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Introduction

In July of 2008, Nicolas Carr of the *Atlantic* wrote an influential article entitled, "Is Google Making Us Stupid?" The predominant consideration of this ironically long article is the "deterioration" of human information processing caused by growth of information technology. The main culprit responsible for this downward trend is the Net, whose operating philosophy mandates the continual expansion of information accessibility, the reducibility of information to small bits, and the encouragement of constant consumption and generation of information. The epitome of this operating philosophy is Twitter, an extremely popular social networking website whose entire premise is based on users submitting updates about their life of no more than 140 characters (this sentence is longer than 140 characters).

In true McLuhan style, Carr contends that the Net "remaps" our neural circuitry to emulate the very medium with which we access information. We are able to process more information in a shorter amount of time, but at the cost of being prevented from focusing on long pieces of prose for sustained periods of time: "Immersing myself in a book or a lengthy article used to be easy.... That's rarely the case anymore. Now my concentration often starts to drift after two or three pages."¹

Carr drives the nail in the quick when he bemoans our decreasing capacity to focus on long pieces of information and our tendency to spend only a marginal amount of time on a single piece of information before moving onto the next. His observations beg the following questions: If our cognition is changing, then what major factor is contributing to this change, what effect does it have on society, and exactly how is cognition changing?

To explore this question, we will first follow our main lead of the Net as a cause of change in human cognition by considering how the Net has ephemeralized. Next, we will consider how the ephemeralization of the net has created a hyper-reality of the "instantly available," how human cognition has changed with regards to information processing, and how that hyper-reality could be considered a cause of change in human cognition. The paper will then critically explore this hypothesis and conclude that it is insufficient to explain the observed changes in human cognition. The paper then presents the notion of globalization and the globalized digital network as an alternate hypothesis and shows how its effects on our awareness of current events is a cause of the observed trend in our cognition. The present paper then verifies the key assumption of the globalized digital network hypothesis. Finally, the paper concludes by discussing the significance of the findings.

Ephemeralization of the Net

Ephemeralization is a term coined by famous inventor Buckminster Fuller to denote technology's ability to enable humans to accomplish more with less. As technology evolves, so does the productivity of the present technology. The evolution of transportation is an excellent example demonstrating the power of ephemeralization. With each technological progression, the time needed to reach a certain distance decreased. Certainly, today's cruise ship can travel around the world much faster and with much greater ease and comfort than the galleons of Magellan's voyage.

The same applies to information transmission. Prior to the industrial revolution, most mail was delivered via couriers on horseback; nowadays, we can communicate internationally using an online connection via fiber optic cables. If we compare the rate of information

transmission from then to now, in just two hundred years, the rate has increase around 100 billion times.² Coupled with search engines like Google, our ability to find information has radically improved. We can now access information at rates unimaginable to our ancestors three or even two generations ago.

As with all communication systems, consumption and generation of information are reciprocal. If we can now access the information online faster than before, we will want to generate more information as well. Thus, the process of ephemeralization is self-strengthening. Historian Alvin Toffler affirms this effect stating that “the greater efficiency of institutions and technologies not only leads to greater output of goods and services, but also to a faster rate of further innovation, as new ideas are generated, developed, tested and communicated with less effort, while ever more time and energy becomes available to invest in research and development.”³ The improved efficiency of information transmission has lead to more efficient means of information generation. With websites like YouTube, Facebook, and Wikipedia, the Net has adapted to increased demand for information generation, thus further ephemeralizing the Net’ information system capabilities. UC Berkeley conducted a three-year study from 2000 to 2003 to study information generation. The final report entitled “How Much Information?”⁴ found that in 2002, the world produced 5 exabytes of unique information in stored media (such as print, film, magnetic, and optical storage devices). As large as that amount seems, it pales in comparison to the 18 exabytes of unique information generated through electronic channels. To better conceptualize the vast size of this amount of information, the report states that 18 exabytes is equivalent to the amount of information found in the Library of Congress times 133,200. Furthermore, the amount of unique information generated annually has doubled over the three years of 2000 to 2003.

