

# Handbook of Research on Computer Mediated Communication

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# Chapter LVI

## Digital Photography

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### ABSTRACT

*Digital photography is a relatively new topic for scholarly study in the area of computer mediated communication. Photographic technologies were only first computerized in the 1990s, but have rapidly supplanted older film technologies for a majority of professional uses. Digital photography has not simply substituted silicon chips for film, however, but has brought about rapid changes throughout the photographic process as photography entered the realm of information technology. This chapter presents a typology for approaching the study of photography as a form of computer mediated communication, and then presents several examples illustrating the consequences digital photography has for amateurs and professionals. Examples include photojournalism, scientific photography, photography in the legal system, and personal photography. The chapter ends with a call for additional research into the social aspects of this ubiquitous form of computer mediated communication..*

### INTRODUCTION

Digital photography rapidly emerged as a technology during the 1990s and achieved high levels of adoption during the first decade of the 21<sup>st</sup> century. This new computer mediated form of photography had long been anticipated. Vannevar Bush (1945) discussed the development of photographic technology in his influential *Atlantic Monthly* article "As We May Think." Among his predictions were miniature, wearable cameras, capable of holding 100 images, that used fixed focus and auto-ex-

posure to achieve high-quality results. He also predicted that "dry" nonchemical photography could result by developing still cameras that used similar principles to television, using moving beams of electrons to record images. While the details of the modern process differ from Bush's predictions, by the 1990s digital cameras were developed that achieved these feats and more.

Digital photography has all but replaced traditional film photography in recent years. By 2006, all the major camera and film manufactur-

ers had discontinued the manufacture of most types of film and film cameras. Minolta, in fact, went so far as to cease all production of cameras and film, abandoning their photography division entirely in March 2006. While there has been some attention to how this shift away from film and away from traditional camera manufacturers has affected companies in the photo industry, many of the most interesting consequences of digital photography are reflected in the use of photography by professionals. This chapter will discuss these changes.

Digital photography is not always thought of as a typical computer mediated communication (CMC) format. Part of the reason for this is that photography is a long existing medium which for most of its existence was not connected to computing in any fashion. From the mid-19th century until the 1990s, photography was a purely analog medium, using light and chemical processes to inscribe images. However, the introduction of the combined package of digital cameras, scanners, editing programs like Photoshop, and the widespread popularity of these packages has created what some call a revolution in photography. This revolution moves photography into the realm of computer mediated communication as computerized photographs are shared on Web pages and photoblogs, published on Internet news sites, and transmitted via networks by scientists, police and other professionals.

Although relatively little research has been done on digital photography as a form of CMC, there is growing interest in this research area as more scholars study the role of photography in specialized workplaces. The digital revolution in photography has computerized this communication medium and promises (and often delivers) fundamental changes in the way people do their jobs. This chapter identifies various types of people who work with digital photography, and highlights several domains in which photography plays an important role as a form of computer mediated communication. The domains discussed

here represent the areas with the most scholarly research activity, and also are good illustrations of the wide variety of communication uses that photography enables.

## **BACKGROUND**

Cameras are used by a wide variety of people for an equally wide variety of purposes. Photography is an egalitarian art form. Unlike painting or sculpture which generally require relatively extensive skills and training before the amateur is able to produce a piece that recognizably represents reality, the camera allows even the rankest of amateurs to produce an image that allows easy identification of its subject. While additional training and practice can help distinguish gifted photographers from the masses, the fact that automatic exposure and focusing allows anyone at all to produce a decent image makes photography unusual. This democratizing nature of photography has been recognized since the medium's earliest days. In 1839, the inventor of the Daguerreotype wrote, "By this process, without any idea of drawing, without any knowledge of chemistry or physics, it will be possible to take in a few minutes the most detailed views, the most picturesque scenery, for the manipulation is simple and does not demand any special knowledge, only a little care and practice is necessary in order to succeed perfectly" (Daguerre, 1839/1980).

