

Digital Age Archeology: The Social Impact of Technology Imprinting

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ABSTRACT

“New media” is driving societal changes. A shift is occurring in the way members of our technologically-oriented society interact. Future archaeologists may be clamoring as they discover the culture of virtual villages that have been amassed in the early 21st century, as well as the containment vaults and computer hardware, in which the virtual world is now stored. These scientists may emerge from the ranks of geeks, nerds, or even computer hackers. They may team with dedicated academics curious of as to how human kind took the leap from face-to-face communication to the trust, comfort, and friendships of a virtual society driven by “new media”.

Keywords: Digital Villages, Social Networking Archaeology, Anthropology, Computer mediated communications

1. INTRODUCTION

Technology is changing rapidly, possibly faster than Moore's law [1] ever envisioned. Our society is deluged by this wake of change. Computer technologies are proliferating computer mediated communications faster than many can comprehend [2]. As in other periods in history, the nineteenth century technological revolution was founded on prior discoveries in matter and energy associated with earlier innovations [3]. Comprehending how technology has and will impact the 21st century and beyond, this paper examines social phenomena through the lens of future archeologists and anthropologists.

Archaeology in some academic curricula is a sub-discipline of anthropology [4]. Anthropology is seen as the holistic study of who we are as human beings

in the physical world amidst cultural diversity. Anthropology studies the biological, social, and cultural construct of a period of time, geographic area, or culture [5]. Archaeology dates back to the 15th century. It is frequently described as the study of the chronology of events and cultural traditions through the recovery, documentation and analysis of material remains. Considering these concepts as they relate to exploring virtual digital periods, is fundamentally the same [6] although the complexity of the documentation and recovery increases multi-fold.

In fundamental terms, archaeology can be illustrated as the recovery of tangible objects. Anthropology, the interpretation of the objects, relates to the cultural aspects of the discovery [7]. According to Steibing [8]:

The archaeologist attempts to deduce facts about bygone societies and events from the physical clues they have left behind. Tools, pottery, houses, temples, art, campfires, roads, and any other remains that show the results of human activity (including such unromantic items as garbage heaps), as well as the skeletal vestiges of humans themselves, all have stories to tell (p. 22).

The archaeologist interprets the story of people from physical objects. Simply put, “archaeology is the study of mankind's past through the recovery and analysis of its material remains” [8], p. 22).

To understand life in the 21st century and the impact of technology and the “new media”, future researchers may need the skills of a computer forensic technician to extract the contents from iPods, Blackberrys, mini-camcorders, and other digital devices. The understanding and potential extraction of what is becoming a virtual society will demand an understanding of computer containment vaults and techniques for removing data from operational as well as non-operational computer systems and storage devices. Anthropologists analyzing the 21st century will use digital mining techniques, computers, software programs and electronic instrumentation

2. BACKGROUND

Berger and Luckman [9] advanced the theory of social construction when they noted that everyday life is “not only taken for granted as reality by the ordinary members of society in the subjectivity meaningful conduct of their lives, it is a world that originates in their thoughts and actions and is maintained as real” (p. 20). In the late 20th to the

early 21st century, individuals have become fast-paced and time-constrained working longer and harder than they did 30 years ago [10]. Technology has helped fill some the time gap. A shift is occurring in the way members of our technologically-oriented society interact [11], changing from one of personal relationships to a dialogue between individuals. Technology has driven the “new media” over the past 10 years. A distinguishing attribute of a true technological reconstruction is that many innovations occur at the same time [12]. Kuhn [13] explained this shift as a paradigm change.

Technology is a complex system in which the actors construct artifacts in a context shaped both by their interests and by the underlying physical nature of their artifacts [14]. The artifacts being left in the digital world are not objects that will be dug by picks or shovels years from now, instead they will be stored digital records of our likes and dislikes. According to Lyman and Varian [15], printed documents of all kinds currently comprise only 0.003% of the total information being generated. Magnetic storage devices are rapidly becoming the universal medium for information storage as our habits, friends, and conversations are digitally recorded and stored for future analysis and scrutiny.