The Hyper-reality of the “Instantly Available” Hypothesis and Changes in Human Information Processing

It would hardly be an understatement to call the amount of information currently found online an “information flood.” The ephemeralization of the Net has clearly acted as a driving force in improving the accessibility of information found online, condensing information into terse bits, and encouraging the constant consumption and generation of information. Since the net contains an ineffable amount of readily accessible, never degrading, and typically digestible information and since so many of us rely on it, we are misled to believe that the Net allows us to find any kind of information whenever we want. I call this misperception the hyper-reality of the “instantly available” whereby individuals over-rely on the Net as an omnipotent source of information. We falsely believe that the Net is an always accessible, omnipotent source of knowledge that we can tap into to find information, so long as one can think of the correct keywords to type into Google.

One could contend that because we falsely perceive the Internet as a nearly limitless source of information that we can always access, we use the Internet in a way that fundamentally changes the manner in which we process information. We now spend less time critically interpreting information online and synthesizing it (vertically processing information) and more time simply reading it at surface value to generate awareness (horizontally processing information). We rapidly tab through websites and stop just to read the titles of the page and maybe the first few sentences of the article before we get the gist of the page then move onto the next piece of information. We do so because it takes less time to consume information in a shallow manner so that we can spend more time browsing the Net to find even more information to consume. This horizontal form of information processing stems from the misperception that we can always return to the information once we discover it and that as long as we remember what the article is about and how to retrieve it, we don’t actually need to critically read the information and store it into our memory. After all, if the Internet will always contain that information, what’s the point of wasting our “memory space” on rote memorization of data when we can expand

our intelligence by using our memory to remember where the Internet has stored that information on its memory?

The University College London published a study in January 2008 called “Information Behavior of the Researcher of the Future,” that affirms such effects that the hyper-reality of the “instantly available” have had on the “Google generation.” The report’s findings demonstrate new patterns of information consumption than what is normally done for traditional print sources of information. While gathering information from newspapers and books require slow, careful reading—what is commonly referred to as “deep reading”—information consumption for our current generation on the Internet follows a pattern of “horizontal information seeking.” In this new form of information consumption, readers will “view just one or two pages from an academic site and then ‘bounce’ out, perhaps never to return. The figures are instructive: around 60 per cent of e-journal users view no more than three pages and a majority [of people] (up to 65 per cent) never return.” Furthermore, the study confirms that the average time a person spends on each page of information is far shorter than with traditional print sources, so short that the readers have to be skimming the paper rather than actually reading the paper “in the traditional sense,” and that an average person spends as much time looking for an article than actually reading them. Internet users believe that since the information will always be online, they can come back whenever they want. For the average Internet user, the most important task while surfing online is to become aware of the information out there so they can retrieve the information when necessary when in reality, most users never return to the article again.

Furthermore, this trend of reduced depth in information processing has also spilled into traditional prints. Professor Bauerlein of Emory University wrote in his book, *The Dumbest Generation: How the Digital Age Stupefies Young Americans and Jeopardizes Our Future (Or, Don't Trust Anyone Under 30)*, that the Net creates a mental paradigm of “information retrieval, not knowledge formation” for those who grew up with the internet as a staple part of life.

The hyper-reality of the “instantly available” created by the ephemeralization of the Net suggests several key trends in our processing of information. While we can now consume more sources of information, we spend less time critically reading the information and more time absorbing key statements of information as suggested by topic sentences and article titles. The reason for this change in information processing is a result of our compulsion to collect and “read” the vast amount of information available on the Internet in a timely fashion. The only way for Internet readers to actually consume all this information is to power read: sacrifice careful reading for quick skims of key points in the article.

