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Is Google Making Us Smart?
An Essay on the Effects of the Internet

An Interactive Qualifying Project Report
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Abstract

This IQP involved researching and analyzing data on how the Internet is having an effect on individuals and society. It looked at three key areas: young people who grew up using the Internet, the political implications that Internet technology brings, and the discussion of the Internet and its effects among the educated public. Data from scientific studies was evaluated and used to draw conclusions about these effects where appropriate, and news articles and other media were looked at to provide a rational perspective on the topics in modern society.

I. Introduction

Society defines humanity. A trademark of our mammalian heritage, social interactions are at the core of most people's lives, and our complex and extensive communications contributed to all of mankind's achievements. Since we first began to speak to those in a distant time by leaving written records, communication has been considered a crucial part of civilization; as it improved in speed and range, so improved the spread of knowledge and development of technology. And so, as the 20th century brought about a great surge in the development of technological communications, it brought finally a vast and impressive work of engineering: the Internet. As it developed rapidly at the end of the century and even more so in the beginning of the next, it combined the qualities of the media before it into one super-medium; and while the words and images and sounds and videos were no different from the words, images, sounds, and videos of the past, the delivery platform seems to have made all the difference.

In the early 90's, perhaps the most important development in the history of the Internet began to gain significant momentum. The World Wide Web was implemented and opened to the public, and with it came its hallmark: the website. Though essentially a collection of text, images, and other media, the website is hard to categorize. It is not like a book, and it is certainly not a radio or TV show. It is a different thing, built upon the cornerstone of the Internet, but with older media forming the rest of its foundation. It differs from older media mainly due to hypertext, the basis of all websites. The idea behind hypertext is that it is connected to other hypertext via hyperlinks, allowing hypertext writers to direct their readers to, or use inline, other hypertext on the Web. As Internet technology became more sophisticated and Internet connections became faster, hypertext was expanded to hypermedia, with all kinds of data across the Web being pulled from and linked to. Although 20 years ago the concept of hypertext was alien to most people, today it is as natural as any other medium; the website is now the most iconic Internet

technology, and the most common way that people access data online. Hypermedia clearly changed the way that people think about media, giving birth to blogs, wikis, social networking, and more. In just a couple of decades, the Internet has changed the way that people think about and do many things, and its influence continues to grow. The true breadth and depth of this influence is unknown, and especially as a new generation develops under it, the effects of the Internet on society and individuals are important to the future of mankind.

The purpose of this project was to look at scientific studies, books, articles, and other media to determine some of the effects the Internet is causing, with a focus on children and young adults who are growing up with the Internet. Since identifying all of the effects of the Internet is clearly beyond the scope of this (and perhaps any) project, the concentration will be on a few important topics. One of these is, as mentioned, the "Digital Generation", or those who have been using the Internet their entire lives. This is an important group to study; eventually the vast majority of everyone alive will have grown up using the Internet, so studying how this generation is affected will provide insight into the future of humankind. Another topic of interest is the public discussion of Internet-related issues, which will look at some of the things the educated and thinking public has been saying about the Internet in recent years. The last topic is on the political implications of social media, a topic very relevant to the current world scene. This report will serve as a guide to the research conducted, presenting and explaining the relevant information and offering rational analysis and conclusions.

II. The Digital Generation

i. Social Effects

Although the Internet has essentially existed for about four decades, it did not begin to assume its current form until the late 1990s. Even then, although most people would recognize the drab, boxy designs and plain text as web sites, it was almost a full decade of rapid increases in Internet use and both hardware and software technology that led to the priceless wealth of information and endless universe of distraction we are used to today. As such, even the oldest of those who grew up having access to this modern Internet are now only beginning their adulthood. There is a widely recognized gap in use and understanding of computer technology, especially the Internet, between the younger and older generations, and as the mass of the Internet's users and content grows ever larger, so its momentum steadily and rapidly increases. It seems clear that we are beginning to see a world where not only is the Internet being shaped by the people, but the people, too, are shaped by the Internet.

For example, in the beginning, email was invented in the image of postal mail, allowing the sending and receiving of text, and later images and files. This service has changed and expanded over the years, but remains basically analogous to post, and as such is easily understood by nearly everyone. Instant messaging, while seen in primitive forms on local machines even before the Internet, became massively popular during the Internet boom of the 1990s and 2000s. Instant messaging is popularly seen as a largely youth-dominated technology, especially in the form of text messaging, which is basically instant messaging between cell phones. Nowadays many, if not most, young people prefer instant or text messaging to other forms of communication, and can even feel awkward or out of touch without it. Instead of long letters, or the aural or visual connection of telephone or face-to-face

communication, their default method of communication involves flurries of short, text-based messages (audio, images, and even hypertext can be included). It is easy to see why it is a favorite: the messages can be read right away or saved for later, are sent and received nearly immediately, and distance is no barrier. But most importantly, it is what these young people grew up with. It is not seen as an improvement over other technology, but rather other technology is seen as stodgy and slow compared to the usual instant convenience. In this way, what started as an addition to Internet-based technology has effected a permanent change in the mindset and behavior of the generation who grew up never knowing the old, but embracing the new.

Certainly one of the most popular ways that young people use the Internet is to interact with others, especially their peers. This is evidenced by the previously mentioned massive popularity of instant messaging applications, and by rapid growth of social networking websites over the last few years. Trading instant messaging "screen names" is a common addition or replacement to the older exchange of phone numbers, and with social networking websites such as the ubiquitous Facebook storing this contact information and more, many young people are foregoing the exchange altogether and simply requesting that their new acquaintance "friend" them.