Ponschock [16] discussed the findings on social shifts of Internet networking. His research indicated that the internet creates an atmosphere where every communication is treated as if it were constructed in a small home town—where everyone knows everyone else’s business. As he noted, communities like MYSPACE are reflections of this migration to a virtual relationship.

3. DATA MINING: PICK AND SHOVEL NOT REQUIRED

A Google™ or Yahoo™ search for “digital Archaeology” will most likely explain how to perform reconstructive imaging of a “dig” in Botai located on the Iman-Burluk River, a tributary of the shim, in Kokshetav, Oblast or a title like “Digging without the Dirt: Online Excavations” [17]. Khalid Baheyeldin [18] defined the archeological discipline as it relates to today as including the use of digital media and digital information to get a clearer image of the society that uses them. Such findings or artifacts from the 21st century could be emails, newsgroups and forum postings, databases, digital pictures or videos. Baheyeldin [18] furthered his argument by asking how people several centuries or millennia from now will uncover enough information about us to formulate a complete picture of what was occurring in the 21st century. With the inception and

growth of the digital world, our past is not only being buried under rock and rubble, it is being stored and replicated in digital containment vaults like network servers, personal computers, digital cameras, Personal Data Assistants, and cellular telephones.

In the 21st century, the digital legacy can be replicated and virtually stored in hundreds of locations around the world on multiple media [16]. Less isolated than archeological findings of the past, the archaeologist of the future may search for pieces of information or cookies on a server in Bangladesh, a personal computer in Pittsburg, and numerous other containment vaults. The current archaeologist pieces together past cultures by interpreting their findings and formulating theories based on the artifacts discovered. The location of the “find” historically has been near the point of origination. For example, Native Americans carved, pecked, chipped, and abraded messages/pictures as etchings called petro glyphs into rocks or resident walls of a cave leaving us clues and insights into their actions and their behaviors [19]. The location of the rock or cave did not change from the time it was created except in rare occasions, when it was transported to another location. In contrast, the discovery of a video in the future may be found a continent away from its origination point.

Upcoming archaeologists will hear and see people from the past. Digital containment vaults will have not only the written pictures and words that petro glyphs held; their stories will include videos and e-mails expressing the emotions of their authors and their readers. While present archaeologists may speculate how buildings were constructed and the tools that were used decades ago, the digital age stores and collects the actual building process for historians to view and analyze. These containment vaults may be part of virtual villages like MYSPACE™, YOUTUBE™, iVillage™ Friendster™, Facebook™, and Xanga™, or personal Blogs on every imaginable subject and discipline, or even on a digital camera in a garage in up-state New York [20].

Archaeologists analyzing the 21st century digital age will also be required to separate factual findings from fantasy, as virtual reality towns or worlds may exist only in cyber space [21] and virtual villages or townships are not represented by geography, social class or financial accounting. Instead, their cyber positional location is defined purely by curiosity and individual classifications [22]. The legacy of 100 million subscribers are currently being buried in the form of personal likes, dislikes, dreams, and possibly “dirty laundry” in land fills of virtual villages or virtual communities like MYSPACE. Laurie

Anderson musician and artist wrote "Technology is the campfire around which we gather" (p. 2) [23]. The 100,000,000 members of MYSPACE [24] and many similar internet virtual socialization network communities, communicate as individuals do in the physical world, leaving artifacts for future discovery prolonging the legacy and the data trail. In fact, Jessica Vascellaro [25] wrote about a 92 year old housebound individual who wanted to show the world her piano skills through YOUTUBE so the documentary could become modern time capsule evidencing her prowess.

The digital age may also be leaving personal individual information of our human remains through the veri-chip™. The veri-chip™ is about the size of a grain or two of rice and can be micro-implanted under the skin where it can be then read by a "transponder"; a barcode type reader, or tracking device. Although facing privacy barriers [26] this device could eventually have widespread acceptance, allowing the tracking of an individual's entire medical history and whereabouts for storage and future recovery.