The result of this ease of use is that cameras have become ubiquitous in much of the world. Masses of people armed with cameras and cameraphones stand ready to document people, places and events at a moment's notice. Given this fact, how can one even attempt to come to some understanding of such a widespread phenomenon?

Faced with such a daunting task, it is helpful to break down various types of photographers using a simple but ultimately helpful typology as shown in Table 1.

Table 1. Types of people using photography and examples of each

	Photographers	Use photography
Professional	I	II
	Photojournalists Wedding/events Sports Advertising	Scientists (biology, medicine, astronomy, archaeology, ecology, etc...) Police/courtroom
Amateur	III	IV
	Hobbyists Photography clubs Citizen journalists	Personal snapshots Family photographs Scrap bookers

In this simple 2x2 table, people who use photography are divided along two axes. The left dimension distinguishes between professional and amateur photographers. While in reality the difference between vocational (professional) and avocational (amateur) approaches to photography may lie more on a continuum instead of two discrete categories, this simplification serves well here. Evidence suggests that professionals and amateurs view photography differently, and use photography in different ways. This observation is based on the author's own research and on other literature about differences between professionals and amateurs (See Star & Griesemer (1989) for a discussion of differences between professionals and amateurs in science and Stebbins (1992) for a thorough discussion of the complex relationship between professionals and amateurs in general.).

It is important to note that there is no value judgment implied here: amateurs are not less important, nor necessarily less knowledgeable, than professionals. Certainly, an amateur photographer may be far more knowledgeable about the specifics of camera equipment than a professional scientist using photography as a scientific

tool. Nevertheless, besides the obvious financial difference between amateurs and professionals, there are undeniable differences in the ways amateurs and professionals are viewed by the public, and these differences have meaningful consequences.

The top dimension represents another aspect of identity: whether the person using a camera is a self-identified *photographer*, or whether they have another more important role, in a symbolic interactionist sense, to which their practice of photography is secondary. In this sense, they *use photography*, but are not primarily a *photographer*. So a professional sports photographer falls in quadrant I, whereas a scientist who uses photographic techniques falls in quadrant II. The sports photographer has *photographer* as a primary role and an important part of their personal and professional identity. The author's research with scientists, on the other hand, suggests that they generally do not view themselves as photographers, but as scientists, and that cameras and photography are simply scientific tools no different from a microscope or mass spectrometer (Meyer, 2007). *Photographer* is generally not a role they identify with in their professional career, or when it is, it is a smaller, secondary role to their major role as a scientist.

The difference between these two quadrants is significant. Professional photographers have to engage photography daily as the main driving force behind their work. Professionals who *use* photography but are not primarily photographers, on the other hand, are often less engaged in debates around photography but are no less significantly affected by changes in technology. Their level of engagement reflects that they have other more central roles to which their practice of photography is secondary.

Likewise for amateurs, an amateur photographer connotes someone actively engaged in the hobby of photography (quadrant III). Again, *photographer* is a major role, in this case an avocational role rather than a professional role. Com-

pare this to a college student going to a party and sending casual snapshots via their camera phone. Without any particular interest in photography *per se*, it is still possible to own and effectively use photographic equipment, but in this case the person is using photography to fulfill other needs and desires such as social interaction and as a tool for memory (quadrant IV).

The four categories here are related to people's social roles, and thus may be situation-specific. For instance, a scientist who photographs microscopic specimens in her professional role may also be a hobbyist photographer on the weekends. Unless she is framing her scientific specimens and entering them in her photography club's exhibitions alongside scenic views of lakes and rivers, these two roles are separate and situation-specific.

I would argue that people occupying roles in the different quadrants of this table view and use photography and digital photography differently and have different expectations for, and understandings of, photographic technology. Whereas a quadrant III amateur photographer may be very interested in detailed technical differences between image production techniques, quadrant IV scrap bookers are generally going to be more interested in whether a particular shot is representative of the event they are trying to memorialize.