Some critics of socialization on the Internet have decried it as impersonal and lacking the benefits of "real life" face-to-face socialization. This is often heard in conversation or in passing, and rarely backed up by any evidence. One may pass it off, as youth are no doubt prone to do, as standard neophobic "back in my day" prattle, but it is an interesting topic which is not possible to settle without serious thought and research. Indeed, a recent study found that the use of the Internet for interpersonal communication actually can have a negative impact on the quality of a person's life, while frequently interacting with friends and family face-to-face has a positive effect on a person's quality of life(Lee et al.). However, this is not to say that these kinds of social interactions online are inherently bad. Many people use the

Internet to communicate with friends and family who are too far away to feasibly talk to face-to-face, or to meet new friends, whom they then interact with in person. A look at the use of the Facebook Groups application among college students shows that many students use Facebook as a means to find and organize meetings or parties(Park, Kee and Valenzuela 729-733). Other research into how young people use the Internet shows that those who are more extroverted are more likely to use the Internet in a way that positively integrates with other activities in their life(Tosun and Lajunen 401-406). This research seems to indicate that the Internet on its own is not enough to sustain healthy social interactions, but for those who are already socially active outside of the Internet, it can provide a good augmentation to their social lives.

But this is not the only way that young people use the Internet. For extroverts and those whose favorite online activities are socially based (such as social networking or instant messaging), the Internet seems to be mostly an extension of the rest of their life, a convenient and powerful social tool. But for those who are less extroverted, the Internet may be more like a separate world. It has been shown that adolescents who possess certain mental traits are often drawn to the Internet for its anonymity and social expectations, which differ from real-life interactions. One of these traits, known in the psychological study as “neuroticism” (used in a different sense than the mental illness), is a personality trait that involves shyness, susceptibility to stress and anxiety, and an inclination to perceive things as threatening or problematic. These people are likely to prefer online interaction to face-to-face interaction due to the lack of social cues and the ability to choose when to send and receive messages(Tosun and Lajunen 401-406). Another of these traits is known as “psychoticism” (also not used to mean that type of mental illness). Individuals with this trait tend to be more solitary, insensitive to others, and to disregard social conventions. In the case of adolescents with either or both of these traits, research has shown that one of the reasons they are attracted to the Internet is because of their desire to express their “true selves” while remaining anonymous, something they could not do in face-to-face interactions. For people who are shy or

who do not want many real-life social interactions, this seems like it may be a good thing. The Internet can provide a venue for them to express themselves freely to others, thanks to the veil of anonymity. However, the same study found that those with “neurotic” personalities show no inclination toward “harmonious passion” for Internet activities. In addition, those with “psychotic” personalities seem likely to develop both “harmonious passion” and “obsessive passion” for Internet activities. In the study, “harmonious passion” was used to indicate that their use of the Internet is positively integrated into their lives, and “obsessive passion” was used to indicate that their use of the Internet is unhealthily involved in their lives. For those with “psychotic” traits, the inclination to express their true selves drives both types of passion(Tosun and Lajunen 401-406). This seems to suggest that young people who are not already inclined to social activity (those with “neurotic” or “psychotic” personality traits) are not helped by the surrogation of online interactions. In the case of those with “neurotic” traits, the Internet appears not to appeal to them enough, and they do not develop a passion for online activities as much as others. For those with “psychotic” traits, the Internet seems to have a lot of appeal, which, unfortunately, can lead to obsession.

There is even more evidence to support the hypothesis that social Internet use is not correlated with unhealthy social lives outside the Internet. A study of loneliness and Internet use shows that those whose favorite online activities are social networking or instant messaging, both inherently social activities, are not unhealthily lonely any more than average, whereas those whose favorite activity is streaming or downloading movies and music do exhibit loneliness significantly more frequently than average(Kim, LaRose and Peng 451-455). As suggested before, however, this also connects introversion and Internet use in a negative way. This does not imply any causal relationship, though, so it is not immediately clear whether the high use of nonsocial online activities is the reason they are lonely, or if those who are lonely favor nonsocial activities for the same reasons their offline social lives are unhealthy. The study does provide some insight in suggesting that individuals who are psychosocially unhealthy not only have difficulty managing

their social lives offline, but have difficulty regulating their Internet use, which in turn causes additional problems in their lives, perhaps driving them to turn to their favorite online activities in a vicious circle of psychological unhealthiness.

So while social Internet use seems to be easily integrated into healthy social lives, nonsocial use is clearly correlated with unhealthy social lives. But the Internet does not know bounds that ordinary social lives know. While social networking is most often based on physical ties, there are many venues in which individuals can socialize with others who they have never met, and will likely never meet, in the offline world. How do these "semi-social" activities, such as participating in chat rooms, forums, or playing multiplayer games where chatting is common, affect the social health of the participants? One of the key reasons that people favor Massively Multiplayer Online Role-Playing Games (MMORPGs) is the social interaction(Yee 309). Players often spend significant amounts of time on such games without actually completing any game objectives, but simply conversing and otherwise interacting with other players, whether they are acquainted with them or not. The question is how this type of interaction, which is social but does not involve any personal face-to-face interaction, affects the participants compared to traditional offline interaction. A study of the enormously popular World of Warcraft MMORPG sought to determine the effects of in-game social support and offline social support on psychological health. The participants in the study were broken down into high-use and low-use categories. The high-use group had significantly higher levels of negative psychological symptoms than the low-use group, although once again there is no determination of a causal relationship(Longman, O'Connor and Obst 563-566). The individuals in this group may have problems in their lives that stem from their high use of World of Warcraft, or they may play the game so much to escape the problems that were already present in their lives. Another interesting finding from this study is that in the low-use group, only offline social support was found to significantly affect negative psychological symptoms. That is, online social support did not relate to better or worse psychological health, but offline social support was correlated with lower negative psychological symptoms.

Taken together, these studies do seem to show a pattern. Real-life interaction is key to having a healthy social, and thus a healthy psychological, life. For extroverts (who are already focused on social interaction), the Internet is easily integrated into their lives, and provides a tool for them to extend their social lives. For non-extroverts, the situation is less clear. Those who have unhealthy social lives often seem to have higher Internet use, and if those online activities are also nonsocial, the likelihood of them having an unhealthy social life seems even greater. For those who can maintain a healthy social life, Internet use seems to be a null factor. It is simply a part of the lives of young people nowadays, and while it has certainly changed the ways in which they interact, in general it doesn't appear to cause any significant changes in their social patterns. Young people with healthy social lives will use the Internet to be social and extend their offline social lives, and young people with unhealthy social lives will use the Internet to avoid social interaction or engage in unhealthy interaction, just as they do in their offline social lives. However, there is an important question about other ways that unhealthy Internet use can affect young people.

ii. Internet Addiction

For some of those who use the Internet very often, it presents a dangerous path. While it is unclear if Internet use causes problems in these peoples' lives or if they simply use the Internet like anything else to escape their problems, many studies have suggested that such use can lead to unhealthily obsessive behavior. This is no trivial possibility, and the topic has gained a lot of attention recently. The idea of "Internet addiction" was quickly recognized as a real issue, and there are many questions about who is in danger of succumbing to it and why.