4. BROWSERS

From simple discovery to large scale research projects, the Internet browser has become an enormous mining tool. Although the Internet was introduced before the graphic user interface (GUI) portal, now referred to as the browser; the paradigm shift [13] to a GUI made the Internet more navigable. Access to the Internet created a drastic shift from the way banking, marketing, and advertising had been conducted. Along with the Internet's wide appeal and tremendous utility, personal and private data is left behind as was evidenced in the AOL privacy scandal where, "21 million search queries also have exposed an innumerable number of life stories ranging from the mundane to the illicit and bizarre" (p. 1) [27]. Some form of browser will undoubtedly provide digital tools for future excavations.

5. SEARCH ENGINES

A browser has limited utility without something powerful enough to retrieve information. In 18 years since 1990 when the first rather crude program called Archie assisted with the retrieval of information from the internet, data mining has grown allowing for almost instantaneous recovery capabilities from mining search engines like Google, Yahoo, Excite, and others. It is now common for someone to say, have you "googled" it when looking for an answer. Archie, an early introduction to internet search capabilities, looked at a list of File

Transfer Protocol (FTP) archives created by a basic command in the UNIX operating system providing a searchable database of filenames. Archie did not look into the files' contents. In 1991, Mark McCahill and a team at the University of Minnesota advanced Archie's earlier introduction. Their new search engine provided a simple way to navigate distributed information resources on the Internet which allowed for enhanced and deeper discovery into digital files by indexing plain text documents. Many of these same text files evolved as websites with the creation of the WorldWide Web. Each search engine now uses its own proprietary methodology that present results to user inquiries. Speed and the number of returned matches now determine the popularity of search engines as well as their long-term viability.

Digging into computer files and networks is frequently referred to as computer forensics. Although the word forensics has been defined as "to bring to court" (p.1) [28], as of 2007, it describes the process of retrieving data or information from a computer device. US-CERT [28], a United States government organization defines the forensic discipline as one that incorporates both constructs of law and computer science to collect and analyze data from computers systems, networks wireless communications, and storage devices in a way that is admissible as evidence in a court of law [29]. As forensic evidence, the data may have been deleted or the device may have been removed from its original operational unit without compromising the data's admissibility as evidence.

We submit, in the future, digital artifacts discovered and documented using forensic disciplines and methodologies will be viewed as a researchable component of electronic communities. The meticulous protocols required in forensic digital discovery mirrors that of an archeological "dig", and tomorrow's archaeologist will need to possess expert computer data detection and retrieval skills. Present day logs used by forensic digital examiners represent step-by-step records of not only their findings; they also include the methodology used in the retrieval. The log is the documentation of the "chain of custody" in the archaeologists' discovery [29]. Digital computer artifacts often exist in many formats, with earlier versions still accessible in multiple digital containment vaults (i.e. hard drives, memory chips, etc). Knowing the possibility of their existence, even alternate formats of the same data can be discovered through the scrutiny of a practiced digital forensic excavator.

6. FUTURE DIGITAL EXCAVATION

Future archaeologists will face many new obstacles. Where the archaeologist of the 20th and 21st centuries had to dig through layers of rock rubble or even garbage, the digital age archaeologist will face different layers of obstacles: computer hardware, data encryption, varied operating systems, password protections, rapidly changing storage types and standards, transported recorded language, abbreviations/codes, etc. The storage of virtual artifacts while containing enormous insights of the culture and behaviors of the inhabitants of the 21st century will include challenges of ensuring the authentication and protection of digital artifacts.

The computer forensic archaeologist will need to follow principles, practices and methodologies that will withstand scrutiny and analysis of others. Three steps will need to be meticulously followed:

1. Do not alter or change of digital artifacts;
2. Authenticate and log the recovery;
3. Do not modify the finding during the analysis [30] (Davis, 2004)

Tools other than picks and shovels will be used in future explorations. Many of these devices may not have been invented. Based on what we currently know, some of the digital tools may be browsers, search engines, and software programs like EnCase™ or ILook™ Investigator. If the artifact is from an UNIX™ based computer, Sleuth Kit™ and HashDig™ may be two computer software utilities used to uncover digital substantiation (Davis, 2004).

