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MOTIVATING, INFLUENCING, AND PERSUADING USERS

B. J. Fogg,* Gregory Cuellar, David Danielson
Stanford University

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*B. J. Fogg directs the Stanford Persuasive Technology Lab and is on the consulting faculty for Stanford's Computer Science Department.

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Since the advent of modern computing in 1946, the uses of computing technology have expanded far beyond their initial role of performing complex calculations (Denning & Metcalfe, 1997). Computers are not just for scientists any more; they are an integral part of workplaces and homes. The diffusion of computers has led to new uses for interactive technology; including the use of computers to change people's attitudes and behavior—in a word: persuasion. Computing pioneers of the 1940s probably never imagined computers being used to persuade.

Today, creating successful human-computer interactions (HCIs) requires skills in motivating and persuading people. However, interaction designers don't often view themselves as agents of influence. They should. The work they perform often includes crafting experiences that change people—the way people feel, what they believe, and the way in which they behave. Consider these common challenges: How can designers motivate people to register their software? How can they get people to persist in learning an online application? How can they create experiences that build product loyalty? Often, the success of today's interactive product hinges on changing people's attitudes or behaviors.

Sometimes the influence elements in HCI are small, almost imperceptible, such as creating a feeling of confidence or trust in what the computing product says or does. Other times, the influence element is large, even life altering, such as motivating someone to quit smoking. Small or large, elements of influence are increasingly present on Web sites, in productivity tools, in video games, in wearable devices, and in other types of interactive computing products. Due to the growing use of computing products and to the unparalleled ability of software to scale, interaction designers may well become leading change agents of the future. Are we ready?

The study and design of computers as persuasive technologies, referred to as *captology*, is a relatively new endeavor when compared to other areas of HCI (Fogg, 1997, 1998). Fortunately, understanding in this area is growing. HCI professionals have established a foundation that outlines the domains of applications, useful frameworks, methods for research, design guidelines, best-in-class examples, as well as ethical issues (Berdichevsky & Neuenschwander, 1999; Fogg, 1999; Khaslavsky & Shedroff, 1999; King & Tester, 1999; Tseng & Fogg, 1999). This chapter will not address all these areas in-depth, but it will share some key perspectives, frameworks, and design guidelines relating to captology.

[AQ1]

DEFINING PERSUASION AND GIVING HIGH-TECH EXAMPLES

What is "persuasion"? As one might predict, scholars do not agree on the precise definition. For the sake of this chapter, *persuasion is a noncoercive attempt to change attitudes or behaviors.* There are some important things to note about this definition. First, persuasion is *noncoercive*. Coercion—the use of force—is not persuasion; neither is manipulation or deceit. These methods are shortcuts to changing how people believe or behave, and for interaction designers these methods are rarely justifiable.

Next, persuasion requires an *attempt* to change another person. The word *attempt* implies intentionality. If a person changes someone else's attitude or behavior without intent to do so, it is an accident or a side effect; it is not persuasion. This point about intentionality may seem subtle, but it is not trivial. Intentionality distinguishes between a *side effect* and a *planned effect* of a technology. At its essence, captology focuses on the planned persuasive effects of computer technologies.

Finally, persuasion deals with *attitude changes* or *behavior changes* or both. While some scholars contend persuasion pertains only to attitude change, other scholars would concur with my view: including behavior change as a target outcome of persuasion. Indeed, these two outcomes—attitude change and behavior change—are fundamental in the study of computers as persuasive technologies.

Note how attitude and behavior changes are central in two examples of persuasive technology products. First, consider the CD-ROM product *5 A Day Adventures* (www.dole5aday.com). Created by Dole Foods, this computer application was designed to persuade kids to eat more fruits and vegetables. Using *5 A Day Adventures*, children enter a virtual world with characters like "Bobby Banana" and "Pamela Pineapple," who teach kids about nutrition and coach them to make healthy food choices. The program also offers areas where children can practice making meals using fresh produce, and the virtual characters offer feedback and praise. This product clearly aims to change the attitudes children have about eating fruits and vegetables. However, even more important, the product sets out to change their eating behaviors.

Next, consider a more mundane example: Amazon.com. The goal of this Web site is to persuade people to buy products again and again from Amazon.com. Everything on the Web site contributes to this result: user registration, tailored information, limited-time offers, third-party product reviews, one-click shopping, confirmation messages, and more. Dozens of persuasion strategies are integrated into the overall experience. Although the Amazon online experience may appear to be focused on providing mere information and seamless service, it is really about persuasion—buy things now and come back for more.

