I.

Computing power has increased exponentially over the last three decades. According to Moore's Law, computing hardware's power has doubled nearly every two years. However, the software that we use on top of this hardware hasn't kept up. How could the old Apple GUI of 1984 last, unchanged and unsullied, through several decades of computing revolution? How could the brainchild of Douglas Engelbart and the Apple artists weather the winds of Moore's Law, the emergence of the Internet, videogames, and the surrounding media?

The Windows, Mac, and Linux GUIs of today are offspring of the 1984 Apple Macintosh. In fact, take any Macintosh user today and hand her an Apple Lisa. Odds are that she will be up and running in very little time. This is not to say that the GUI is intuitive – although that is one theory. The GUI is just blindingly familiar. The pretty icons, loud wallpapers, and cartoony themes may be lost when we go back in time, but at its core, the GUI is unchanged.

Some do argue that the GUI is a timeless classic that suits our every need and requires no change. A computer is a device that we use to navigate the world of information, and it's true that this purpose has not changed since 1984. What has changed are *how* we access this information and *what* information we access. In 1984, people thought of computers as the digital analog of file cabinets. This was useful at the time because it provided a metaphor for the *what* and the *how*. Information was discrete – corporate records, personal finances, company files. This led to the ubiquitous tree-like document structure in the GUI. Folders within folders within folders represented an intuitive way to find documents.

The *what* and *how* of today are drastically different. Our world of information is not relegated to business records and documents. We deal with all sorts of other information: social networking, video, games. There is no reason to believe that the best way to represent these things is a tree of folders. Those who naively argue that the GUI's design is a timeless classic are ignoring the demands of today's users.

Another reason for the unchanged GUI is that humans are change averse. At some fundamental level, people distrust machines. They are metallic, unintelligible, and generally unintuitive.

The GUI's stagnant design may be abusing human psychology. Studies show that people hesitate to change to something even when it is demonstrably better. Change averseness is heavily related to commitment. When people commit to an idea, they naturally become

change averse. These principles can supply an answer to our question. Users commit the GUI, learning its ropes, the right buttons to push to develop a feeling of control. After such an investment to learn a system that is not inherently intuitive, users feel committed to their choice (the same thing happens in any software battles: emacs versus vim, Macintosh vs Windows, Firefox vs Chrome). With the deep-rooted history of the GUI and twenty years of use, people are hesitant to consider alternatives.

Twenty years of learning the old GUI is hard to move away from. However, for the youth who grow up in the age of Facebook, Twitter, and Counter Strike, the age old GUI belongs more in a museum than on a computer screen.

Perhaps the unchanged GUI is just an accident of history, a change that never happened. In the 80s, computers were still difficult machines that were unusable by the general populace. It was only with the emergence of Windows 3.0 and its evolving GUI that computers erupted into the mainstream. In the early 1990s, people began to notice that the old Apple GUI was not necessarily the *best* GUI. A lot of this speculation came along with the enormous impact of the web. The web presented a portal into a flow of information – different from the discrete information in someone's file folders. The first web browsers, which were windows into the world of the web, hinted that we were poised on the precipice of an interface revolution. In 1994, Gary Wolfe wrote in *Wired* magazine "Don't look now, but Prodigy, AOL, and CompuServe are all suddenly obselete – and Mosaic is well on its way to becoming the world's standard interface."

However, the changing interface demands of the web were swept away with the explosion of the web itself. The dot com boom started an avalanche of information bombardment that masked the interface issues of the GUI. People were distracted and excited. Companies that could have reformed the GUI concentrated on colonizing the limitless real estate available in the Internet. This tide has come and gone, and now, in 2010, the GUI's flaws are once again apparent. The information present in the Internet is a flow and the nature of information has changed from corporate records to a social lifestream. It may be time to place the old GUI in a museum and move on to more innovative things.

II.

The ubiquitous presence of networked computers has changed the dynamics of teaching and learning drastically. Teachers depend on computers to share information across the school, and students use computers to navigate through the world of information they are presented with.

Computers were initially inducted into the educational system not as tools to make learning easier, but as training devices for the real world: computer technology was becoming prolific in the working world, computer manufacturers were trying to make their products easier to use, and users were enamored with the power available at their fingertips. Technology was a global phenomenon, and without the proper training, the belief was that students would not be able to compete in the real world.

So when computers were first introduced into the educational system, they were tricycles. Students trained in the use of computers to be competitive in the workforce. Over time, computers became ingrained into the educational system as tools to deal with information. A computer's value was not only as a training device, but it was the Swiss army knife of encyclopedias: able to sort, deliver, and calculate information.

The current networked computer greatly reduces friction in information access. It allows the student to summon figures, articles, and media at will. The hive mind of the Internet is available to any student: but is this a good thing for teaching and learning?

A student writing a paper will first research the topic and gather existing information. The first resource he will turn to is the Internet.

Because it is so easy to fire up a web browser and type in a search term, the low hanging fruit of knowledge can easily be reached. The brazen simplicity of this process shows the power of networked computers but also hints at their flaws.

