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The Internet, Cognitive Enhancement, and the Values of Cognition

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Abstract This paper has two distinct but related goals: (1) to identify some of the potential consequences of the Internet for our cognitive abilities and (2) to suggest an approach to evaluate these consequences. I begin by outlining the Google effect, which (allegedly) shows that when we know information is available online, we put less effort into storing that information in the brain. Some argue that this strategy is adaptive because it frees up internal resources which can then be used for other cognitive tasks, whereas others argue that this is maladaptive because it makes us less knowledgeable. I argue that the currently available empirical evidence in cognitive psychology does not support strong conclusions about the negative effects of the Internet on memory. Before we can make value-judgements about the cognitive effects of the Internet, we need more robust and ecologically-valid evidence. Having sketched a more nuanced picture of the Google effect, I then argue that the value of our cognitive abilities is in part intrinsic and in part instrumental, that is, they are both valuable in themselves and determined by the socio-cultural context in which these cognitive abilities are utilised. Focussing on instrumental value, I argue that, in an information society such as ours, having the skills to efficiently navigate, evaluate, compare, and synthesize online information are (under most circumstances) more valuable than having a lot of facts stored in biological memory. This is so, partly because using the Internet as an external memory system has overall benefits for education, navigation, journalism, and academic scholarship.

Keywords Internet · Google effect · External memory · Cognitive enhancement · Cognitive technology · Values and information technology · Information ethics

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1 Introduction

The Internet is one of the most powerful and ubiquitous cognitive technologies,[1] making information accessible in a way not seen before in human history. It thereby transforms our memory practices and perhaps constitutes a new epoch of external memory systems. However, various theorists have recently expressed their worries about the undesirable effects of the Internet on cognition (in general) and memory (in particular). Carr (2011), for example, argues that the Internet diminishes our ability to read, remember and concentrate. Like Carr, Greenfield (2014) argues that using search engines and online information makes us more superficial thinkers and cognitively lazy. Some of their critique draws on empirical research in cognitive psychology, showing that when we know information is easily available in some external media, we put less effort into storing that information in biological memory (Sparrow et al. 2011). Instead, we develop ways to remember where information is stored rather than its precise content. Thus, reliable access to online information, the argument goes, results in storing less facts in our biological memory systems, thereby making us less knowledgeable. Given the large number of people across the globe that consistently use the Internet, this is an important phenomenon to better understand, not just for individual Internet-users, but also for society at large.

The Google effect is extensively debated in popular media and the blogosphere. Surprisingly, it has not received much attention from philosophers, ethicists or other scholars in the humanities. The emerging field of Internet Studies, for example, focusses on legal, social, historical, economic, and ethical aspects of the Internet (Consalvo and Ess 2011; Dutton 2014), but has so far ignored cognitive aspects of the Internet. Studying cognitive aspects of the Internet, such as the Google effect, is thus a topic that would benefit and enhance not only Internet Studies, but also other fields like ethics of technology and cognitive science. This paper uses concepts from philosophy, ethics, cognitive science, and technology studies to better understand the cognitive relations between the Internet and its users, both from an individual and societal perspective. It aims to contribute to and is written for theorists in these fields and also for those interested in the cognitive studies of technology. The goals of this paper are (1) to provide a more nuanced view on the cognitive effects of the Internet and (2) to suggest an approach to help think about the desirability of these effects.

This paper has the following structure. In the first part of the paper, I begin by briefly describing the Internet and some of its relevant functional and informational properties. I then outline some of the critiques of the Internet and the empirical research in cognitive psychology on which it is based, arguing that we should not jump to conclusions and need more robust and ecologically-valid data. In the second part, I develop an approach to evaluate the effects of the Internet on memory and

[1] Cognitive technologies can be characterised as physical objects that are used to aid humans in performing cognitive tasks (Clark 1997; Brey 2005; Heersmink 2016). Examples include maps, diagrams, models, checklists, calendars, timetables, calculators, computer systems, and many other artifacts. The informational properties and functionalities of such artifacts are crucial for performing a wide range of cognitive tasks, including navigating, calculating, planning, remembering, decision-making, and reasoning.

cognition in terms of intrinsic and instrumental values of cognition. Focussing on instrumental value, I argue that, in an information society such as ours, having the skills to efficiently navigate, evaluate, compare, and synthesize information are (under most circumstances) more valuable than, for example, having a lot of facts stored in biological memory.

2 The Internet

The World Wide Web was invented by Tim Berners-Lee in 1989 at CERN in Geneva, initially to help scientists store and communicate data but soon developed into a global phenomenon we now know as the Web. The Web is an information space in which documents and other Web resources are identified by URLs, connected by hyperlinks, and accessed via the Internet, which is a global system of many interconnected computer networks. In this paper, I use the term "Internet" as a catch-all term for all the various applications that are built on top of the Internet, including the Web, which is currently the most popular Internet application. From a user-centered perspective, the most salient aspect of the Internet is the information it contains. This paper looks at the relation between human cognition and online information. Given this focus, at least three properties of the Internet are important to point out.