Like any topic of study that is just beginning to be understood, the name and definition of Internet addiction varies slightly from source to source. Some have called it Internet addiction disorder, others use the terms "pathological Internet use" or "high Internet dependency"(Byun et al. 203-207). The definitions given by various studies also vary slightly, but all essentially compare it to any other type of addiction. Note that this definition does not necessarily include the irresistible compulsive force often associated with addiction, especially physical addiction. A useful definition of addiction with regards to psychological and social health is that "an individual is addicted when an individual's psychological state, which includes both mental and emotional states, as well as their scholastic, occupational and social interactions, is impaired by the overuse of the medium."(Beard 7) Most of the talk about Internet addiction centers on adolescents and young adults, mainly those in high school and college. These groups are notorious for their comparatively high Internet use already, so it makes sense that they would be most likely to display symptoms of obsessive use. Indeed, studies suggest that the occurrence of Internet addiction in the population as a whole ranges from 0.3% to 1%(Lam et al. 551-555), whereas the occurrence among adolescents and young adults ranges from 3.8% to 10% or more, depending on the country and specific age group surveyed(Ghassemzadeh, Shahraray and Moradi 731-733; Ni et al. 327-330). Internet addiction seems to be especially prevalent among college students, and

there is some evidence to support the contention that the college lifestyle leads students toward problematic Internet use. For example, a study of college freshmen in China found that 6.44% of the students exhibited Internet addiction, whereas a study of college students of all levels in China found a 10.51% prevalence(Ni et al. 327-330; Wu and Zhu 1363). The study among freshmen also found a correlation between Internet addiction and students majoring in technical sciences, which may be because these students are more likely to be heavy Internet users in the first place.

Other links and risk factors for Internet addiction have also been studied. A study of 1618 adolescents found four significant risk factors, namely being male, drinking, dissatisfaction with family life, and recent experience of a stressful event(Lam et al. 551-555). These risk factors do shed some light on what may cause or be related to Internet addiction; they point toward a common and well-known problem source: stress. Drinking among adolescents has been identified as significantly related to stress, especially among young males(Pohorecky 438), and stress is a known risk factor for addiction to substances(Sinha). This information indicates that while there may be additional factors involved in the propensity toward Internet addiction (such as majoring in a technical science), the heart of the matter is that Internet addiction is very much like an addiction to any other activity or substance. It is not a special property of the Internet that is causing this addiction, but likely the stress that these students are experiencing is driving them to seek refuge by escaping into the online world, a world that, unlike most drugs, is familiar to them, and legal for them to use.

The consequences of Internet addiction are very similar to that of any other addiction, where obsessive use can affect every part of the addicted individual's life. In a study of Internet addiction among Greek adolescents, the majority of addicted individuals admitted to jeopardizing or risking the loss of a significant relationship, job, educational, or career opportunity, as well as staying online longer than intended and lying to others to conceal their involvement with the Internet(Siomos

et al. 653-657). In addition, Internet addiction is more difficult to discover than other harmful activities. With most high school and college students using computers for both work and recreation, there may be no noticeable difference between a work-oriented student getting ahead in his studies and relaxing at night and a student who cannot control his use of the Internet and is neglecting his work and social life.

iii. Academic Effects

The Internet is a universe rich in information; it is, after all, sometimes referred to as the "information superhighway". Often it seems as though one could find literally anything, and indeed punching one's query into Google rarely disappoints. Reviews of a recent bestseller, analysis of a chess game, the latest published microbiology studies, and a beginner's course on calculus are all available easily and quickly on the Internet, among many, many other things. So with all this information out there, one would imagine that the Internet would be a huge boon to schools, boosting test scores and the general level of knowledge among students around the world. However, unsurprisingly, there is also a huge amount of comics, videos, games and music – things young people would much rather spend their time on than school assignments. So as today's schoolchildren and university students make the age-old decision between work and play, it remains to be seen if they are using the Internet to research and learn, or if it is to be treated, like television, as a mostly non-educational distraction.

To begin with, there are many educators who recognize the potential for using the Internet to help teach and learn. College professors often have their own websites, with links to their research or other work in their field and pages for their current and past courses that students can browse to see the course syllabus, assignments, etc. In addition, many colleges have online teaching aids such as Worcester Polytechnic Institute's myWPI website, which uses the Blackboard platform to provide professors, students, and TAs with bulletins, course resources, forums, quizzes, file submission, access to grades, and more.

The scope of the Internet's academic use isn't just for research and supplemental course information, either. Entire courses are now frequently offered online, with little or no offline interaction at all. In fact, surveys show that online course registration has been steadily climbing, with 9.6% of post-secondary

students in the US taking at least one course online in 2002 growing to an astonishing 25.3% in 2008(Allen and Seaman 5).

It is easy to see why this number is going up in such a dramatic way; there are many attractions to online learning. Online courses require no physical space, allowing students to take the course from anywhere in the world. This saves an enormous amount of money on property (or rent) and travel costs, making it financially superior to traditional classrooms for both students and educational institutions. Students can also learn on their own time, eliminating the dreaded course scheduling conflict. In addition, essentially any number of students can be enrolled in a single course, although if the instructors wish to have interactive sessions or fully accommodate students' questions and need for help, additional instructors or teaching assistants may be necessary. These online lessons can even help eager learners not enrolled in the course (if the institution is feeling generous, that is). For example, the lectures from Stanford University's CS193P class, a course on iPhone development, were all put on the course website and iTunes by the university for anyone to download. The professors and TAs did not take questions from anyone outside the University, but the lecture videos on their own were an effective (and free!) learning tool for anyone wanting to learn about iPhone development.

