to have changed throughout the decades, as technological change has eased some worries, deepened others and raised new ones. More recent assessments of the internet's effect on communities are generally more specific, issue-focused and empirically driven, with many aiming to discredit the monolithic treatment of online sociality and internet users as a group (Haythornthwaite, 2006) and the equally artificial dualistic utopian-dystopian descriptions of the internet's effects (Williams, 2006).

Of course, potential negative effects on social relationships and communities must be balanced against corresponding benefits. It may be that internet use allows people to improve their existing relationships, either by providing the forms of sociality that offline contact does not or by enabling ways of maintaining relationships that are not possible offline (e.g. regularly Skyping with family). Similarly, it may be that the internet can be used to form new relationships, either online relationships only or relationships that have significant online and offline dimensions (mixed relationships). Sabatini et al. (2014) show that social networking sites provide a number of relationship-promoting services, including promoting offline meetings.

6.1. Withdrawal, replacement, and degradation

There are three potential aspects regarding threats to social relationships and communities due to increased or excessive internet use: i) withdrawal from social relationships/communities; ii) replacement of relationships/communities with less valuable alternatives; and iii) internet use leading to social relationship degradation (depicted in Figure 9).

Withdrawal

Withdrawal from one's valuable relationships or communities is likely to be harmful whatever the cause. The present concern is that internet users will engage less with family, friends, co-workers and others. Early critics of the internet worried that the internet would, like TV a generation before, cause people to be less social across the board (Bargh, 2004). However, the harm of withdrawing from relationships or communities depends, in part, on the value of what replaces the social engagement.

A concern is that, as users spend more time online, they will neglect existing social relationships and be less likely to form new relationships. For example, users might, due to their (excessive) internet use, act in ways that actively damage the relationship, e.g. an excessive consumption of pornographic material might cause damage to one's marital or intimate relationship. Alternatively, one might neglect the necessary maintenance of the relationship due to internet use. This would constitute a significant harm because these relationships are irreplaceable contributors to human wellbeing and may ultimately result in a less meaningful and less valuable social life (Helm, 2017). The present move towards identifying and studying particular at-risk groups is increasingly important, given that vast majorities of the population in many developed countries regularly use the internet (Pirannejad, 2017).

Replacement

As internet technology improves, online spaces will partially replace offline spaces for socialising and interacting. Early studies suggested that internet use replaced watching TV (Bargh, 2004) but there is also some evidence that online activity is substituting for, or competing with, face-to-face interaction (Baek, 2013; Taghavi, 2016) and that online interactions tend to replace offline experiences (Brey, 1998). This is a difficult claim to assess empirically because it requires knowing which of a person's previous leisure activities are being replaced by time spent online, which is something that we cannot be clear about (Haythornthwaite, 2006). Another hypothesis is that time online actually coincides with other offline activities (e.g. we surf the web or check Facebook whilst doing other things).

Some researchers underline the relatively low 'bandwidth' of online communication, i.e. its ability to communicate detail, nuance and important social cues found in face-to-face offline communication (Bargh, 2004; Dreyfus, 2009).

Figure 9. Potential negative effects of internet use on social relationships and communities

Others have claimed that richer forms of internet sociability make the replacement of offline relationships with online or mixed relationships less harmful (Søraker, 2012). Overall, there is some evidence that the replacement of offline social relationships by online social relationships is beneficial, although the overall effect this has on the quality of social relationships in general is unknown.

In terms of community, many social practices and institutions are partially migrating to the internet. Commerce, for example, has moved online in part, with many people and businesses now making use of e-commerce. This has had consequences for inner cities and neighbourhoods, where many local shops have had to close down. More and more professional interactions take place online, as do some leisure activities such as playing games with others and discussing and engaging in one's hobbies. These developments unavoidably put pressure on offline communities and may lead to their partial replacement or degradation.

Nonetheless, one study shows that internet use can both displace and augment social engagement in rural communities (Chew, 2011). There is also evidence that the internet is, to some extent, replacing family, school, neighbourhoods, friends, and workplaces as venues for meeting romantic partners (Rosenfeld, 2012), and the effects of this are not obviously negative (Cacioppo, 2013).