The first is that it "remediates" pre-existing media systems. Bolter and Grusin (1999) conceptualize remediation as the incorporation and *re*-representation of one medium in another. Over time, many pre-existing media systems have been absorbed by the Internet, including newspapers, scientific journals, TV programs, encyclopaedia, databases, archives, textbooks, maps, and so forth.[2] This has centralised information access in a way not seen before in human history, resulting in a new epoch of memory practices. It is safe to say that the Internet is currently the most ubiquitous cognitive technology and constitutes a significant part of our overall cognitive ecology[3] (Smart 2014; Smart et al. 2017). When analogue information is remediated and becomes part of a digital ecology, its affordances change. So the way we use and interact with digital information differs from the way we use and interact with analogue information. An online document, for example, has quite different search functions than its analogue counterpart, making it easy to find keywords or phrases.[4] As a result, we do not have to scan or read the entire text to find what we are looking for, in that way changing our reading practices.

A second property is that it keeps evolving, partly because its physical architecture changes in that new kinds of devices such as smartwatches, Google glasses, as well as smart objects and environments are added to the Internet, and

[2] Although these are available online and thus remediated, most of these also still exist independently of the Web, that is, in their original, un-remediated form.

[3] Floridi (2014) has argued that contemporary humans are "inforgs", that is, informational organisms who live in an "infosphere", an ecosystem of information. This infosphere is largely constituted by the Internet.

[4] Most digital texts have this functionality, so it is not unique to online information.

partly because these new devices allow users to interact with the Internet in novel ways. A recent development is the Internet of Things,[5] a view on the future of the Internet where objects, devices, cars, and buildings wirelessly communicate with each other, potentially creating a much larger ecosystem of information embedded in the environment (Greengard 2015). This will most likely make information even more easily accessible, which will have consequences for human cognition that are different than the one's the Internet currently induces. Having said this, it is also important to keep in mind that it is hard to predict what will happen in the future. 10–15 years ago it would have been difficult to predict that most people would carry a small interactive screen in their pocket, giving them access to almost all the information in the world. It is not unlikely that 10–15 years from now similar substantial changes will occur, but information technology develops so quickly that it is very hard to predict what will happen in the (near) future (Stahl et al. 2010a, b; Sullins 2012). The future of the Internet is thus largely epistemologically opaque.

A third property is its multifunctionality. In the metaphysics of artifacts, some philosophers argue that artifacts are characterised by their function and that they may therefore be classified on the basis of their function (Heersmink 2016). In Hilary Kornblith's words: "At least for the most part, it seems that what makes two artifacts members of the same kind is that they perform the same function" (1980, p. 112). A Website is a human-made structure and can be seen as an artifact, so its function is helpful to distinguish it from other Websites. One way to classify different Websites is thus to look at the functional role of the information they contain. From a user-centered perspective, Websites have many functions, including entertainment (e.g., online games), social interaction (e.g., Facebook or Twitter), selling products (e.g., Amazon or Booking.com), navigating (e.g., Google Maps), storage of factual information (e.g., Encyclopaedia Britannica or IMDB), and searching for information (e.g., Google or Wolfram Alpha). These functions are neither exhaustive nor mutually exclusive. For example, Booking.com's main function is to sell and manage hotel bookings online, but for those who have a profile, it also stores all previous bookings, in that way providing a kind of calendar or diary of one's past activities, which may aid one's memory. Thus one may find memory-aiding functions not only on online encyclopaedia and other Websites that are specifically designed to aid memory, but also on Websites where you do not expect it at first.

Due to the Internet's multifunctionality, it is difficult to make course-grained generalizations about its effect on memory and cognition. Online games, Facebook, Booking.com, encyclopaedia, and search engines, all influence memory and cognition, but do so in very different (and often unexpected) ways. In sum, the Internet has at least three characterising properties that distinguish it from other cognitive technologies: it remediates pre-existing media systems in that way changing their cognitive affordances, it keeps evolving and so its effects on memory and cognition keep changing as well, and it has a variety of functions, some of which are to aid memory and cognition.

[5] This view or design paradigm in computer science is also referred as "ubiquitous computing" or "ambient intelligence".

3 The Internet and Memory

3.1 The Google Effect

Throughout human history, when new cognitive technologies were introduced into society, they were initially often met with criticism. Socrates, for example, was rather critical about the effects of written language on memory. In Plato's *Phaedrus,* he says:

> For this invention will produce forgetfulness in the minds of those who learn to use it, because they will not practice their memory. Their trust in writing, produced by external characters which are no part of themselves, will discourage the use of their own memory (Plato 1925, p. 275a).