With so many clear benefits compared to traditional classroom learning, the critical question arises: how well do students learn in online course environments? The answer, as expected, is complicated. Since online learning is relatively new, there isn't an enormous body of literature or studies on the subject, and what does exist often uses differing definitions and methods. Also challenging is the fact that different online courses are conducted in different ways, with varying amounts and types of material and varying levels of interactivity (both between students and the software and between students and the instructors). So far there have been efforts to look at various online learning components and determine their usefulness, but no real information on how an entirely online course compares to a traditional

course. Although with the many different ways a course can be conducted both online and physically, perhaps that task is too broad to be either plausible or useful. Perhaps the best way forward is to determine what elements of online learning are most useful and to integrate those with the most useful traditional elements. In any case, this is what many studies are attempting to learn, and probably what most schools are adopting anyway.

One study compellingly suggests that students' learning styles can affect how useful online learning environments are to them(Zhan, Xu and Ye 961-968). Previous research into students' learning styles has yielded the Felder-Silverman model as an accepted notion of different ways in which students learn. Part of this model is the contrast between active and reflective learners. Active learners tend to learn better by attempting to use their new knowledge in some way, whereas reflective learners like to think for a while before trying out the new idea(Felder). This part of the learning style model has been considered to have a large effect on a student's collaborative learning, and the study in question sought to determine how an online collaborative learning environment affected students' performance with regards to their active or reflective learning style. In the study, some students in a normal face-to-face class were asked (as part of their grade) to participate in an online discussion after class, while others were asked (also as part of their grade) to study individually or participate in a face-to-face discussion. At the end of the class the students would be tested (with a normal class test) to judge how well they learned the material. The hypotheses of this study were: that students with a reflective learning style would perform significantly better if they were in the online collaboration than offline, and that students with an active learning style would perform significantly better in the offline collaboration than online. This is because the online collaboration would allow the reflective learners some time to think about the material, whereas the offline collaboration or individual learning would allow active learners to try out their new knowledge immediately.

The results of this study are interesting. As hypothesized, the reflective learners performed significantly better when they used the online collaboration. However, the second hypothesis was refuted with an opposite effect. The active learners, too, performed better when involved in the online collaboration. The authors go on to suggest that the online collaboration seems to be a good way to mediate discussion between students and instructors.

Another study of a hybrid teaching method studied a class in which lectures were delivered online, and during class hours students participated in "active learning sessions" to reinforce the material. The class material and exams were matched to the same course given the previous year in order to determine the efficacy of this hybrid teaching style. The study found that the sections using the online lecture delivery had significantly higher quiz and test scores than those with the traditional class/lecture layout(Lancaster, McQueeney and Van Amburgh 23-29). This seems to make sense, because the students essentially received extra instruction via the online lectures. In addition to the exercises they performed in class, they had the luxury of reviewing the lectures whenever they wanted, however many times they wanted. This is another clear benefit over traditional classes. In order to study at home, students would normally take notes during lectures. It is not only difficult to copy exactly what the professor says and means, but taking notes can also distract the student from parts of the lecture and from considering what the professor is trying to get across at the time.

Online learning is only in its infancy, and as it becomes more popular (which it undoubtedly will, thanks to its many benefits) there will be more research to help determine its true strengths and weaknesses compared to traditional learning. However, online courses are not the only way the Internet is affecting students' academics. Using the Internet as a tool for normal classes and the Internet's function as an entertainment provider both seem likely to have an impact on students' performance and learning at almost all grade levels.

Many surveys and studies confirm what intuitively seems obvious: most students think the Internet helps them with academics, and indeed it does – when they use it for research. A 2001 survey reported that 78% of those surveyed who were aged 12-17 thought that the Internet helped them at school; somewhat surprisingly, 87% of their parents agreed. 94% of the adolescents said they used the Internet for school research at some point(Lenhart, Lewis and Rainie). These numbers are from 2001; Internet use has seen an enormous increase since then, suggesting that the vast majority of students in this age range certainly must use the Internet for school today. A large study of over 18,000 students at 71 colleges and universities across the US found that surfing the Internet for course material had positive effects on both intellectual development and vocational preparation (Kuh & Hu 2001). Another study among middle-school students in Taiwan found that students who used the Internet to search for information had significantly higher high school entrance exam scores than those who did not(Chen and Fu 797).

Contrariwise, a seemingly opposite intuitive assumption is also supported. The same study found that playing online games had a significant negative effect on boys' academic performance, as did Internet use for chatting and socializing on girls' academic performance(Chen and Fu 797). There are other studies supporting these positive and negative effects of Internet use, but frankly it seems that they only serve to confirm something that is already clear: students who spend more time studying and researching get better grades than students who spend more time playing games and socializing. What is needed is a study that looks at Internet access and use in general and correlates it to students' grades and test scores. This is the only way to find out if Internet use on the whole has a real effect on students' academic performance.

Such a study was conducted among low-income families in Michigan between December 2000 and June 2002. The average age of the students was 13.8 years, the average GPA 2.0, their average standardized testing scores were around the 30th percentile, and the median annual income for their households was $15,000 or less.

This was a group that was consistently performing below average academically, and the idea was to see if Internet use had an effect on their performance. Their home Internet use was recorded for 16 months, with no special regard as to what type of use it was. The findings showed that those students who used the Internet for more time had significantly higher GPAs and scores on standardized tests of reading and comprehension after 6 months, 1 year, and 16 months, than those who used the Internet less (Jackson et al. 2006). The researchers concluded that Internet use may have affected these students' academics because it caused them to read more than they otherwise would.

A similar 2-year study was conducted (also in Michigan) and published in 2010, which sought, among other things, to determine the links between Internet use and academic performance without regard to factors such as the financial or social standing of the students. The findings of this study were consistent with the previously mentioned study. Students with below average reading skills showed a direct correlation between Internet use and academic performance: the more they used the Internet, the higher their performance. Students with average reading skills also showed improvement with Internet use, but not as marked an increase, and only in the second year of the study. Students with above average reading skills were neither positively nor negatively affected by their Internet use, whether high or low(Jackson et al. 228-239).