Degradation

A third threat of internet use concerns the potential degradation of one's offline or mixed social relationships and communities.

General sociability

There is a considerable amount of evidence linking internet use, particularly social media use, to loneliness and social isolation (Primack, 2017a). For example, Primack et al. (2017a) showed that young adults (19-34) who spent more time online are twice as likely to feel socially isolated than those who spent less time online. As already mentioned, this phenomenon might be explained through the replacement of face-to-face interaction with social media (Baek, 2013). Another possible explanation is that viewing others' highly curated online profiles makes users dissatisfied with their own lives and relationships. In either case, there are at least indirect links between time spent on social media and increased symptoms of depression and anxiety, possibly mediated by loneliness and social isolation (Andreassen, 2016; Primack, 2017). On the other hand, it should be mentioned that – when used as a tool to establish new relationships or deepen existing connections – use of the internet can actually help to combat loneliness. In adults >50 years, internet use can enhance quality of life by reducing loneliness (Khalaila, 2018). In this way, social internet use and loneliness consists of a dynamic, bidirectional relationship, determined by individual behaviour (Nowland, 2017).

Romantic relationships

The harm that internet use causes to romantic relationships is best documented in relation to pornography. Given the number of internet users that regularly watch pornography – in a 2014 survey, 46 % of men and 16 % of women aged 18-39 reported watching pornography in the previous week (Regnerus, 2015) – the potential harm caused by pornography deserves consideration. Pornography use has the potential to harm relationships in a variety of ways. Owens (2012), notes that adolescents who watch pornography have lower degrees of social integration, more delinquent behaviour and decreased emotional bonding with caregivers. Perry (2017) provides data supporting the common assumption that pornography use by male partners (especially married ones) reduces marital quality over time. Indeed, his evidence suggests that pornography use is amongst the strongest predictors of decline in marital quality.

Impoverished communication

As with social relationships, a central concern is that the internet is an impoverished environment for communication, especially emotional communication, and that relationships are harder to build online. If this is the case, affective ties will be more difficult to forge and online relationships will be harder to form and maintain (Haythornthwaite, 2006). Such a conclusion is also supported by studies showing that mixed communities – those with both online and offline components – promote trust between their members, and that the offline dimension of these social networks contributes to a reduction of sociability problems and thereby promotes knowledge sharing (Matzat, 2010).

Incivility

A phenomenon of increasing concern is the apparent rise in incivility online, especially on social media. Incivility is especially problematic if, as evidence suggests, it is becoming the status quo in online political communities (Antoci, 2016; Duggan, 2017). Rösner et al. (2016) found that exposure to uncivil comments on a news article is associated with increased hostile cognitions in the reader. Groshek et al. (2016) identify what they call the 'mobile online disinhibition effect' as a potential threat to our sociality in the public sphere. They show that participating in online discussions via a mobile device predicts impoliteness, though not incivility. In addition, they show that Twitter users are more likely to retweet others' posts when the content of the tweet is uncivil.

Malicious online social behaviour (online harassment, cyberbullying, cyberstalking, online predation)
The internet is home to a wide variety of online behaviours that involve malicious intent. Online harassment constitutes a broad category that covers most of the others. It is the act of sending offensive, rude and insulting messages to online recipients. Such acts can take place through email, chat and other forms of communication, but also through actions such as doxing (the collection and distribution of confidential or hard to retrieve personal data from an individual), revenge porn, online shaming, online sexual harassment, targeted hate speech and the targeted sending of viruses.

Cyberbullying is any form of repeated online harassment that involves sending or posting mean or cruel messages to people, either by individuals or by groups, usually on social media and often anonymously. Cyberstalking is the anonymous use of the internet to pursue, intimidate and harass another person in a systematic way, through threatening messages, spamming or other means. Online predation is child sexual abuse that begins or takes place on the internet, and is a form of cyberstalking that involves an adult and a minor.