Socrates thus worries that writing makes us forgetful, because of a lack of practice of biological memory. Rather similar concerns have recently been expressed about the Internet. Carr (2011), for example, begins his critique by pointing out that there are important differences in the way the human brain and the Internet store information. An important property of human brains is that they continue to process information in memory long after it is received, integrating it with other relevant information stored in memory. So, Carr claims, biological memory is integrative, whereas computer memory is not integrative. An advantage of the integrative nature of biological memory is that it allows us to understand the relations between different items in memory and to build up an integrated corpus of knowledge about the world and one's past experiences. Consequently, Greenfield (2014) is critical about using Google and the Internet as an external memory system. On her view:

> If you can only remember the places to look for answers rather than the answers themselves, then even these dots will not be learned and therefore cannot be joined up with other dots to form an individual perspective of the world (2014, p. 221).

Carr makes a similar point:

> With each expansion of our memory comes an enlargement of our intelligence. The Web provides a convenient and compelling supplement to personal memory, but when we start using the Web as a substitute for personal memory, bypassing the inner processes of consolidation, we risk emptying our minds of their riches (Carr 2011, p. 192).

Both Carr and Greenfield thus claim that by using the Internet we store less information in our biological memory, in that way becoming less knowledgeable. Before further analysing these effects it is helpful to first look at the empirical research in cognitive psychology on which some of their criticism is based. Sparrow et al. (2011) performed a number of experiments where participants had to remember various trivia statements such as "An ostrich eye is bigger than its brain". The participants were told that these statements were sometimes stored in a

particular folder on a desktop computer and sometimes they weren't. Without going into the statistics and details of the experiments, the researchers conclude that:

1. When we do not know something, we are primed to use the computer to look it up;
2. When we know information is accessible externally, we put less effort into encoding it internally;
3. When we know information will not be accessible externally, we put more effort into encoding it internally and have better recall of that information;
4. When we know information is stored externally, we often know where it is stored but not the exact content of that information.

As the researchers point out, "these results suggest that processes of human memory are adapting to the advent of new computing and communication technology" (2011, p. 778). I agree and I think this is a valuable insight. Ever since computers and the Internet were invented we entered into a co-evolutionary process in which we adapt to the technology and the technology to us. Particularly with the advent of mobile computing technology did we increasingly incorporate online information into our memory practices.[6] Sparrow et al. further claim that "We are becoming symbiotic with our computer tools, growing into interconnected systems that remember less by knowing information than by knowing where the information can be found" (2011, p. 778). So the researchers who discovered the Google effect agree that using computers and information technology results in storing fewer facts in biological memory. However, they do not think this is maladaptive, which I will explain in more detail in the next subsection.

3.2 The Google Effect?

Whilst these cognitive consequences of external memory systems are referred to as the Google effect, it is noteworthy to point out that the experiments were neither done by using Google nor information on the Web, but by using information stored in folders on a computer in a psychology laboratory. I think it is very likely that using the Internet as an external memory system transforms our biological memory in important ways, but the experiments done by Sparrow et al. do not actually demonstrate such effects. Whether storing information in folders on a desktop computer in a psychology laboratory is relevantly similar to using the Internet in real-world situations as to justify the claims Sparrow et al. make about the Internet needs more justification. An inductive inference from their laboratory research to the cognitive effects of the Internet in the wild may or may not be true, but we need more empirical evidence to justify the inference. Essentially, the Sparrow et al. study examined how an agent's knowledge of the availability of trivia statements influences the recall of those statements. If the agent knows the trivia are available externally, then the internal recall of those statements is less good. This is important

[6] However, it is also important to keep in mind that our memory and cognition have been co-evolving with cognitive technologies for a long time (Donald 1991; Staley 2014). The Internet is just the most recent in a long history of cognitive technologies (Smart et al. 2017).

research but it does not seem to capture the richness and complexity of our cognitive interactions with the Internet. Using online information to complete our cognitive tasks such as, for example, using Google Maps to navigate, Wikipedia to answer a question, a train time table to plan your trip, an online recipe to make a meal, and weather radar to decide whether to bring an umbrella, are typically not trivia (nor trivial for the agent), but important for performing day-to-day tasks. The relevancy of information for performing everyday cognitive tasks is important for whether we store that information in biological memory. If information has real consequences (e.g., we get lost, wet, or are late for an appointment when online information is wrong), then it seems plausible that we put more effort into encoding it internally.