Examples of types of people using digital photography for computer mediated communication are also listed in the table above. The fields with the most current research available to review include photojournalists (in quadrant I) and scientists, medical researchers, and police forensic photographers (in quadrant II). Scientific photography, for instance, represents one of the most common types of employment for photographers.

## USES OF DIGITAL PHOTOGRAPHY IN COMPUTER MEDIATED COMMUNICATION

When considering digital photography as a form of computer mediated communication, the table discussed above helps us to focus on domains where the computerization of photography has had the most impact on communication processes. We will look at examples from each of the four quadrants in turn. Quadrants I and II are of most relevance to this volume on the professional uses of CMCs, but quadrants III and IV are also help illuminate our understanding of the topic.

### Photojournalism

Photojournalists are an interesting case to examine because of the tight coupling between their work behavior and the technology associated with photography. These quadrant I professional photographers have a professional identity that is inextricable from their role as photographers. In addition, the communication aspect of their use of computer mediated communication technologies is central to their work communicating news stories to the public. Evidence suggests that the shift to digital photography for news organizations has led to tensions within the work system. According to Mitchell, "Their unconventional channels of distribution conspire to make [digital images] very difficult to pin down... There is an erosion of traditional boundaries between artist or photographer, editor, archivist, publisher, republisher, or viewer" (2001, p. 53).

These tensions may be particularly acute due to a conservative attitude among some news employees toward changes in work practices. For example, the comparative ease with which digital cameras may be used may lead news organizations

to send out a reporter armed with a digital camera instead of sending an accompanying professional photographer (Lowrey & Becker, 2001). Tensions also arise between generations of employees: as new journalism school graduates enter the workforce, they are being differentially selected for having technological skills (Hansen, Paul, & Neibergall, 2003). Existing senior employees, however, may view these skills as comparatively unimportant compared to their better developed conceptual skills. Reporters, photographers and editors must adjust to new information-processing tools and behavior patterns (Fahmy & Smith, 2003). Employment will be in jeopardy for lab technicians and others previously involved in developing, printing, cataloging and storing photographs unless they find a role to play working with new digital systems.

The ability to delete photographs on location using digital cameras affords photojournalists with greater control over their images as they decide what to keep or delete, but this in turn leads to a tension with their editors (Fahmy & Smith, 2003). Some research estimates that one quarter of all digital images are deleted by photojournalists by differentially choosing images or through censorship (Puente, 2005). War photographer Peter Howe commented that “the problem with digital cameras is, I think, they will radically reduce the amount of images available. If these field commanders are allowed to censor images before they’re transmitted, and they don’t like a particular image, they can just say, ‘Delete it’” (Baker, 2003, p. 7).

Image manipulation is, of course, nothing new in the field of photography. Even though photography has been widely seen as a tool for recording objective reality, all photographs other than ones taken by totally automatic processes involve some degree of manipulation. The position where the photographer stands in relation to the scene, the instant at which the exposure is made, the choice of camera, lens, shutter speed and aperture, and the selection of which photo-

graphs among many to print and publish can all be considered manipulations of reality. In addition, traditional photographic techniques allow for a broad range of manipulations between when the shutter is pressed and the final print is displayed. Film may be over or underdeveloped to compensate for exposure issues during developing, and prints may be dodged, burned, developed in varying chemicals and using various papers, and retouched.

The introduction of computer mediation to photographic communication raises the potential for manipulation to new levels. Altering an image is much easier with Photoshop or comparable programs used to digitally alter images, and harder to detect in many cases. “Here, photography and digital imaging diverge strikingly, for the stored array of integers has none of the fragility and recalcitrance of the photograph’s emulsion coated surface...The essential characteristic of digital information is that it *can* be manipulated easily and very rapidly by computer” (Mitchell, 2001, p. 7). Changes to the array of pixels in a digital image can be made to the original image, and in skilled hands can be done undetectably. Compared to developing photographs in darkroom, the editing tools of digital photography allow anyone with a computer and appropriate software to manipulate photographs without the involvement of a skilled technician.