7. Policy options

National health authorities are expressing concerns about the potential negative effects of internet use (Lord's Select Committee on Communications, 2017) and some governments are becoming increasingly interested in implementing policies aimed at curbing problematic internet use (Király, 2018; Fineberg, 2018). Policymakers could even make the case that some harmful activities go beyond mere generic social harm and are now issues that threaten social stability, democracy and the well-being of a significant percentage of the population.

Policy options presented in this in-depth analysis are summarised in Figure 10 under five themes. It should be remarked that for some of the negative effects identified in this report there is uncertainty regarding their scale. In addition, there is also a lack of longitudinal studies that would allow for observations on long-term changes and effects. As such, further research is needed to address these lacunae. An integrative approach, creating cohesive and comprehensive regulation by simultaneously applying multiple policy responses to target different issues – such as prevention, education, regulation, harm reduction, encouraging better technology and promoting more research – is assumed to be the most efficient approach.

Theme 1: Prevention and health promotion – reducing risk and harm
Policy option 1. Initiate information and prevention campaigns.
Policy option 2. Increase education regarding internet use and its consequences.
Policy option 3. Stimulate employers to develop policies that protect workers against harmful work-related internet use.

Theme 2: Providing support services
Policy option 4. Strengthen the health and social services support available for internet users that engage in harmful use.
Policy option 5. Support communities and networks affected by individual online users.

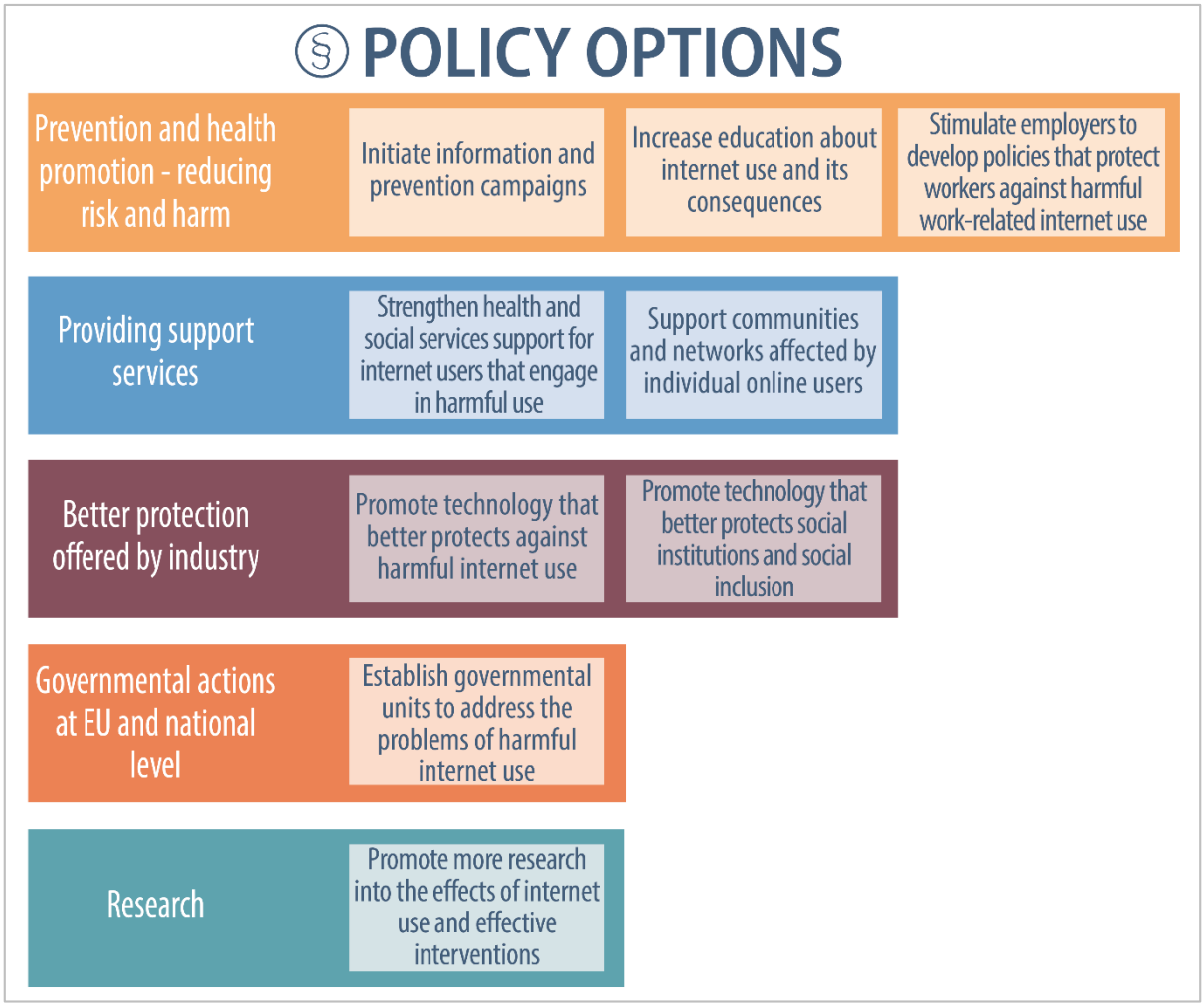
Theme 3: Governmental actions at EU and national level
Policy option 6. Establish governmental units to address the problem of harmful internet use.