The findings of these last two studies are particularly interesting. While it seems that, in general, Internet use per se has little effect on students' academics, it does facilitate frequent reading, which can help students who have weak reading skills. This may be a fairly important point, since the only conceivable way to increase reading skill is to read more, and students with low reading skills are less likely to read books or magazines for pleasure than those who are already proficient at reading and comprehension.

III. Public Discussion

Scientific studies are excellent for examining the quantitative relationships and effects of Internet usage, as Internet use around the world continues to increase, people are becoming become more and more interested in the qualitative analysis of our Internet use. Science can help in this too, as there are ways to translate qualitative assessments into numbers, but this must still be based on questions and answers that the researcher has pre-determined. There is no way to perform a scientific analysis and find the mean of 100 free-answer essays on how the Internet has affected one's life. This leaves a lot of discussions and debates to be had across a broad range of topics, some of which have piqued the public's interest and gained quite a lot of attention.

Any new technology is invented to replace, at least in part, some old technology. The techniques involved in using the new technology often differ from the old techniques, and if the invention becomes popular enough, the old techniques tend to become lost or relegated to an antiquarian minority. The Internet is no exception, and while the technologies that it could potentially replace are numerous, the techniques involved in using the Internet do not vary as much as those used with the old technologies. The Internet lends itself to be used in certain ways, such as skimming search results for information, clicking links that take you away from the current page, and watching or listening to media instead of just reading. Certainly, the Internet is a more interactive and fast-paced medium than books, magazines, video, or audio alone. While some see this as a great feature, allowing one to learn and accomplish more in a shorter amount of time than previously possible, others have taken a step back from the immediate use of online resources and asked how it is affecting people in their daily lives. Humans are exceptional at adaptation, frequently and rather quickly attempting to optimize themselves for their environment. So as the Internet (and the devices used to connect to it) are

used more frequently by more people, some are wondering if there are hidden drawbacks lurking behind the obvious advantages this technology provides.

In his article "Is Google Making Us Stupid?" in *The Atlantic*, Nicholas Carr argues that there are such drawbacks, and that he and others have seen them in their lives. Though not a scientific study, Carr's article contains persuasive anecdotal evidence that seems to make sense, and the article was very widely read, eliciting many responses both agreeing and disagreeing with him. In it he describes how he feels his mental capacities are changing (ostensibly for the worse) and how his use of the Internet has likely induced this change. He explains how he cannot seem to read a book as he was once able to, scanning pages or reading short amounts at a time instead of becoming immersed in the pages for hours. "Once I was a scuba diver in the sea of words," he says, "Now I zip along the surface like a guy on a Jet Ski." (Carr). He also notes that many friends and colleagues to whom he has mentioned this are feeling the same way.

His explanation is that the way media is structured on the Internet lends itself to a skimming, bite-size style of reading. It is easy to see how useful the Internet is (Carr mentions this as well) for finding facts and minutiae, but Carr argues that his frequent use of the Internet in this way has inhibited his ability to think deeply and concentrate when reading, whether online or otherwise. He also points to hyperlinks as a cause of fractured reading online. These links point to (usually) related material, but following them breaks the flow of thought from the current page. What's more, these links often point to material that the reader must be at least familiar with before continuing to read that page. Carr makes the comparison that "unlike footnotes … hyperlinks don't merely point to related works; they propel you toward them." This is an interesting dynamic of online media that is not present in other media.

Carr is not alone in his critique of the online lifestyle; an article in *The New York Times* looks at a man with similar woes. It describes him as constantly

connected, with digital distractions causing him to forget things like dinner plans and have trouble focusing. His wife says that "it seems like he can no longer be fully in the moment."(Richtel 1). The article suggests that skimming and clicking online "play to a primitive impulse to respond to immediate opportunities and threats" which generates stimulation and excitement. It also mentions that the multitasking that is common when using Internet browsers, chat clients, and connected smartphones fractures the thinking process even when away from these things. The article goes on to propose that constant use of the Internet can cause even greater problems than Carr's difficulty reading. It provides examples such as a husband spending hours a day away from his wife on their second honeymoon, using the Internet connection in the hotel they were staying at instead. Another example describes a student who received his first C in high school and blames his academic downturn on the distractions of digital devices, most of which involve the Internet.

The article does provide some reasons why being constantly connected may affect people significantly, and why it is difficult for people to simply ignore the distractions that come with this connection. It consults a researcher who designed a study to determine how non-critical information is received by people who frequently multitasked using technology versus those who do not. He found that those who multitasked had a harder time ignoring unnecessary information, which might explain why those same people are often distracted by emails, tweets, blog posts, and other Internet media. The article also mentions a study that found that people who are interrupted by email felt more stress than those who were left to concentrate without distraction. Another study linked stress hormones to reduced short-term memory. All of this put together forms a reasonable argument that Internet-connected technology can very likely take a toll on users' lives, even if they try to stay focused.

Some also fear that, as with many things related to technology, these effects are hitting the younger generation the hardest. Another article in *The New York Times*, coming from the same series as the previous article, focuses specifically on

secondary school students and how the use of new technology affects them. Entitled "Growing Up Digital, Wired For Distraction", the article describes problems similar to the articles previously mentioned, and comes to similar conclusions about the origins of these problems as well. It first describes Vishal, 17-year old high school who will be entering his senior year. Although "several teachers call [him] one of their brightest students," his grades have been dropping recently, and even though there is only one day until school begins again, he has not even come close to completing his only summer homework assignment(Richtel 1). The last semester he was in school, he received a D-plus in English and an F in Algebra II, and his teachers "wonder why things are not adding up." Vishal himself admits that he lacks the self-control needed to concentrate on schoolwork instead of browsing Facebook or YouTube, explaining that "a book takes so long… I prefer the immediate gratification." The article goes on to give several other examples of students who cannot control their impulses to browse the web, check e-mail, and otherwise distract themselves with technology. It is well known that the brain is very malleable before adulthood, and the article proposes that the frequent use of such fast-paced, always-connected devices can wire one's mind, especially at a young age, to become "habituated to distraction and to switching tasks, not to focus."