Photojournalism as a field has taken a strong stance against the manipulation or alteration of photographs. Two leading professional organizations for photojournalists, the American Society of Media Photographers and the National Press Photographers Association, both have strong statements in their codes of ethics against electronically altering photographs. The following is representative of the view maintained by these professional societies:

*As journalists, we believe that credibility is our greatest asset. In documentary photojournalism, it is wrong to alter the content of a photograph in*

*any way (electronically or in the darkroom) that deceives the public. We believe the guidelines for fair and accurate reporting should be the criteria for judging what may be done electronically to a photograph* (National Press Photographers Association, 2003).

With such a strong position, one might conclude that photojournalists never engage in manipulation of photographs, and had the strongest possible motives to avoid the temptation of such manipulation. In practice, however, a variety of manipulations clearly occur, and the reaction in most instances when such alterations are discovered has been swift and decisive. When a Los Angeles Times photographer was discovered to have stitched together two images taken immediately after each other to make a more compelling cover photo, he was immediately fired and forced to leave the profession. In an interview after his firing, the photographer said:

*When I saw it, I probably just said, no one is going to know. I don't know. I've tweaked pictures before—taken out a phone pole. It's not a common practice, but you can do it. I can't speak for anyone else, but I imagine they've done it here and there. This was going overboard—taking pictures and putting them together. I think it's just that I wanted a better image. Then when I did it, I didn't even think about it* (Walker, 2003).

Other alterations in recent years have also resulted in swift reactions. Public apologies and firings have resulted from such seemingly insignificant alterations as digitally erasing the name of a competing newspaper from a player's uniform in a sports photo, or digitally placing a tennis ball in a shot of a tennis serve. The fact that even these apparently unimportant alterations have been dealt with so decisively underscores the fear that allowing any sort of digital manipulation of news photographs will result in widespread public distrust of photojournalism. The easy

manipulation of digital photographs will require that organizations place additional emphasis on the reputation of photographers, editors and publications as a means of reassuring viewers that images are not intentionally misleading: "As it becomes easier to tamper with the evidence of the photograph, all those involved in the process of publishing photographs will personally have to vouch for the content of the image" (Ritchin, 1999, p. 98).

### Scientific Photography

Scientific digital photography is an interesting but understudied area. Photography is an integral part of many scientific projects. Archaeologists use cameras to document excavations, wildlife biologists use photographs to identify and track animals from whales to elephants, microbiologists record images of microscopic specimens, and astronomers record optical and radio images of distant suns and galaxies. Medical research and clinical medicine rely on photographs for brain imaging, documentation of dermatological disorders, plastic surgery documentation and follow-up, mammography, and a myriad of other uses for data collection and patient care. However, even with the widespread use of photography in the sciences, most of the publications in this area are limited either to "how to" manuals and journals that focus on specific equipment and techniques, or to art books showing the artistic beauty of the scientific world. To date, very little research has examined the consequences of using photography (digital or otherwise) in science.

A recent case study illustrates some of the issues arising from scientific digital photography. The author of this chapter engaged in one of the first research projects aimed at better understanding how scientists use digital photography. Meyer (2007) researched digital photography adoption and regular use in one scientific field, marine mammal science. Marine mammal scientists use photographs to identify and track individual

animals over time and space. Photo-identification as a method was first developed in response to the Marine Mammal Protection Act of 1972 and to growing public sentiment against capturing and tagging dolphins and other animals. Compared to the stress placed on animals by capturing and tagging them and taking biopsy samples, photo-identification is minimally invasive. Photo-identification relies on unique features of each animal. For dolphins this is generally their dorsal fin, which is marked by a series of nicks and notches resulting from encounters with sharks, boats, hooks, and other dolphins. The unique pattern of wounds is like a fingerprint that allows individuals to be tracked over a period of years. Whale researchers can rely on fluke (tail) shapes, coloration, and wounds and on coloration patterns on the whales' backs as they surface. Seals, manatees, and otters are also studied using these techniques by relying on unique wounds, shapes of body parts, and coloration patterns.