Theme 4: Better protection offered by industry
Policy option 7. Promote technology that better protects against harmful internet use.

Policy option 8. Promote technology that better protects social institutions and social inclusion.

Theme 5: Research
Policy option 9. Promote more research into the effects of internet use and effective interventions.

Figure 10. Policy options



Theme 1: Prevention and health promotion – reducing risk and harm

Preventative and educational campaigns have a wide audience reach and can be implemented in conjunction with active treatments. Prevention can be considered in terms of outcome, i.e. preventing onset, reducing incidence or reducing impact (Caplan, 1964), as well as in terms of the targeted population, i.e. universal, selective or those at risk (Gordon, 1983). Multi-system approaches incorporating schools, parents, the community and others may be the most effective effort for prevention (Rutter, 2016). It is also important to realise the potential that parental guidance can have, as well as the important role that scientific and public health organisations can play (Gentile, 2018).

Policy option 1. Initiate information and prevention campaigns

Information campaigns can create awareness and help users to develop skills that prevent harm. Such campaigns have already been run in several Member States and non-EU countries, including

campaigns against cyberbullying, sexting and internet addiction, as well as campaigns for better internet security practices, for recognising and dealing with online sexual predators, for safe internet use by children and for recognising fake news.

A systematic review of the prevention of internet addiction (Vondráčková, 2016) showed that some target groups in particular – such as adolescents, college students, parents and individuals in the environment of those affected, as well as employees with regular access to the internet – may benefit from prevention campaigns that focus on psychopathological factors, personality characteristics, physiological characteristics and patterns of internet use. Additionally, more evidence-based programmes are needed to guide future action (Throuvala, 2019).

In relation to this, various features are designed to allow parents to set controls for their children's computer, including: i) limiting access to specific content, specific websites or software; ii) setting specific time limits that prevent logging on during certain times of the day (e.g. after 8 pm); and iii) monitoring online activity when using the device. Such parental control features are available on most video game platforms (Király, 2018). The use of parental controls is largely up to the parents, however government regulation could influence the availability of such controls – for example by forcing providers to install controls in all of their gaming products – whilst state financed campaigns could raise awareness amongst parents regarding the usefulness of such features (Király, 2018).

Internet addiction and information-related stress could be publicly recognised as disorders, so as to encourage citizens to seek help. Using information and educational approaches can stimulate self-regulation by internet users who can regain control of their internet consumption without requiring the assistance of health professionals. Similar campaigns could be developed to raise awareness of other harmful aspects related to internet use.

Policy option 2. Increase education regarding internet use and its consequences

Actions related to this option could include: i) education in schools on digital literacy ii) education on the technical aspects of the internet, and the way it is used by different user groups and for different purposes; iii) education on the social consequences of the internet, as well as education on the way in which the internet can benefit and harm both individuals and society; iv) self-aware internet use: developing skills and practices for responsible internet use that can reduce the potential harm to one's own wellbeing, as well as harm to others.