Weakness of the Hyper-reality Hypothesis and Introduction of the Globalization Hypothesis

While the ephemeralization of the Net has created a hyper-reality of the “instantly available”, it is inadequate to pinpoint ephemeralization as a root cause in the change of our human cognition towards reducing attention to vertical integration of knowledge and increased prioritization of horizontal information processing. The hyper-reality of the “instantly available” does not fully explain why Internet users are choosing to consume information horizontally.

While it is true that users are horizontally consuming information at far greater rates than ever before at the cost of reduced vertical consumption of information, and that such habits are even manifesting itself in the manner with which we generate information (such as the fact that many of us would prefer to use the number “2” instead of the word “to” when the difference of just one character is insignificant), the reason for this trend in human cognition is not the hyper-reality of the “instantly available” nor the ephemeralization of information. Just because information is easier to access and generate does not provide the impetus for users to forsake critical reading to become more aware of the information content available on the Net. Furthermore, the effect of the hyper-reality of the “instantly available” should actually create a desire for users to horizontally and *vertically* process information. Since the hyper-reality creates

the false perception that the Net contains any information desire so long as we can find it, we would engage in horizontal information processing to quickly become aware of the information we needed, to find then engage in vertical information processing, and to critically consume the pieces of information relevant.

However, this is not the case. Individuals are completely forgoing vertical information processing and becoming knowledge dilettantes, as if some force is compelling us to focus our energies on being more aware of the information around us at the cost of actually understanding it. Thus, the current trend in human information processing suggests that something else is at the root of this change in our cognition. In fact, the ephemeralization of the Net seems to be a partial byproduct of our increased prioritization of horizontal information processing. As we desire to become more aware of the world around us, we demand more unique information to be generated and we demand increased accessibility to it. Therefore, the hyper-reality of the “instantly available” is actually an effect of this trend in human cognition and not a cause.

As such, it seems that Carr fails to identify the actual cause of the trend in consideration, instead pinpointing a symptom. However, as with pathology, the better we understand the symptom, the better and more easily we can discover the cause. If the symptom is a tendency towards horizontal information processing that causes us to become over-dependent on the internet because it is the easiest way to access information, thereby creating a hyper-reality of the “instantly available,” then there must a force that causes us to want to become more aware of the world around us- that force is globalization.

The Globalized Digital Network and its Effects on Awareness

Globalization is the process of connecting individuals, organizational entities, and cities to the international community. By bypassing national boundaries, globalization allows individuals from around the world that would normally never intersect to interact. By connecting cultures, companies, and people from around the world together, globalization acts as network multiplier, creating new networks and increasing the density of preexisting ones. However, given the geographic distance that would act as a constraint to any physical interaction amongst the members of these networks, interactions by the members of a network created by globalization occur on the Net. Thus, globalization has created what Saskia Sassen called a “digital network” – a network of like-minded individuals who interact solely online and almost never physically interact. Since such digital networks are not formed with the expectation of ultimately meeting physically, such digital networks are formed on the premise of information exchange. As Sassen coined this term prior to the popularization of social networking sites, it is appropriate to distinguish between local digital networks that augment preexisting networks, such as Facebook and Myspace, and global digital networks that form entirely new networks.

What is important to note about the effect globalization has had in the creation of globalized digital networks is that interactions that occur within such networks do not follow the patterns of traditional interactions. While interactions between two agents in a traditional sense would be based on the premise of cultivating and improving a sense of friendship between the two, the interactions of members of a globalized digital network are centered around information generation and exchange. Let us consider several types of globalized digital networks to expand on the claim that globalized digital networks are based upon the premise of information exchange.

Internet forums are online communities of users who post questions, discussion topics, and relevant information based around a theme or point of interest. Users do not join the forum to better understand the other users but to discuss a topic or theme. As a result, Internet forum users do not necessarily feel restrained from “bashing” and “flaming” the posts of other users when they disagree about a comment because the Internet forum’s purpose is to discuss and exchange information, not to foster friendships. This of course does not necessarily preclude

friendship amongst online users and forums based on developing friendships, but the primary focus, and indeed the *raison d'être*, of globalized digital networks such as the Internet forum, is one of information exchange amongst the users.