Like many scientific fields, marine mammal researchers began switching to digital photography in the late 1990s. By 2007, a majority of researchers in this area had switched from film to digital. Some of the consequences of this shift are fairly predictable. Since the marginal cost of each shot is essentially zero, more photographs are taken in the field than when the scientists had limited film and developing budgets. The increased capacity of memory cards also increased the number of shots, as the scientist no longer needs to reserve those last few shots on a 36-shot roll in anticipation of not missing an important shot while reloading film. The quality of the images using current technology is perceived by many as superior to the black and white film and color slides which had been the standards in the field.

Other consequences are less predictable. For instance, digital photography has contributed to better health: the scientists now work with their photographs on large computer monitors rather

than hunched over a light table with a loupe pressed to one eye for hours at a time. The reduction in back-strain and eye-strain has been a significant change reported by nearly all the scientists who worked with slides. Those who printed their own black and white prints also benefit from not being exposed to the toxic chemicals that were a significant source of health problems and pollution during the film era for all types of photographers.

An interesting side-effect of the increased numbers of images being recorded during field sessions is that many scientific studies have increased the sizes of their staffs to deal with the growing catalog of photographs and the increasing computerization of all aspects of the process that accompanies digital photographs. While images can be initially processed either in the field on boats or immediately upon returning to shore, the cataloging, identifying, documenting and double-checking of the images can take up most of a scientist's time for several months after each field season. Additional staff are often required to deal with other aspects of these newly computerized photography systems in the digital era: databases, photo management software, software used to automatically identify individual animals based on algorithms, and GPS and GIS mapping software. This growing complexity of the scientific research requires additional management and coordination skills to keep everything working smoothly and efficiently.

These are just a few examples of the impact of using digital photography in science. For this field, the consequences of moving from a noncomputerized form of communication (film photography) to a computer mediated form of communication (digital photography) are significant. There are anecdotal accounts of similar changes in other scientific fields, but more research needs to be done in this area to understand the similarities and differences between fields.

## Photography in the Legal System

Another domain of quadrant II professionals is law-enforcement personnel who use photography in their work with the police and in courtrooms. Digital photography being used for computer mediated communication is involved in the legal system at several levels. Forensic teams take photographs of crime scenes; police use automatic cameras to photograph license plate numbers of cars speeding, running red lights, and driving in restricted areas; the wounds of assault and abuse victims are documented with photographs; and citizen's photographs of crimes and of inappropriate or illegal behavior by the police themselves are used to identify and potentially prosecute or reprimand perpetrators.

Digital photography is allowing police to more aggressively prosecute certain types of crimes, including domestic abuse cases. Whereas blurry snapshots used to take weeks to wend their way through processing labs and find their way to the courtroom, digital photographs of bruises and wounds can immediately be sent electronically to judges and prosecutors who can use the evidence to prosecute abuse cases even without the victim's consent (Kershaw, 2002). Domestic abuse victims are often unwilling to press charges against their abusers, but prosecutors have pushed for "mandatory prosecution" policies that allow prosecution without the cooperation of victims. The ready availability of digital photographic evidence of abuse to present to the court has increased the ability of prosecutors to hold and charge abusers who formerly would have been released due to uncooperative victims and lack of convincing evidence to present in court.

Police departments and the courts are computerizing all aspects of the legal system, and photographs play a part in a variety of systems. Police use in-car databases that can pull up photographs of suspects and computerized mug shot databases. Courts use case management systems

that allow efficient tracking of cases throughout the justice system. Forensic scientists use digital photographs to document evidence of crimes, and can use image analysis tools to examine digital photographs and videos for evidence.