As well as educating students on the effects of internet, schools can take measures to identify harmful internet use by pupils. One example is the ban on smartphones and other kinds of internet-connected devices – such as tablets – passed in 2018 by lawmakers in France that applies to schoolchildren between 3 and 15 years of age (Smith, 2018). French high schools, or lycées, with students 15 and older will get the opportunity to choose whether or not to adopt the phone ban for their pupils. Schools can also take measures to assign mentoring roles to teachers and staff regarding these harmful effects, as well as offer social services support. They can also instigate and enforce codes of conduct. Secondary schools in Britain are also introducing strict new bans on mobile phones where all pupils aged up to 16 must lock them away for the entire day (Hymas, 2018). However, in Canada there is a different approach to the issue: after years of trying to ban mobile phones, many schools are now trying to make them work in the classroom. Canada's largest school board reversed a four-year ban on phones and now allows teachers to dictate what works best for their classrooms. This approach can work, but it is essential to have guidelines in place around the use of technology (McQuigge, 2017).

Policy option 3. Stimulate employers to develop policies that protect workers against harmful work-related internet use

Employers have a major role in shaping internet use. Work-related internet use has been cited as the major source of information overload, and a major barrier to maintaining private-public boundaries. Moreover, it can also be a source of online harassment and is one of the causes of internet addiction. Public policy could address this issue, and already is addressing the issue in some Member States. For example, in 2017 France implemented the 'right to disconnect' law which gives workers the right to ignore work emails outside of typical working hours, as well as requiring French companies with more than 50 employees to draw up policies with their workers regarding limiting work-related technology usage outside the office. This law was drawn-up due to the perceived need to limit information overload and enable workers to better set the boundaries between their work and home life. It should be noted however that this law has proven difficult to be put into practice. This suggests that voluntary initiatives may also be needed to support, or even replace, legal requirements.

As well as policies that address information overload and the maintenance of private-public boundaries, policies that either require employers to adequately protect workers against online harassment, or that promote the recognition of and support for internet addiction can also be introduced. Codes of conduct for internet use could be a part of such policies. In addition, companies could also be required to review the technology that they provide for their staff to help them manage their internet and information consumption, as well as to review the internet usage habits that they promote or discourage.

Theme 2: Providing support services

Policy option 4. Strengthen the health and social services support available for internet users that engage in harmful use

This option suggests providing support to health professionals so that they are properly equipped and able to recognise cases of harmful internet use. Internet addiction is currently not officially recognised as a mental disorder, though many health professionals have advocated that it should be (for comparison, gaming addiction was recently recognised as a disorder by the WHO). Clinical services for problematic internet use are available only in some EU Member States, and within the same country the therapeutic offer is fragmented from region to region. If internet addiction were to be recognised as a mental disorder, this would: i) enhance psychological and pharmacological treatment options ('digital detox') available to individuals affected by this condition (Winkler, 2013); ii) facilitate reimbursement by insurance companies; and iii) increase the screening that could be undertaken for children with preliminary symptoms of internet addiction. Additionally, information lines for questions about harms associated with internet use could also be an additional service that helps users deal with internet harm more adequately. Pro-active intervention could be provided by either non-governmental organisations, government bodies, or private services.

Policy option 5. Support communities and networks affected by individual online users

Educational, social and clinical support could address individuals in the immediate context of problematic users (i.e. parents, siblings, partners, friends, peers, etc), although this would require training resources for educational and healthcare professionals. Family members, friends, clubs, and communities in which people operate all have a potential role to play in encouraging or discouraging harmful internet use. Policies can target these stakeholders and motivate them to take effective action to discourage harmful internet use.