The focal points of the articles that warn against the pitfalls of an increasingly "connected" world are very similar. They all claim that a fast-paced, always-online lifestyle with little downtime causes one to become accustomed to constant task-switching and instant gratification, and to become less able to concentrate on a single subject for long periods of time. They all provide persuasive evidence through anecdotes from suffering technophiles and research that shows how the brain can be molded subconsciously. But, as expected, not everybody is convinced. Some argue that alarms are sounded every time things change, and this is no different, while others are embracing the changes and believe that Google is making us smart, not stupid.

One year after Nicholas Carr's "Is Google Making Us Stupid?" article appeared in *The Atlantic*, the same magazine printed Jamais Cascio's suggestion that we "Get Smarter." In part a reply to Carr's article, Cascio speaks of this new technology, all linked together by the Internet, as a catalyst for our intelligence and capabilities to grow. As for the barrage of emails, blog posts, tweets, and instant messages that others find distracting and overwhelming, Cascio simply says that "it's easy to mistake more voices for more noise."(Cascio). He argues that media and technology of the past has made us smarter, not dumber, and that we are much more tuned today for a kind of thinking that scientists call "fluid intelligence". This involves the ability to make connections and see patterns, and Cascio holds that even modern TV shows and video games are filled with detail and subtle connections, rewarding and honing our ability to recognize these things. Cascio is a strong believer in the future of technology, envisioning a world where the individual mind is made more powerful through the use of technology, and the collective intelligence of mankind is expanded using collaborative tools, such as the common Wiki-based software of today. As for the argument that technology users are overloaded with information, he suggests that we merely need better tools to manage it, saying that "Google isn't the problem; it's the beginning of a solution."

While Cascio has grand visions of a future shaped by technology, others dissent from Carr's arguments in a more pragmatic way. *New York Times* blogger Nick Bilton authored a post on *The New York Times* technology blog entitled "The Defense of Computers, the Internet, and Our Brains"(Bilton), which presents a casually-written yet convincing line against Carr's school of thought. Drawing from scientists who study the brain and research on media, Bilton essentially argues that while our brains are certainly changing, they have always done so and the Internet will have no greater effect on humankind than any other technological advance. He notes that different media exercise different parts of the brain, and that the Internet, with its enormous stock of all kinds of media, is likely an excellent source to further develop your brain rather than ruin it. One of the scientists he cites, Professor Steven Pinker of Harvard University, wrote an Op-Ed piece for *The New York Times*,

which presents similar arguments. He writes that panics such as Carr's article "often fail basic reality checks." He calmly dismisses the notion of technology ruining our thought processes, saying that "cognitive neuroscientists roll their eyes at such talk. Yes, every time we learn a fact or skill the brain changes…but the existence of neural plasticity does not mean the brain is a blob of clay pounded into shape by experience."(Pinker 31)

While the anecdotes about scatterbrained tech gurus and distracted A-students garner lots of attention, it seems that these warnings to be wary of new technology have come consistently throughout the ages. The human brain will be changed by the advent of Internet, and like other technology before it, we will likely adapt well and use it to propel ourselves forward even more. And although these articles were quite popular, some research has indicated that most people believe that the Internet will, in fact, make us smarter. Pew Research's fourth "Future of the Internet" study, conducted between December 2009 and January 2010, found that 76% of the participants thought that "by 2020, people's use of the Internet has enhanced human intelligence…Nicholas Carr was wrong: Google does not make us stupid."(Anderson and Rainie). The Internet and the technology linked to it are very powerful, and as humans become increasingly "connected", speculation will turn to observation of how mankind is changed. It seems unlikely that people will become "stupider", but very likely that we will lose at least some of our skills as they are replaced with new ones.

IV. Political Implications

Though the Internet, and the World Wide Web in particular, often seems like a vast garage filled half and half with superlative tools and unkempt rubbish, one must remember that it is not merely a communal storage place full of statics. The Internet is, at its very heart, a method of communication. It is natural to think of instant messaging, forums, or email as interpersonal, but also each restaurant menu, each Java documentation page, each dictionary entry was put there by a human for another human to see. As a tool for communication, the Internet is clearly superior to older media. Unlike books or television, any person can get a blog or Facebook page or Twitter account for free and post anything they want, as much as they want (legal restrictions aside; that is a separate issue and applies to books and television anyway). Unlike in letters or phone calls, any type of data can be sent and received on the Internet; a single blog post may include video, audio, picture and text. As the Internet becomes more embedded in more people's lives, these people are better understanding this power that the Internet provides them with. This has led to an enormous boom in the "social media" sector, which is based entirely on interpersonal communication, most of which would not be possible outside of the Internet. Although there are surely many ways in which the Internet has an effect on politics, this project focused mainly on the implications of the use of social media. The reasons for this were twofold: because these social media websites have been growing and are now very much a center of attention on the Internet, and because there are currently many critical events occurring in world politics in which social media have been involved in some way.

These social media websites all offer things that traditional media don't. Twitter, for example, is the largest and most prominent "microblogging" website. Each post on Twitter is text-only. In addition, each "tweet", as they're known, is

limited to 140 characters. This sounds a bit odd and restrictive at first, but many tweets have links in them to articles on web pages, or audio, video, pictures or anything other kind of file. Every tweet is visible by every user, although users can choose whose tweets they would like to be actively notified of. This format makes it quick and easy to read and send tweets from mobile devices, enabling people to easily participate anywhere, anytime.

Facebook also offers things that traditional media cannot. In fact, there is very little about Facebook that compares directly to any traditional media. Facebook users have a status that they can set so others know what's going on in their lives currently, a "wall" their friends can post on that is visible to all of their friends, and applications to use (most frequently games that can involve others). They can create events and invite people to meet up in real life (or virtual reality), they can make public and private groups, and show their support for their favorite band or TV show by "becoming a fan". There is more, and nearly everything one can see and do is extensively customizable.

These two super-popular social media sites don't seem to have much in common. One seems Spartan, a short text-only broadcasting service, and the other overflows with options and additions and activity. However, they share something very important: the ability for any person to communicate with any number of other people near-instantly, at any time, publically or privately. Especially important is the public part. Social media gives its users an open platform to say what they want, and easily connects them to others.