Moreover, whether these results generalize across cultures is not clear either. Heinrich et al. (2010) have criticised research in cognitive psychology and other behavioural sciences to be performed in WEIRD societies, that is, Western, Educated, Industrialised, Rich and Democratic societies. As there is a lot of variety across cultures, WEIRD societies tend not to be sufficiently representative for the human species. Sparrow et al's study was performed on 46 undergraduate students at Harvard University, a highly specific and intellectually elite segment of WEIRD societies. According to Internet Live Stats,[7] there are approximately 3.5 billion Internet-users worldwide. Of those 3.5 billion people, 0.9% are from Oceania, 9.8% are from Africa, 19% are from Europe, 21.8% are from North and South America, and 48.4% are from Asia. The majority of Internet-users are thus from non-WEIRD societies. Furthermore, due to cultural and political reasons, there are also differences in the kind of online information people have access to. In some countries, such as China, certain information is censored. So there is a digital divide between information haves and information have-nots (Hongladarom 2004; Sullins 2012), which is relevant for a global account of the cognitive consequences of the Internet.

My point is not that the Internet does not transform memory and cognition, rather my point is that the research on which Carr and Greenfield build some of their critique is not based on ecologically-valid data, but on experiments in highly controlled laboratory settings of which we do not know yet whether they are generalizable to the Internet within and between different cultures.

For those interested in the cognitive effects of the Internet, the ultimate goal should be to have robust empirical evidence (neurological, psychological and anthropological) on the way people with different cognitive profiles use the Internet and how that transforms their memory and cognition in different ways. There is a great diversity in people's cognitive profiles and there will not be one way the Internet effects our memory and cognition. How the Internet transforms our memory and cognition depends on aspects that influence our cognitive profile like, for example, age, gender, level of education, and socio-cultural background (Sassenberg 2013). It will, importantly, also depend on technological and informational properties of the Internet such as the accessibility and quality of online information. Before we jump to conclusions regarding the effects of the Internet on memory and cognition, we need more robust empirical and ecologically-valid data as well as

[7] http://www.internetlivestats.com/.

conceptual analyses about human–Internet interactions that take all these aspects into account (see also Nestojko et al. 2013). At this point, the currently available empirical evidence does not support strong conclusions. For similar views see Mills (2014) and Bell et al. (2015).

How is the desirability of the Google effect discussed in the literature? Some theorists, such as Wegner and Ward, are quite positive. They argue that "As we are freed from the necessity of remembering facts, we may be able as individuals to use our newly available mental resources for ambitious undertakings" (2013, p. 61).[8] Others are a bit more nuanced, pointing out both positive and negative consequences. In a recent overview paper on the effects of the Internet on brain and cognition published in *The Neuroscientist*, Kep Kee Loh and Ryota Kanai write "Relying on technology as an external memory source can result in reduced learning efforts as information can be easily retrieved later. This is not entirely maladaptive as we can strategically free up additional cognitive resources for other prioritized operations" (2015, p. 11). So, on Loh and Kanai's view, there are reduced learning efforts but also advantages such as freeing up internal cognitive resources. Yet others are rather sceptical and see mainly negative consequences. Carr (2011), for example, writes that using the Internet as an external memory system does not free up long-term memory because it is almost unlimited. On his view and echoing Socrates, "the Web is a technology of forgetfulness" (2011, p. 193), as it makes us cognitively lazy and less knowledgeable.

In response to these claims, it is important to point out that we do not use the Internet (with the intention) to free up internal resources. We use the Internet and many other cognitive technologies because our brains have limited memory capacities. Long-term memory may have "almost unlimited elasticity", as Carr (2011, p. 192) writes, but unfortunately that does not mean we can remember everything we want. Human memory is notoriously unreliable, particularly when it comes to details. We rely on the Internet and many other informational resources not so much because we want to, but because we have to. An important reason for using external cognitive recourses, such as the Internet, is that they have different informational properties than information stored in the brain, in that way complementing internally stored information (Levy 2007; Sutton 2010). Thus it is often because external information is more fixed and detailed than internal information that it provides the stability that cognitive systems such as ours need to function properly.

Moreover, it has not been empirically established that the Internet actually diminishes long-term memory. Sparrow and Chatman (2013a), in their target article in *Psychological Inquiry,* argue that repeated exposure to online information may still result in storing that information in biological memory. By comparison, doing an open book exam also has beneficial effects on the learner's retention of information and it is not unlikely that similar effects occur when using online information to answer questions or achieve some goal. Thus when I look up some fact on the Internet, such as how many people live in Sydney or at what time I need

[8] To be fair, this quote is from Scientific American, which is a popular science outlet and may therefore invite less nuanced statements.

to catch my train to the university, I may store that information in my biological memory so I do not have to look it up again. Which information is stored in long-term biological memory is a complicated process, depending on our degree of attention, the importance of the information for the task we are performing, and our interest in the topic. More empirical research is needed to better understand this topic in relation to online information.