Theme 3: Governmental actions at EU and national level

Policy option 6. Establish governmental units to address the problem of harmful internet use

All the policy options suggested here require policy interventions at different levels. European institutions have a major role to play given the international nature of matters linked to the internet. The mission of the European Commission's DG Connect is to foster a modern, secure, open and pluralistic society through the use information and communication technologies. Therefore, DG Connect could create units with specific initiatives that focus on the individual, social and cultural harms of the internet. Also, DG Research and Innovation could institute research programmes on harmful aspects of the internet, whilst other DGs that could establish actions on internet harm include the DG for Education, DG Employment and DG Justice. Similar units could be created at ministerial level for each of the 27 EU Member States.

Theme 4: Better protection offered by industry

Policy option 7. Promote technology that better protects against harmful internet use

This policy option requires technology companies to introduce design features, products and services, as well as corresponding user policies, that enable internet users to avoid usage patterns that cause harm to their health and wellbeing. Often, this means modifying products and services so that the harmful effects to users are reduced or eliminated, whilst sometimes it also means introducing new products and services that enable users to protect themselves. As detailed in the UK Parliament's report 'Growing up with the Internet', such minimum standards should also include the requirement that these technologies always apply by default the strictest privacy settings available (Lord's Select Committee on Communications, 2017).

Some further examples are as follows:

- Technology companies could be required or encouraged to equip their products with settings that measure internet use, notify users when usage patterns exceed agreed norms and include options for limiting or shutting down functionality when norms are exceeded, or impose such limits in certain settings or during certain hours of the day. Reward systems that encourage addictive behaviour could also be prohibited or discouraged (Yousafzai, 2014; Király, 2018).
- Technology companies could be required to include solutions that address information overload, for example ones that partially automate information processing, or that limit exposure to information at inconvenient times and places.
- Technology companies could be required to introduce solutions that help users to maintain increased control over private/public boundaries and boundaries between spheres of life. For example, this could be achieved through the user receiving automated notifications when these boundaries are threatened – based on previously stated preferences – or through features that allow for particular functions of smartphones and tablets to be automatically switched off at certain times or at certain locations.

Policy option 8. Promote technology that better protects social institutions and social inclusion

This policy option encourages tech companies to introduce products and services that better protect social institutions, equality and social inclusion. A number of tech companies have already started to realise that technology and services have a major societal impact, and have begun to acknowledge that they have a corporate social responsibility to address societal harm. For example, some tech companies have started combating online harassment, filter bubbles and political manipulation of social media.

Regarding further prevention and harm reduction policy, increasing the price of video games could be an option. A higher retail price or monthly subscription fee for playing video games online could potentially lead to a general decrease in the number of gamers. This could be initiated either by the gaming companies themselves or by legislative authorities, through the imposition of higher taxes on either video games in general or specific games that show a major addictive potential (Kiraly, 2018).

Theme 5: Research

Policy option 9. Promote more research into the effects of internet use and effective interventions

Despite an increasing number of studies discussing the harmful aspects of internet use, a lot of research is still needed. It is important for standardised measures to consistently assess the problem and to be able to compare it in terms of treatment success, as well as to enable treatments to be compared in terms of outcomes. Key research priorities to advance the understanding of internet use and problematic internet use are: i) Reliable consensus-driven conceptualisation of what problematic internet use is (defining main phenotypes, related comorbidity and brain-based mechanisms); ii) Assessing instruments that help to screen, diagnose and measure problematic internet use; iii) Characterising the impacts of different forms of problematic internet use on health and quality of life, with follow up studies; iv) Reducing obstacles to timely recognition and interventions; v) Clarifying the possible role of genetics and personality features in different forms of problematic internet use; vi) Considering the impact of social factors in the development of internet use; vii) Generating effective interventions to prevent and to treat problematic internet use, identifying biomarkers (including digital markers) to improve early detection (Fineberg, 2018).

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The past few decades have been characterised by political endeavours to maximise internet access throughout the European Union, in particular through the development of the digital single market. However, it is being increasingly recognised that the internet, in spite of all its benefits, can also have significant negative effects on individuals and wider society.

This analysis reviews a selected number of potentially negative effects of internet use, namely: internet addiction, harm to cognitive development, information overload, harm to public/private boundaries and harm to social relationships and communities.

Reflecting on these, policy options are presented for the prevention and mitigation of these effects.

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