Forensic science is an interesting example of how advancing technology can have unexpected and unforeseen social consequences. A recent concern among legal experts is the so-called "CSI Effect." Not limited to digital photography, the CSI Effect refers to the changing expectations of juries who expect high-tech, definitive evidence based on what they have seen on the popular television show *CSI: Crime Scene Investigation* and its offshoots. The speed of analysis, ability to use computers to enhance digital images, and highly automated systems that forensic scientists are portrayed using on these popular television shows has caused concerns that juries come to the courtroom with unrealistic expectations of what forensic science is able to accomplish. While forensic scientists have far more tools at their disposal than in the past, the flashy television version moves well into the realm of science fiction and can cause juries to be wary of evidence that is not as impressive as what they have seen on television.

Despite some early concerns about the potential easy manipulation of digital images, digital photography has been widely adopted by police agencies and courts. The concerns expressed about maintaining the chain of evidence required for admissibility into evidence have been addressed in several ways. Software programs designed to verify the authenticity of digital photographs have been developed, and police departments have established procedures for transmitting and storing digital images. Crime scene technicians can also be called to testify that the digital images represent what they saw at the crime scene. In short, if the images are a "fair and reasonably accurate representation" of what the photographer observed with their eyes, the evidence is considered admissible (Parke, 2003).

Digital cameras are also influencing policing due to the growing ubiquity of small digital cameras, video cams and cameraphones that people routinely carry. There have been a number of high-profile instances of citizens using digital cameras and cameraphones to snap pictures of crimes in progress. In addition, there are growing numbers of cases of citizens recording still or video images of police allegedly abusing suspected perpetrators that are regularly surfacing in the media and on the Internet. Web sites have been set up to track incidents of alleged police brutality and misconduct. Thus, digital photography has the consequence of increasing both the likelihood of catching criminals, and of catching inappropriate police conduct.

Digital surveillance is another key issue in the legal system. Surveillance cameras are increasing in quantity, particularly in urban areas. The United Kingdom has been among the most aggressive at establishing a “surveillance society,” installing digital CCTV cameras throughout public spaces in London and the rest of the UK. Other countries, including the United States, have been less aggressive in monitoring public spaces, but concerns over crime and terrorism are causing law enforcement personnel to examine increased monitoring. Increased public surveillance raises a number of issues, including concerns over balancing the privacy rights of citizens against public desires for reducing crime and increasing safety (Norris, McCahill, & Wood, 2004).

### **Amateur Photography: Snapshots, cameraphones and Web 2.0**

While the focus of this volume is on professional uses of CMCs, it would be remiss to discuss digital photography without mentioning the growing research into people’s personal uses of digital images. A prominent researcher in this area is Van House (Van House & Davis, 2005; Van House et al., 2004). Van House’s work examines the social meanings people place on photographic images.

Much of the related research in this area is from a Human-Computer Interaction (HCI) design perspective. HCI strives to understand the interfaces designed to facilitate the use of images, and of image capture and storage devices.

Research in this area has examined how casual photographers use and want to use digital photographic technologies. The research suggests that users have the same difficulties organizing their digital photos as they did when faced with piles of photo albums and shoeboxes stuffed with prints. They have a desire for new ways of sharing, sending, indexing and annotating photographs for their personal use. Unfortunately, this desire is mostly unrealized for now. In fact, several studies have found that only two features of indexing software were desired or used regularly: date-based sorting and showing lots of thumbnails on the screen. In software with more complex indexing and annotation features, those advanced features were not used after initial experimentation. Cameraphone users, in fact, have been shown to be uninterested in the wide variety of options for annotating photos, and mainly want to be able to attach either a short personal comment or a witty remark to their images.

Photoblogging is another area that has drawn scholarly interest. Photoblogging is part of the so-called Web 2.0. In general, photoblogging is seen as a social networking activity on the Internet, enabled by sites that allow easy posting of photographs to share with others. The range of activity of photobloggers tends to fall into two types which are consistent with quadrants III and IV of Table 1, according to our research (Meyer, Hara, & Rosenbaum, 2005). The quadrant III photobloggers are amateur photographers, who regularly post artistic photographs, often to their own dedicated Web sites. The quadrant IV photobloggers, who are more accurately engaged in photo sharing than photoblogging, are posting snapshots of events, friends, family, and travel. These photo-sharers often use popular mass market sites such as Flickr rather than dedicated personal Web sites.