In a closing defence of their target article, Sparrow and Chatman suggest that people are generally not having poorer memory. "Instead, people don't bother to remember information that is not personally relevant (such as trivia) when they can find it online at any time. We find this adaptive in this age of information overload" (2013b, p. 351). Using the Internet only to outsource personally irrelevant trivia indeed seems adaptive in our information society. But we also use the Internet for many other reasons, for example, we use Google Calendar to store our appointments, Google Maps to help us navigate, news Websites to stay informed, train timetables to plan our trip, social media to interact with others, and so on. The Internet is highly multifunctional and influences memory and cognition in various ways. These effects are not yet well understood. Empirical research should go beyond studying the effects of outsourcing the storage of trivia and should also study other cognitive uses of the Internet (see also Clowes 2015).

At this point, it is helpful to briefly introduce a distinction between different memory systems. Cognitive psychologists often distinguish between procedural, semantic, and episodic memory (Tulving 1993). Procedural memory concerns our implicit knowledge of how to perform certain tasks such as riding a bicycle or using a computer mouse. Semantic memory concerns our explicit knowledge of facts such as Canberra is the capital of Australia. Episodic or autobiographical memory concerns our explicit knowledge of past personal experiences such as graduating from university. Whilst procedural memory is important to be able to interact with the Internet by knowing how to click, type or swipe,[9] it is largely semantic memory with which the Google effect is concerned. Episodic memory is not addressed in the research performed by Sparrow et al. (2011). It is, however, important to point out that the Internet is increasingly influencing and transforming episodic memory. We post pictures and videos of our holidays and other personal experiences on social media such as Flickr, Facebook or Instagram; we create online travel blogs; use Google Calendar to store our appointments and other activities; and so forth. Interacting with this online information that we made ourselves often evokes autobiographical and sometimes emotional responses. To get a full picture of the cognitive effects of the Internet, we should include the relation between online information and episodic memory in our explanatory target.

As repeatedly pointed out throughout this essay, we need more empirical (and conceptual) research on what different aspects of the Internet do to and for our memory and cognition. Empirical research on the cognitive relation between the Internet and its users has only just begun, studying the relation between online

[9] Dourish (2001) argues that design paradigms in computer science should focus more on our embodied interactions with computer systems. The more computer interfaces mimic the real world, the more intuitive they are to use. This is partly so because our procedural memory systems have evolved to interact with objects and structures in the real world.

information and semantic memory (Sparrow et al. 2011), the relation between cognitive profile and smartphone use (Barr et al. 2015), the effect of Internet access on our willingness to answer questions (Ferguson et al. 2015), and how we sometimes mistakenly attribute cognitive ownership to online information (Fisher et al. 2015). This is valuable research, but we need more research on the relation between (a) aspects that influence cognitive profile such as age, gender, level of education, and socio-cultural background and (b) the functional and informational properties of the Internet.[10]

3.3 Information Access, Truth, and Bias

Up to this point, I tried to provide a more nuanced view on the effects of the Internet on memory and cognition, arguing that the situation is more complicated (and perhaps less dystopian) than Carr and Greenfield portray it. I do, however, acknowledge that there are some potential issues with relying on the Internet as an external memory system. First, the accessibility to online information seems different to the accessibility to internal memory. I am not referring to the difference between the phenomenology of introspection and perception, which does not seem that important to me, at least not from a functionalist perspective (but compare Walsh 2016). I am referring to the difference in reliability of access. We do sometimes forget to bring our mobile computing device, sometimes we have no network coverage, and sometimes we forget to charge it. There will inevitably be moments that we do not have access to the online world, due to technical problems. Access to biological memory certainly is not perfect either, but seems in general more reliable than access to the Internet.

Second, the quality of online information ranges from helpful facts to utter nonsense. Lynch (2016, p. 66) gives a striking example of how misleading online information can be. When you ask a question in Google Search, it provides a "featured snippet" at the top of the search results page. This snippet includes a summary of the answer, extracted from a Webpage as well as a link to that page. When Lynch Googled "what happened to the dinosaurs?", the snippet Google provided was:

> The Bible gives us a framework for explaining dinosaurs in terms of thousands of years of history, including the mystery of when they lived and what happened to them. Dinosaurs are used more than almost anything else to indoctrinate children and adults in the idea of millions of years of earth history.

For the uninformed and naive reader, this may look like a fact, but it is, of course, false, misleading, and even manipulative, as search engine optimisation strategies by creationists has led to this snippet being top-ranked for this question.

[10] For more conceptual research on Internet epistemology see, for example, Simon (2010), Fallis (2009) or Goldman (2008). For research on epistemology, cognitive enhancement and extended cognition, see Carter and Pritchard (forthcoming).

Third, Google's page ranking may not always be cognitively beneficial for its user, not only because it is relatively easy for individuals and organisations to manipulate page ranking in Google, but also because it potentially reinforces bias and thus threatens objectivity (Simpson 2012; Tavani 2012; Miller and Record 2013). When using Google Search, it personalises the ranking of the pages on the basis of one's prior search terms and other variables such as geographical location. Whilst some argue this is convenient, others point out that this might lead to confirmation bias and undermine users' access to objective information (but compare Smart and Shadbolt forthcoming).