Then there are digital networks such as Wikipedia and YouTube that are information generation platforms that enable users to share information by generating it. While Wikipedia focuses on information exchange of factual topics and YouTube is a video uploading platform that focuses on information exchange in the form of visual multimedia, both sites are digital networks that have formed on the premise of information exchange.

And let us not forget file-sharing networks. While most of the time, such sharing of information is illegal due to copyright laws, a very large underground digital network has been formed by users with the purpose of sharing of movies, TV series, and other digital media content.

While this list is by no means exhaustive – in fact, it goes on and on and encompasses a variety of online platforms such as WordPress, Twitter, Flickr, and Blogspot – it substantiates the claim that digital networks created by globalization are information exchange orientated.

An indirect effect of being a member of the globalized digital network is that our perception of what it means to become aware has changed. No longer is having an understanding of domestic affairs and international issues with regards to domestic politics considered being well-versed in current affairs. If one did not read about the Russian invasion of Georgia in 2008 or see it on the news, then one could not be considered informed of current events. No longer is a diner who only eats American food considered sophisticated. Rather, a diner must experience foods such the wild dog in China, the poisonous puffer fish of Japan, or Aztec chocolate from Mexico to be a sophisticated fine diner. No longer can a person who doesn't know the hottest movie on Bollywood be considered a top rate movie critic.

The globalization of social networks has increased the amount of unique information previously inaccessible to many individuals. Information about cultural foods, tendencies, and holidays are now easily accessible; information about the current affairs of the world are just a click away on Google News; information about cults, the occult, and cult movies are easily found online. It is not just information generation and accessibility that has increased on the Net, it is also the amount of unique information previously inaccessible and exclusive that has also vastly increased on the Net.

Thus, we find the main problem in the hypothesis of the hyper-reality of the “instantly available”- it fails to address to change in the quality of the information found online as well. The societal standards of being “aware” of the world around us have toughened as the quality and uniqueness of information accessible to us have increased. The amount of knowledge one must have to be considered “aware” is much higher than before. Thus, individuals use the internet more and more as a way to quickly find information and become more aware of the world around them while sacrificing time vertically processing such information. This enables them to digest more unique information because the standards for being “aware” are higher than before.

It seems that the mavens of Malcom Gladwell's *Tipping Point* have their work cut out for them.

Why Being Aware Matters and Why We Still Can't Vertically Process Information

The hypothesis that human cognition is shifting from a prioritization of vertical information processing to horizontal information processing because we must spend more time horizontally processing information to stay “aware” of the world around us is dependent on the assumption that being aware matters. After all, even if the standards for being aware are higher, it doesn't matter if we don't care about being “aware.”

The Journal of Advertising Research conducted a research study in December of 2007 that found that for most individuals, the average number of topics of interest that a person constantly followed and wanted to be well aware of was 11 topics of interest—more than half of all the possible areas of interest on the list (Smith). These topics of interest are extremely broad and include topics such as “music”, “electronics”, “money and investing”, and “video games”. Furthermore, around 65% of the subjects in the study state that being aware is important because their peers ask them for information about their area of interest. For the average person, being aware of the world around us is important because it strengthens out connections with peers. With 11 areas of focus and the increasing standards for being “aware” caused by globalized digital networks, the amount of information a person must be aware of to be considered “aware” has greatly increased.