Research suggests that digital photography and sharing photographs on the Web changes people's definitions of what is worthy of being photographed. Due to the essentially zero per-shot cost of taking a photograph, users are more likely to take pictures of mundane or humorous things. In fact, Cohen (2005) argues that photobloggers are often motivated by a desire to share their particular view of the world, but especially of mundane objects in the world. Cohen also notes that photobloggers use their photoblogs to motivate them to take and post new photographs more regularly than they may have in the past. This is consistent with other research showing that users take far more photographs (an increase of between 20% and 200%) once they began to use digital equipment.

## **DISCUSSION AND CONCLUSION**

Scholarly research into digital photography as a form of computer mediated communication is only recently receiving serious attention. While there is great deal of literature on the topic of photography, relatively little of this deals with the role of photography as a technology that has social consequences. Only with the recent advent of digital photography and the computerization of the whole photographic process has photography come to the attention of information and communication technology researchers. The ubiquity of digital photography tools, however, will almost certainly lead to a growing number of studies in this area.

This chapter has discussed various domains which use digital photography as a form of computer mediated communication. By distinguishing between professionals and amateurs, and between self-identified photographers and those who use photography mainly as a tool for other purposes such as scientific data collection or maintaining personal relationships, this chapter offers entrée into a large and complex set of

socio-technical relationships. Several examples are used to illustrate the range of issues that arise once photography moves from a communication technology to a computer mediated technology. While these examples are by no means exhaustive of the ways in which photography is used, they represent good illustrations of the issues arising for each of the various types of people who use photography, as identified in Table 1.

A number of tendencies and tensions arise when individuals and organizations begin to use digital cameras and other digital photography tools. Digital photography embodies a number of contrasting changes from film photography. Digital cameras are generally viewed as easier to use and simpler than film cameras, but they actually require a much more complex computerized technology package to use to their fullest. Film cameras required the purchase of a camera, possibly a detachable lens, and film which could be sent for developing. Darkrooms were entirely optional, and relatively rare. Digital cameras require the purchase of a camera which is often more expensive than comparable film cameras, possibly a lens, memory cards to store images, a computer to retrieve images from the camera, software to manage and manipulate the images, a color printer, and possibly online access fees. While some of these elements are optional, this complete package is a much more common setup than private darkrooms were to past generations. While it is possible to take one's digital camera to the drugstore to print out a single copy of a shot before deleting it, this is not the norm.

Besides purchasing this complex technology package, those wishing to make photographs must also learn to use all these tools. Scientists keeping catalogs of whale tail photographs cannot just maintain a folder of slides on a shelf. Now they must learn to work with databases and various computer hardware and software packages, or hire additional staff to do this work for them. Photojournalists no longer send their film to the lab for developing, but must instead travel with

computers with network connections (possibly via satellite in remote locations) and manage their photo collections on-site. The advantage in speed comes at a cost of increased complexity.

Other contrasts are apparent as well: people take more photographs, but they tend to print fewer of them. More photos are deleted, but more are shared through e-mail or Web sites. Fewer chemicals are required, but computers have their own embodied environmental cost. Ongoing costs are lower, but equipment may initially be more expensive. In addition, digital cameras, software and computer systems all experience relatively rapid obsolescence and are replaced much more quickly than film cameras traditionally were replaced. Photo manipulation software allows users to easily correct errors in exposure and framing, but also set the stage for potential distrust of photographs by allowing for easy manipulation of files to create images that misrepresent reality.