These are pressing issues associated with using the Internet as an external memory system,[11] but there are ways to help deal with or circumvent these issues. To help deal with the second and third issue, we could start by informing users about these properties of the Internet so that they can make better informed decisions and use the Internet in a more cognitively responsible way. I think there is a societal responsibility here for academics to engage with the public and the media, as to inform people about these issues. Designers and policy-makers, too, have a role to play here. A research program in ethics of technology called "value-sensitive design" advocates that we should design and build information technology such that it is consistent with our moral and cultural values (van den Hoven 2007; van den Hoven and Manders-Huits 2009). Although epistemic values are typically not referred to in this research program, they are, of course, relevant as well. One way to embed epistemic values such as objectivity and truth into the infrastructure of the Internet, for example in Google Search, is not to completely disable personalisation (as to avoid paternalism), but to allow users to control the degree of personalisation, perhaps by allowing users to select certain modes of personalisation. Another potential solution would be intervention of law and policy-makers. Simpson (2012), for example, argues that because objectivity is a public good, the government should regulate search engines. Also, to avoid using manipulated featured snippets in Google, one can opt out, but this does require some investigative work on part of the user.

Lastly, there is a responsibility for educators to contribute to the digital literacy of Internet-users. A number of recent books are helpful in this regard. I single out two of them: Rheingold's (2012), *Net smart: How to thrive online*; and van Dijk and van Deursen's (2014), *Digital skills: Unlocking the information society*. These are elaborate studies on how to use the Internet in a cognitively beneficial way, giving valuable suggestions for how to find, evaluate, synthesize, and use online information to achieve one's cognitive goals. Schools, universities and other educational institutions should include such material into their curriculum, as to educate students in digital literacy.

[11] These are by no means the only three cognitive issues associated with the Internet, but I do think they cover a substantial part. Another issue is that reading hypertext is more distracting than reading analogue text. The increased demands on decision-making and visual processing when reading hypertext impair reading performance (DeStefano and LeFevre 2007). This may, in turn, effect memory performance as well.

4 Intrinsic and Instrumental Values of Cognition

In the normative debate on the Google effect, we are comparing two situations, which can be seen as opposites on a spectrum with various shades in between.

(1) Having less semantic memories stored in long-term memory, but vastly more information available externally;
(2) Having more semantic memories stored in long-term memory, but much less information available externally.

(1) is our current situation in the Internet-age and (2) is the situation before the Internet was introduced. The more someone uses the Internet as an external memory system, the closer that person approaches situation (1). One way to look at this comparison is to see it as a trade-off between losing something and gaining something. If we gain more than we lose, then the trade-off is acceptable. According to Clive Thompson: "From Socrates onward, we lose old cognitive skills as we gain new ones, but we've benefited from the trade-off" (2013, p. 135). I think Thompson is largely right, in that we indeed lose some of our cognitive skills but overall benefit from new cognitive technologies. For example, with written language we have partly given up our narrative culture, but much progress in philosophy, science, engineering, law, and literature would have been impossible without it. I think it is safe to say that much progress in these different fields of society has indeed been made due to written language. A similar argument can be made about other cognitive technologies such as maps, number systems, calculation devices, and clocks, in that they produced an overall benefit. This consequentialist view, however, may not be accepted by those who think that having certain cognitive skills has intrinsic value, and whose value should not be measured in relation to what we might gain. A non-consequentialist would argue that those skills are valuable in themselves and should be cultivated, regardless of the larger benefits the Internet may bring (see also Heersmink 2015).

In this final section, I suggest an approach to evaluate these consequences by looking at the values of cognitive skills. Why are particular cognitive skills (such as, for example, reading, calculating, navigating, remembering, and problem-solving) valuable? Such skills, I suggest, have both intrinsic and instrumental value. Cognitive skills are valuable in themselves, regardless of what they are used for. Being able to read, calculate, navigate, remember facts or past experiences, and solve problems, give meaning and purpose to our existence. The subjective experience of engaging in these skills is often deeply meaningful to us and largely defines who we are as persons. People whose cognitive skills are damaged or altered, for example through a stroke or accident, frequently experience an undesirable change in their identity (Sacks 1985). So our cognitive skills are essential to our self-image and identity, which is one of the reasons why they have intrinsic value.

A number of theorists in the cognitive enhancement debate have likewise argued that cognitive skills have intrinsic value. Nick Bostrom and Anders Sandberg, for example, write:

> Most cognitive functions, however, are not purely positional goods. They are also intrinsically desirable: their immediate value to the possessor does not entirely depend on other people lacking them. Having a good memory or a creative mind is normally valuable in its own right, whether or not other people also possess similar excellences (2009, p. 328).

Ethicist Buchanan (2011) goes further and argues that not just our cognitive skills in themselves, but also enhancing them is intrinsically valuable.