For example, a student writing about Shakespeare's *Hamlet* has an easy starting point: Google. In 0.27 seconds, there are more than ten million links displayed. How does the student process this information, pick out the good stuff, and really think about the topic? The problem with networked computers in education is that there is too *little* friction in information access. A student is unwittingly thrust in a bizarre world with everything from "Hamlet made easy: plot, characters, fast focused…" to "Hamlet: Cincinatti Shakespare company." A student drowns in this information like a plant that has been watered too much.

One problem with information overload is that much of the information is irrelevant. There is a famous linguistic maxim by Paul Grice that any answer to a question should be relevant and clear. The results given by a search engine fail this maxim. This information overload forces the student mind to be used a sieve to sort this information. Instead of contemplating on the research topics, efforts are wasted in simply determining *what* the relevant topics are.

The modern workflow is finding all the available information first, and then sifting through it to determine the relevant information. In the old days of card catalogs and typewriters, these steps were reversed. A student would think about what information he actually needed and then he would go find that information. The modern day information overload gets this backwards, and in doing so, teaches students that the correct way to answer an interesting question is to see what other people said about it *first*, rather than mulling over it independently.

However, the wealth of information available in the Internet does help those students who strive to learn independently. For young students, this power gives them free reign to explore and digest information of their choice. The Internet gives students intellectual freedom, and this is a powerful thing in education. The education system is not only in place for students to learn history, geography, mathematics and other subjects, but it is for students to experience the intangible thrill of embarking on an intellectual journey. The Internet gives students this freedom.

The real problem of depending on a computer as a learning tool is that a tool provides a shortcut, and a shortcut doesn't help students learn better. For example, most students write papers on a text editor such as Microsoft Word. Word provides an automatic spell checker which

annoyingly underlines any word that it thinks is misspelled or misused. There is a tendency for students to depend on this "feature" as a crutch. The presence of an automatic spell checker early in the educational development of a student actually impedes his learning. The student no longer has to learn to write the correct spelling of a word because he knows that Microsoft Word will correct it. By removing the sweat and blood from the learning process, computers don't augment learning ability, but hinder it.

Without computers, learning would be a more of a bottom up process. Hours of toil would produce results. However, students would be subject to the constraints of finding information. The experience of intellectual freedom would be harder to come by.

III.

We are surrounded by information – a chime, beep, or buzz lurks around every corner. This is the reality of the information age: information is at our fingertips; it surrounds us and is a part of us. Our parents lived in a different world – a world that lacked omnipresent screens and information.

The global connectivity of the information age lets me consider different perspectives on the same topic, while my parents were subjected to an American perspective. The Internet's lack of censorship and free flow of information allow me to consider all sides of the story before forming my own opinion. Because there is an endless amount of information with no friction to access, there is an unlimited potential in becoming informed.

Websites such as LiveLeak and Twitter take advantage of the Internet as a medium to transfer news that cannot be seen elsewhere. Censorship dies at the hands of the Internet, and those who choose to become better informed can be. The Internet has provided a forum for discourse. The problem is that this discourse is not necessarily rational or controlled: the same lack of rules that give the Internet its free nature also create stomping grounds where good information goes to die. The key idea here is that we cannot be better informed without *good* information.

How do we determine what information is good? In the information age, it's not only the Internet, but also all forms of media that flood people with an unrestricted flow of information, much of which we don't want to hear. One problem with this is that much of this is information is irrelevant to our interests. If only the quantity, not quality, of information increases, then it is harder to be better informed. It's difficult to sift through the desert of information and pick out the single outstanding grains.

The other problem with this information overload is that it actually dulls us to information itself. The transfer of information is no longer as exciting as it was before, simply because there is just so much of it everywhere. Hand a man a beautiful, engraved watch and he will be excited and intrigued; do this every day for years and the value of that next watch will be zero. The value of information is increased by its quality or scarcity. The information that we deal with on a daily basis is neither: there is a lot of it, and it's not necessarily *better*. This nebulous cloud of information becomes suffocating and dulls our senses. Our parents did not have to deal with this. Information was scarcer and the presence of rules, which the Internet lacks, established some threshold of quality.

Because there is no friction in information access, information can be distracting. Consider a student in class who looks up a mathematical formula on the Internet. The other two million or so links that pop up on Google can just be red herrings. The irrelevant information is not only dangerous because it is irrelevant, but because it can distract from the good, relevant information. Suddenly, the student has ten windows open with a few tabs in each – each portal exploring a different facet of the search term. Compare this to our parent's who would have had to leaf through a textbook to look up the same formula. There would be no red herrings and the information would be relevant.

The fundamental issue is that the web is not a static encyclopedia of information; it is dynamic and evolving. Information pushed to the web is streamed onto our terminals, and our terminals are the portals into this world of information. We navigate this world of information and we can pick and choose what we want. Information changes to people's interests, and the web is a huge, unordered amalgam of interests. Does its presence make us more informed? Probably not. There are too many caveats and side effects that tag along with web use. Combine this with general media overload, and we are no better informed than our parents.