A wide variety of amateurs and professionals have adopted digital photography for both personal and work-related uses. For both amateurs and professionals, and for those who identify as photographers and those who simply use photography as a tool, there are important consequences to adopting this technology. For many of these uses, however, there has been a paucity of scholarly research to understand the implications of this new form of computer mediated communication. While social informatics and human computer interaction researchers have started to study digital photography, additional attention needs to be paid to the social and organizational impacts of new photographic technologies. Digital photography is undeniably here to stay, at least until it is replaced by a newer technology. As a widespread technology with the ability to shape public opinion, scientific understanding, and personal relationships, digital photography and related technologies are worthy of far more scholarly attention, and the hope is that more academics will take up this call to study digital

photography from a variety of disciplinary and interdisciplinary perspectives.

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## KEY TERMS

**Daguerreotype:** The daguerreotype was the first publicly available photographic technology. The method for creating the daguerreotype was described at a scholarly meeting in Paris in 1839 and published in a pamphlet in the same year by Louis Jacques Mandé Daguerre. While Daguerre relied on discoveries by earlier inventors for elements of his innovation, the publication of the relatively simple process for making images on silver iodide treated copper sheets and fixing the images with mercury fumes, table salt, and water ignited worldwide interest and fueled developments on a number of alternate processes (Marien, 2006).

**Digital Photography:** In addition to electronic cameras, digital photography has come to refer to the entire computing package of hardware and software used by practitioners. Included are

digital cameras which record images using electronic sensors and save these images as binary data, generally on solid-state memory cards. Software is then used to transfer these images from the camera to a computer, where the same software or other software can be used to store, catalog, alter, crop, retouch, and print images. A number of online Web sites also support uploading photographs to share with friends, family and the general public.

**Pervasive Computing:** Also called ubiquitous computing, pervasive computing refers to efforts to allow computers to disappear into the everyday environment by becoming ever-present and allowing natural interaction from users. The notion is that once computers become sufficiently integrated in the environment, users no longer “use a computer” but simply perform a task that happens to draw on computing power to accomplish the task. Cameraphones are sometimes seen as a step toward “smart” phones becoming successful pervasive computing devices that allow users to communicate via audio, video, still images, e-mail, and the Internet without having to stop and deal with issues such as connectivity and technical issues.

**Photoblogs:** Photoblogs are an extension of blogs (short for Web logs). Blogs are a form of journal on the Internet where short posts, often with links to articles on other blogs or Web sites, are posted in reverse chronological order, with the newest posts on top. Photoblogs extend this notion by being primarily focused on posting photographs rather than text comments. Many hobbyist and semiprofessional photobloggers use their photoblogs as a way to inspire themselves to regularly generate new content and to distribute their photographs to others. Photoblogs are a subset of more general photo sharing sites that allow digital images to be uploaded and shared with others.

**Social Informatics:** Social informatics is an interdisciplinary research area associated primarily with information science researchers. Drawing on theories and methods from sociology, computer science, information science, business, and a variety of other social science fields, social informatics seeks to understand the complex nature of the relationships between people and the technologies they use. Social informatics differs from human-computer interaction in the following way: while HCI is interested in the interaction between people and computers at the individual interface level, social informatics studies the interaction between people and technologies at an organizational and societal level. Kling (1999) is considered the founder of social informatics in the United States. More information about this approach can be found in Kling, Rosenbaum, and Sawyer (2005).

**Web 2.0 and Social Networking:** The term Web 2.0 was coined in 2004 to refer to the newly emergent Web sites that relied on the power of user contributions to generate content and build social network connections between individuals and groups. Instead of static Web sites that individuals merely surf around and consume, Web 2.0 applications enable active contributions by users. Examples of Web 2.0 applications are Wikipedia, blogs, MySpace, photoblogs, and photo sharing sites. Many of these also rely on folksonomies, which are user generated tags as a means of categorizing content. In folksonomies, the tags are not limited to a list determined by developers, but emerge from the descriptions attached to items by users. The photo sharing site Flickr, for instance, allows users to tag their own photographs to indicate their content, and then to search or link to other photographs with similar tags.