> In deciding whether we should develop new cognitive enhancements, instrumental value is important. But cognitive enhancements are also intrinsically valuable: Most people enjoy knowledge just for the sake of knowing, and many of us find activities that require more complex skills, including cognitive ones, more satisfying (Buchanan 2011, p. 133).

In our contemporary technological society, most people are educated in traineeships, schools, or universities in order to get a job. We learn to read, calculate, and solve problems, because we need those skills in order to maintain and survive in our complex society. Depending on which society one lives in—either historically or geographically—different cognitive skills are instrumentally valuable. In oral societies, being able to remember and retell stories and narratives is instrumentally valuable because it is an essential method to disseminate information in such societies. However, when writing was invented and a transition from an oral to a written culture took place (Ong 1982), being able to remember long narratives was less instrumentally valuable because there was less demand for it. Likewise, when the Internet was invented and information access became centralised, storing facts in biological memory became less instrumentally valuable. This, of course, is not to say that storing facts in memory loses its instrumental value. Given that online information access is never perfect, having knowledge about the world stored in memory will always be instrumentally valuable. The point here is that when new cognitive technologies are introduced in a society, they can transform the instrumental value of existing cognitive skills.

What about the intrinsic value of those skills? Did the ability to remember long narratives and facts lose their intrinsic value when writing and the Internet were invented? Presumably not. Does this mean that all cognitive skills have intrinsic value? It appears so. Is one skill more intrinsically valuable than another? It seems difficult to determine or quantify the amount of intrinsic value of a cognitive skill. It is therefore also difficult to say that one cognitive skill (say, reading) has more intrinsic value than another (say, calculating). It is like comparing apples and oranges. Zimmerman (2014) argues that intrinsic values of different things are difficult, if not impossible, to compare. In his *Stanford Encyclopedia of Philosophy* entry on intrinsic versus extrinsic value, he provides an elaborate overview on the computation (i.e., quantifying and comparing) of intrinsic value and the consensus in the philosophical literature is that this is impossible to do. One may thus argue that the intrinsic value of different cognitive skills is incommensurable.[12] However,

[12] But perhaps each human agent is able to subjectively determine which cognitive skill is more intrinsically valuable to the agent. For example, one person may find being able to solve Sudoku puzzles

it seems possible to say that having an elaborate memory has more intrinsic value than having a less elaborate memory. Generally, the more knowledge stored in biological memory, the more intrinsic value that has for the agent. This is perhaps why Buchanan, in the above quote, says that enhancing cognition is intrinsically valuable. So within a particular cognitive skill, we can make comparisons regarding its intrinsic value, but comparing the intrinsic value of different cognitive skills (e.g., reading or calculating) seems more difficult. In other words, intra-skills comparisons regarding their intrinsic value appear possible, whereas inter-skills comparisons are very difficult, if not close to impossible, to make.

It is easier to compare the instrumental value of different cognitive skills. For example, being able to read might be more instrumentally valuable than being able to calculate when you are a writer. But the opposite may be true when you are an accountant. The instrumental value of cognitive skills largely depends on the cognitive tasks one is performing frequently, which, in turn, depends on one's job, hobby's, and socio-cultural context. Like with intrinsic value, the amount of instrumental value of a cognitive skill (say, problem-solving) increases when the skill increases. Nicolas Agar writes: "The enhancement of our cognitive capacities increases their instrumental value by enabling us to solve more difficult problems" (2014, p. 26). So the more intelligent we are, the more instrumental value those skills have, which, in general, seems true to me. Similar views are expressed by Mikael Dunlop and Julian Savulescu, who write: "General intelligence is seen as one of the most significant all-purpose goods, capable of having considerable influence over a broad range of social outcomes" (2014, p. 190).

How can intrinsic and instrumental values help us think about the desirability of the effects of the Internet on memory and cognition? Recall that in situation (1) we have less semantic memories but have access to the Internet and (given we have the right sort of digital literacy skills) are thus better problem-solvers and better informed, whereas in situation (2) we have more semantic memories but have no Internet and are thus less good problem-solvers and less well-informed. Which situation is more desirable in terms of intrinsic value? As pointed out above, it is difficult to compare the intrinsic value of different cognitive skills, but it is possible to do that within a particular cognitive skill. So, if we only focus on semantic memory and compare (1) and (2), then it seems (1) is more intrinsically valuable because we have more knowledge in biological memory. If we focus only on problem-solving skills, then it seems that (2) is more intrinsically valuable because the Internet allows us to be much better problem solvers (e.g., better navigators through Google Maps or finding information on, say, Wikipedia that answers a question). If we focus on being informed, then it seems that (2) is more intrinsically valuable because the Internet allows us to be up-to-date and satisfy our informational needs.