The power of social media is so great that many people are suggesting that it has the power to turn a silent majority into a roaring majority. The term "social media revolution", once applied to these websites rising in popularity, is now applied to popular uprisings. Recent events in Tunisia and Egypt have many people suggesting that Twitter, Facebook, and blogs are the catalysts for revolution, and even the driving force behind it. Others, however, are asserting that, although these

things were used by revolutionaries, they were no more significant to the revolution than megaphones or a good pair of shoes. Thus the question is: to what extent did social media play a role in the creation of these revolutions, and how significant was its role in their success?

It is impossible to believe that the Internet has no impact at all on such revolutions. Even the governments of these countries can see this. Bloggers have been censored and arrested in countries such as Tunisia, and in some cases major websites or even the entire Internet has been blocked. Corrupt governments such as Tunisia's (which is now overthrown) are clearly threatened by the freedom and wide range of communication that the Internet offers. They are used to being able to control what people see and hear on TV and radio, effectively blocking the spread of information they dislike. For example, while riots ran rampant in the streets of Tunis and the president fled the country, the official TV channel played music and chat shows(Beardsley).

This fear of the Internet is certainly not unfounded. Even though YouTube has been banned in Tunisia since 2007, technologically-skilled activists were posting videos of demonstrations throughout December 2010 and January 2011(Lister 4). There is also no denying that Facebook, Twitter, and blogs such as A Tunisian Girl had an impact on informing the public (both in and out of Tunisia) about the protests and even on getting people involved. While the state TV stations were pretending nothing was going on, social media fed the independent Al Jazeera station with pictures, video and news to broadcast via satellite into Tunisia. These tools were used for more than gathering public interest and getting the protests rolling, too. Tunisians were using Twitter during demonstrations to warn others of sniper locations and to call for blood donations at hospitals, making good use of its cell-friendly platform(Carlson 1). And it isn't just Tunisians who are making use of this technology. Demonstrators in Egypt have been online as well. Much like in Tunisia, the Egyptian government has been arresting and blocking activist bloggers, and much like Tunisia, activists have been online all the more. For example, a

Facebook page dedicated to protests in Egypt had over 80,000 followers the day before the protests were scheduled(Lister and Smith 3). The day before that, only 20,000 people had been following it. How could it have been possible to reach 60,000 people in one day without the Internet? No television or radio station seems likely to broadcast the time and place of a planned mass anti-government protest. The power of these social media websites certainly added to the power of the people.

Communication and logistics aren't the only ways that the Internet helped these uprisings succeed. The huge amount of attention the demonstrators brought to themselves via social media translated into traditional media coverage. In addition to the previously mentioned Al Jazeera coverage, the news and video coming in from many participants made for better and more plentiful material than any on-scene journalist could have provided. Revolutions are often more dependent on politics than violence, and heavy international coverage can put pressure on leaders in these situations. In Egypt, this pressure is what led to the success of the revolution. After more than two weeks of widespread protesting, the leadership of the military, an important part of the Egyptian government, pushed for the President's resignation. Soon after, they announced that the military would ensure a transition to civilian rule. There was no need for a display of military force, it was the political pressure from such a large and important branch of the government siding with the protesters that led to the President's resignation. Without the extensive news coverage of the protests worldwide, one cannot say for certain whether the revolution would have gained enough momentum to lever such political pressure.

However, amid the "Twitter Revolution" headlines, some reporters and scholars are insisting that it was first and foremost a revolution of the people, not of the technology. They want to make sure that the human aspects, the thoughts and emotions that lead to such a popular uprising, do not get lost in all the talk about social media. As one on-the-scene journalist said, "This didn't have anything to do

with Twitter and Facebook. This had to do with people's dignity…People are not able to feed their families(*"Rachel Maddow show" for Friday, Jan 28th 2011*)." He was referring to the cause of the uprising, the true reason people were in the streets. While this reporter went on to mention that "…Twitter and all the social networking stuff helps", he wants to make sure that the people are credited, and rightfully so, for the reform. While this seems obvious, it is important to keep in mind, because social media and other Internet technologies are no more than tools that people can use. They bear no allegiances and are useful to any party who knows how to use them; they have no predisposition toward democracy or justice. Another writer states that, "surely the least interesting fact about [the Egyptian protesters] is that some of the protesters may (or may not) have at one point or another employed some of the tools of the new media to communicate with one another… People protested and brought down governments before Facebook was invented.(Gladwell 1)" But, then again, perhaps that is the very reason why their use of this media is interesting; it is a new variable in an old equation. It is understandable that these people don't want the plight and the courage of the Tunisian or Egyptian people to be minimized by the notion of social media toppling dictators, and it does seem unreasonable to think that the advent of social media caused these protests to occur or was the deciding factor in their success. But as turmoil in the Middle East grows, perhaps the tool of social media is significantly helping to arm citizens with the power they need to stand up to authoritarian governments and corrupt officials.

All of the attention on the impact of social media in countries with popular uprisings seems to be focused on these Internet technologies as a tool for the public to use in their quest for democracy and justice. However useful social media may be for this cause, one must realize that social media is not inherently disposed toward it. Although the public image of social media seems to correlate it with the young, liberal, activist type, it is just as easily the mouthpiece (and hearing aid) of a shrewd authoritarian government.

For example, the North Korean government, one of the strictest dictatorships on the planet, created a Twitter account last July and uses it to post pro-North Korean news and information. Almost no North Koreans have access to the Internet, so this propaganda is probably not aimed at them, and the vast majority of people around the world realize that almost anything said that is pro-North Korea is propaganda. But the North Korean government doesn't keep its power by being ignorant, and it has realized that keeping control over the country's social media connections is important, even if the general public has no way to challenge it.

Now, if North Koreans were to ever gain real access to the Internet, it is likely that their postings would easily drown out the government's words. In a country that is widely recognized as a dictatorship, the message of the people is easily picked out and supported over the blatant propaganda. And in the case of Egypt or Tunisia, it is hardly likely that starting a Twitter account would have suppressed the demonstrations and rioting. However, consider a government such as China's, whose image is not that of a totally corrupt dictatorship, nor is it a beacon of democracy and justice. Such a government would want to retain its power and keep its citizens in check with as much tact as possible.