While we find it extremely important to be aware of the world around us and while the amount of information needed to be considered “aware” has greatly increased, the amount of information our brain can retain has remained the same. Torkel Klingberg, a professor of cognitive neuroscience at the Karolinska Institutet in Sweden, writes in his book *The Overflowing Brain: Information Overload and the Limits of Working Memory*, how despite the fact that the amount of information we must process is increasing, the amount of information our brain can actually process is not changing. This limitation in our information processing capacity is the constraint that causes us to subconsciously prioritize horizontal information processing over vertical information processing so that we can continue to stay “aware” in the face of higher standards of awareness driven by the increasing volume and accessibility of *unique* information generated by the globalized digital network.

Conclusions

When we collect all the pieces of the puzzle and connect them in this fashion, we see that globalization is the cause of the change in human cognition. More specifically, globalization changes the manner in which we process information to become more predominantly focused on horizontal information processing. This change in cognition then acts as an impetus for the Net to further ephemeralize so that it is easier for us to find and generate the unique information we crave. This change also creates a hyper-reality of “instant availability” because of our overdependence on the Net as an ultimate source of information and further strengthens our habits of digesting information in a quick, shallow manner and generating information carelessly so that we can spend more time consuming and generating more information.

Identifying the cause in the shift of our information processing from vertical to horizontal is important. However, it is also of importance to consider the impacts of the effect itself. Carr sees this trend as negative, warning that as we continue to rely on the Net for information “it is our own intelligence that flattens into artificial intelligence.” Bauerlein takes on a more critical stance, as evidenced by the very title of his book, *The Dumbest Generation*. On the completely opposite side of the spectrum, Don Tapscott of “*grown up digital: how the net generation is changing your world*” contends that this trend is proof that the “Google Generation” can better multitask and that the intelligence of the generation is in no way deteriorating, rather it is actually being augmented by the Net. Both arguments are partially correct and incorrect and both argue their stance with great zeal—though Tapscott’s novel as a whole seem to pander more to the electronics industry and their products than serve as an actual piece of academic prose.

That being said, where does globalization fit into this formula? While globalization is a root cause in the change of our cognition from prioritization of vertical to horizontal information processing, it does not seem practical to try to tackle this issue by changing globalization. Indeed, this shift in cognition is a negative externality of globalization and alone does not outweigh the positive effects of globalization. Furthermore, it is nearly impossible to change globalization in a manner that we lower society’s standards of awareness because that would mean the elimination

of globalized digital networks. Considering such factors, we must live with this negative externality. Nevertheless, we can still try to actively change our cognition for the better through conscious efforts. Carr notes that “the human brain is almost infinitely malleable” for both children and adults. If globalization has changed out cognition to the way it is now because the mind is malleable, then it is certainly malleable enough to go the other way—or a completely new direction.

It is important to retain the critical thinking skills tarnished by the current state of information processing tendencies. Without such skills, we would eventually (d)evolve into the humans of MT Anderson's *Feed*, individuals permanently connected to the internet through a microchip, always having the information on hand but never critically thinking for themselves. We can avoid this tragedy while still cultivating the vast benefits of technology by actively fostering positive habits in younger generations. Schools and parents should instill positive habits in information processing by focusing on tasks that require vertical processing of information.

Memorizing facts alone do not make one smarter. The Internet's ability to ephemeralize information accessibility when complemented by one's ability to synthesize information synergizes human intelligence to a new level. However, to use the Internet without augmenting it with critical thinking skills is a slippery slope. For better or for worse, globalization has altered our cognition. With that knowledge, however, we can actively change our method of information processing to better adapt to the status quo. And it is that ability to adapt to new situations that will propel us to greater heights.

Tony Wang is a freshman in Wharton concentrating in Operations and Information Management.

¹ Nicholas Carr, "Is Google Making Us Stupid?" *The Atlantic*, (2008).

² Francis Heylighen, *Accelerating Socio-Technological Evolution: from ephemeralization and stigmergy to the global brain*. Vrije Universiteit in Brussels.

³ Alvin Toffler, *Future Shock*. New York: Random House, 1970.

⁴ Peter Lyman and Hal R Varian, *How Much Information?* Berkeley: Regents of the University of California, 2003.