So when the amount of facts in biological memory is reduced due to consistent Internet-use, it indeed seems that some of the intrinsic value of semantic memory

Footnote 12 continued
highly intrinsically valuable, whereas another person experiences little value in solving Sudokus. So, the intrinsic value of cognitive skills is subjective.

has been lost. However, by becoming more informed and better problem-solvers, those skills gain some intrinsic value. But, again, it is very difficult, if not impossible, to make inter-comparisons of the intrinsic value of different cognitive skills. So it seems that the notion of intrinsic value might not be very helpful in making overall value-judgments on the cognitive effects of the Internet, because several cognitive skills are transformed.

Which situation is more desirable in terms of instrumental value? If we only focus on semantic memory and compare (1) and (2), then it seems (2) is more instrumentally valuable because we have more knowledge in biological memory. If we focus only on problem-solving skills, then it seems that (1) is more instrumentally valuable because the Internet allows us to be much better problem solvers (e.g., better navigators through Google Maps). If we focus on being informed, then it seems that (1) is more instrumentally valuable because the Internet allows us to be up-to-date and satisfy our informational needs (e.g., by using Wikipedia or IMDB).

Whilst it is difficult to quantify the amount of instrumental value of (1) and (2), the instrumental value of having access to the Internet, combined with the right sort of digital literacy skills, can hardly be overstated. Having access to online information has transformed many aspects of human life, often (though certainly not always) for the better, including education, navigation, journalism, political activism, and, of course, academic scholarship.[13] Whatever one thinks of Massive Open Online Courses (MOOCs), they have made available higher education for the masses; Google Maps has made navigating unfamiliar places across the globe easy; Websites such as WikiLeaks have provided journalists with invaluable information that would have otherwise been difficult to obtain and disseminate; and online publishing of scientific articles has transformed how science is done, making it much easier to find relevant literature and allowing academic debates to develop faster.[14] If the trade-off is between having fewer facts stored in biological memory versus much progress in education, navigation, journalism, and academic scholarship, then it seems to me that we indeed gain more than we lose.

Finally, as the above quote from Bostrom and Sandberg illustrates, the instrumental value of cognition can be seen as a positional good (see also Bostrom and Roache 2011). The notion of a positional good was first developed by economist Hirsch (1977). On his view, a positional good provides an agent with a benefit because others in a social group lack this skill. So, if you have better memory skills than your peers, then you are often in a better position than those who have lesser developed memory skills. Generally, being cognitively more competent than others gives you an obvious competitive advantage. If, however, your peers have the same memory skills, then you do not have a positional good. Hirsch writes "if everyone stands on tiptoe, no one sees better" (1977, p. 5). Internet-access no longer is a

[13] Recall that the Web was initially invented to enhance academic scholarship (mainly in astronomy) by making it easier to store and communicate large amounts of information. Currently, that is just one of the many applications.

[14] See, for example, Borgman (2007) for a book-length study of how the Internet has changed academic practice. Likewise, Kukla (2012) discusses how the Internet has made massively distributed research in medical science of a scale that was unthinkable before possible.

positional good in Western societies because most people in Western societies have Internet access. However, the ability to effectively navigate the Internet, to evaluate the truth-value of online information, and being able to compare and synthesize information from different sources *are* positional goods, because not everybody has these skills. From a distributive justice perspective (Dunlop and Savulescu 2014), we ought to make sure that everyone has equal digital literacy skills, or at the very least an equal chance to develop such skills. For this reason, it is important that we, as a society, teach students such skills.

5 Conclusion

We increasingly use the Internet as an external memory system, in that way transforming our memory strategies. This paper first looked at some of the potential consequences of the Internet on memory and cognition and then suggested an approach for evaluating these consequences. First, I argued that the currently available empirical evidence does not support strong conclusions about negative effects of the Internet on memory and cognition. We need more robust and ecologically-valid data before we can make value-judgements about the cognitive effects of the Internet. Second, I argued that the value of our cognitive abilities is partly intrinsic and partly instrumental. So, these skills are both valuable in themselves but also partly determined by the socio-cultural context in which they are utilised. Focussing on instrumental value, I argued that, in an information society such as ours, having the skills to efficiently navigate, evaluate, compare, and synthesize online information are (under most circumstances) more valuable than, for example, having a lot of facts stored in biological memory. This is so, partly because using the Internet as an external memory system has overall benefits for education, navigation, journalism, and academic scholarship.

An important conclusion of this paper is that, in our current information society, we need to develop our digital literacy skills and make sure that these skills are distributed equally. Educators have a responsibility to contribute to the development of these skills. Designers and policy-makers have a responsibility to embed epistemic values in Internet applications. And academics in general have a role to play in engaging with the media and public as to inform them about the potential cognitive effects of the Internet. Ultimately, we need to ask ourselves as individuals and as a society at large what kind of cognitive skills we value (intrinsically or instrumentally) in our information society. Public debate might help to answer this question.

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