To this effect, China employs a group of people known as "Internet commentators", or more commonly by the pejorative "50 Cent Party" due to reports of the commentators being paid half a Yuan per post. These people are paid by the government to post as regular users on popular news sites and forums. They generally target discussions of political significance, and post in such a way that it does not appear to have come from the government. This is a cunning approach to propagating state views online. If the Chinese government simply made an account on a website (such as North Korea did on Twitter), its opinion on political news, however large or small, would essentially not matter. This is for a couple of reasons. First, it is clearly coming from the government, and as such, it will obviously support the government's views and ideals. People will immediately dismiss it as propaganda. Second, and more interesting, is that the government cannot speak

candidly. In an argument online, users can say anything they want. If a user were to comment on how poorly the government (national or local) handled an issue, or that it was corrupt, the government could not propel the other side of the argument by saying candid things such as “it is not a big issue” or even “the government did its job well”, because then it becomes an official statement. For example, if the incident in question is an accusation of a bribe, the Chinese government could hardly stand to be seen simply dismissing bribes as “no big deal”. However, by paying a group of people with no government affiliation to say these things, and even to attack the original posters (as would be common for ordinary users on an Internet forum), the government can quell such dissidence and propagate the image of a majority of citizens supporting the government and its actions.

The success of this method was shown in a document released by the public security bureau of Jiaozuo, a city in Henan province. An unhappy citizen posted a negative comment about the police online, and within ten minutes, one of the employed Internet commentators reported this to the bureau. The bureau then used over 120 people to post in the thread, supporting the police and even condemning the original poster, until eventually the majority of posts was in the government’s favor(Bristow 1). Though the true number of employed “Internet commentators” is unknown, estimates range from thousands to hundreds of thousands. It is prevalent enough that users who take the Chinese government’s side or post pro-government or pro-communist comments are frequently accused of being in the “50 cent party” or “50 cent army”. As is common on the Internet, it is often difficult to tell whether these comments are meant literally, or if they are just derogative terms used to demean people who are taking the side of the Chinese government. However, since it is also difficult to determine if a poster is genuinely expressing his or her views or acting as an online mercenary, it is likely that most users do not care which it is and are trying to fight propaganda from any source.

Interestingly, this sly technique is so much more effective than direct promotion that it is also commonly used in the United States. Not by the government

(as far as anyone knows), but by commercial organizations. Companies will use employees or hire freelance writers to post comments on forums and articles about their products, all in the guise of a regular user. Some of these are obviously paid for; others are better crafted and pass off well as a normal person supporting a brand they like. Unlike governments, there is generally not such a large public distrust of a company such that anyone who supports it is immediately suspicious, which makes these online endorsers more believable. However, as shown in China, this infiltration strategy is a very effective one, and one that uses the anonymity and social networking of the Internet to great effect.

There are undoubtedly many ways to use the Internet and social media to push a government (or corporate) agenda in the range between North Korea's tweets of bald-faced propaganda and China's regiment of anonymous commentators. The difference between a social media revolution and a social media dystopia lies in skill and timing. By the time protestors were uniting and calling for demonstrations by the thousands online, it was too late for the Tunisian and Egyptian governments. They only made their lack of understanding more obvious by attempting to block websites and cut Internet access. The demonstrators had the skill and willpower necessary to use the online tools at their disposal to gain momentum for their cause. However, in China, a government infamous for committing and then simply denying the occurrence of human rights infractions displays similar skill in using technology to keep power seated firmly in its hands. While neither the fate of the Middle East nor that of China will be decided on the digital front alone, the power of the Internet will be very valuable to those who can effectively use it.

V. Conclusion

Twenty years ago, the Internet was a small, curious computer-geek domain just starting to gain some momentum with the public. Since then, it has grown to play a major role in almost every aspect of society, from socialization and gaming to national security and the world economy. The speed and magnitude of this growth have been so great that fully understanding the impact the Internet has made is a task nigh impossible.

The studies examined by this project represent a growing body of research on the effects of the Internet. Some areas of focus, such as academic and social effects, have produced results that seem to mostly portray the Internet as essentially an extension of users' lives. Those who use the Internet to study appear to get better grades; those who use it to play games appear to get worse grades. However, the interactivity of Internet technologies has led to situations perhaps unforeseen, such as the phenomenon of Internet addiction. Although more research needs to be conducted on nearly every aspect of how the Internet affects people and society, scientific studies such as these present a solid, rational way of evaluating these effects.

The other sections of the project deal with social topics that are not as easy to assess and draw conclusions from. Although there is much discussion about the use of social media by revolutionaries in the Middle East, there is, at least currently, no real way to objectively evaluate the impact this technology has had. It seems clear that the ability for anyone to make himself heard on a global scale should empower the masses, but it is certainly unclear whether it can empower them enough to drive government-toppling revolutions. Even if the communication power offered by these media is not significantly more than that of cell phones or other technology, the inspiration that comes from hearing others and being heard could be enough to bring hope and ignite fire in the souls of men. Perhaps this is too dramatic, but it is

such qualities of human spirit that science finds difficult to evaluate, and yet they may play a key role in situations of politics and oppression, where the human psyche is as central as military firepower.

The public discussion also placed heavy emphasis on something science cannot easily quantify: how people feel. There may be tests to evaluate how fast or long someone can read, and how well they comprehended the text, but (as is evidenced by the famous placebo effect) even someone thinking that they will perform differently can affect the way they really do perform. If anything, studies have shown that Internet use helps reading comprehension, at least among school children. But perhaps Internet use, especially always-connected devices such as smartphones, will affect the new generation in ways that will make them differ psychologically from older generations. It certainly is true that people's attitudes change over time, and the Internet plays such a big role in young people's lives nowadays that it is reasonable to believe that it will have an effect on their minds. Simply the exposure to such a broader array of ideas and experiences than previous generations will affect their development.

This project aimed to evaluate and draw conclusions from scientific studies on the effects of the Internet on the "Digital Generation", as well as organize discussions about other effects of the Internet based on research and serious articles from authors and journalists. Some of these discussions are topical, and like much on the Internet, may seem outdated a year from now. But the questions are important, and even if the details are dated, this study of how Internet technology can and does affect society will be useful as long as the Internet exists.

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