There will also be three additional layers of complexity in digital finds. The first will be password protection. A simple Microsoft Word™ document may be password protected. The author may have also encrypted the document. If the excavator is forensically extracting the data, they may also need to understand machine level byte configurations, or American Standard Code for Information Interchange (ASCII) representations. In addition, formats used to record the data are often media dependent varying by operating systems and may be media specific, i.e. diskette versus USB memory stick [29] which will require expertise to unravel.

7. DIGITAL ARTIFACTS

The purpose of mining is to uncover something of value. Gold miners looked for the chance of discovery in rich caverns of the precious mineral and “striking it rich”. Archaeologists in turn search for clues that will assist in a better understanding of a prior civilization or culture. The discovered objects are artifacts; objects made by the residents of that

era, for example: a tool or ornament, a clay tablet, or even a book. These findings have enormous cultural interest and impact on our understanding of societies and their methods of operation.

Digital miners also seek to uncover artifacts. The technological, digital age, will provide the archaeologist and anthropologist in centuries to come two avenues of discovery. The most visible of these artifacts will be tangible objects like cell phones, digital cameras, laptop computers, as well as digital network components, servers, routers, and a myriad of other apparatus. Tangible artifacts will provide researchers tremendous historical value in understanding the conveniences and communication devices used in this era. The digital containment vaults embedded deep within each of these will open vast windows into the culture and civilization of the 21st century. Memory chips in discarded cell phones contain text messages, addresses, and pictures of the past. Computer hard drives may contain video, e-mail messages, and memos of mergers and acquisitions. Digital cameras can show family back yard parties and world travels. ComputerWorld™ reported that in 2007 there were 500 million stored obsolete computers [31], which they defined as an archeological “Gold Mine”.

Future archaeologists face different issues from those of their predecessors. The location of their find may not have anything to do with the continent on which their discoveries are uncovered. The context in which the message is found may be critical to the understanding of its utility and meaning. There may be many identical copies of the same artifact and understanding their nuances may require finesse because digital artifacts differ in many aspects. An artifact of the past, say a piece of pottery can only reside in one place at one time. A petro glyph can only be written once. The exact message, picture, story, account of an event in the virtual digital world can be copied many times over and surface of the setting that may distort or confuse its original meaning and intent.

The excavation of virtual villages and associated “blogs” will enlighten the researcher with discussions and opinions. “Blogs” or web logs are digital debates or commentaries that will bring the past to life for the excavator. “Blogs” will need to be interpreted with caution because the same vault of artifacts that shows the actual past may represent fantasy, or distorted versions of reality. For example, the MYSPACE™ accounting of an event can be factual or make believe. The researcher may also find digital information the author believed was destroyed by deleting the entry, e-mail, or

document. Since deleting information from normal resident access does not delete all digital copies or originals that can be uncovered through forensic digital evaluation, this data may still be accessible. E-mail SPAM, may also lead the voyager down an incorrect anthropological trail of discovery. The researcher will need to triangulate [32] their findings to determine accuracy based upon historically known facts and other images that may be available to substantiate findings as they learn about the future by excavating and understanding digital records of the past.

8. CONCLUSION

The virtual villages and towns where cyber dwellers of the 21st century now reside will be excavation sites in future. Upcoming digital archaeologists and anthropologists will critique people, communities, as well as society through what they discover has been recorded in sound, video, and text as it exists in today's digital society. Coming to understand how our technology has been shaped and formed by "new media" which has substantially changed many of the ways we operate will be a daunting task. Archeological excavators will bring enlightenment to the information society in decades to come as they search for understanding concerning the metamorphosis of people, places and things that evolved during this period.

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