THE FOURTH WAVE: PERSUASIVE INTERACTIVE TECHNOLOGY

Computing systems did not always contain elements of influence. It has only been in recent years that interactive computing became mature enough to spawn applications with explicit elements of influence. The dramatic growth of technologies designed to persuade and motivate represents the fourth wave of focus in end-user computing. The fourth wave leverages advances from the three previous waves (Fig. 7.1). [AQ2]

The first wave of computing began over 50 years ago and continues today. The energy and attention of computer professionals mainly focused on getting computing devices to work properly, and then to make them more and more capable. In short, the first wave is function.

The second wave of computing began in the 1970s with the emergence of digital gaming, first represented by companies like Atari and with products like Pong. This wave is entertainment, and it continues to swell because of continued attention and energy devoted to computer-based fun.

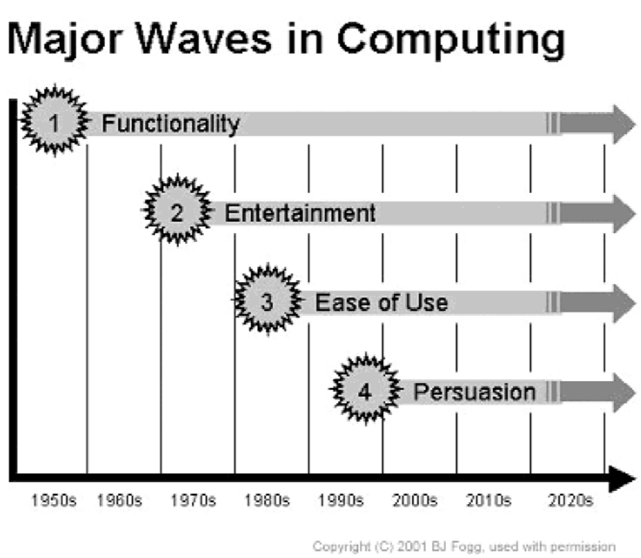
The third wave of computing came in the 1980s when human factors specialists, designers, and psychologists sought to create computers for ordinary people. This third wave is ease of use. Although new developments, like the computer mouse and the graphical-user interface came before 1980, a consumer product—the Apple Macintosh— generated widespread attention and energy to making computers easier to use. Like the previous two waves, the third wave keeps rolling today. It provides the foundation for most work in HCI arenas.

In addition, this brings us to the fourth wave: computers designed to persuade. Early signs of this wave appeared in the 1970s and 1980s with a handful of computing systems designed to motivate health behaviors and work productivity. However, it wasn't until the late-1990s—specifically during the rise of the World Wide Web—that more than a handful of people began to devote attention and energy to making interactive systems capable of motivating and influencing users. This fourth wave—persuasion—is new and could be as significant as the three waves that have come before it.

DOMAINS WHERE PERSUASION AND MOTIVATION MATTERS

Captology is relevant to systems designed for many facets of human life. The most obvious domain is in promoting commerce—buying and branding, especially via the Web. While promoting commerce is perhaps the most obvious and lucrative application, at least 11 other domains are potential areas for persuasive technology products. The various domains, along with a sample target behavior change, are summarized in Table 7.1. [AQ3]

The domains in the table reflect how much persuasion is part of ordinary human experience, from personal relationships to environmental conservation. Interactive technologies have been—and will continue to be—created to influence people in these 12 domains, as well as in others that are less apparent. The way various computing products incorporate persuasion and motivation principles will evolve as computing technology ad-



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Domains for Persuasive Technologies	Example
Commerce—Buying and Branding	To buy a certain product
Education, Learning, and Training	To engage in activities that promote learning
Safety	To drive more safely
Environmental Conservation	To reuse shopping bags
Occupational Productivity	To set and achieve goals at work
Preventative Health Care	To quit smoking
Fitness	To exercise with optimal intensity/frequency
Disease Management	To manage diabetes better
Personal Finance	To create and adhere to a personal budget
Community Involvement/Activism	To volunteer time at a community center
Personal Relationships	To keep in touch with their aging parents
Personal Management and Improvement	To avoid procrastination

vances and as people adopt a wider array of interactive systems for a wider range of human activities. The influence elements in these systems can be readily apparent, or they can be woven into the fabric of an interactive experience, a distinction explored in the next section.

PERSUASION AND INTERACTIVE TECHNOLOGY: TWO LEVELS OF ANALYSIS

One key insight in captology is to see that persuasion in computing products takes place on two levels: macro and micro. On the macro level, one finds products designed for an overall persuasive outcome. For example, the Dole *5 A Day* CD-ROM and the Amazon.com Web site are designed specifically for persuasion. For these and other products, persuasion and motivation are the sole reason these products exist. I use the word "macrosuasion" to describe this type of big-picture target outcome.

On the other hand, one finds computing products with what I call "microsuasion." These products could be word-processing programs or spreadsheets; they do not necessarily have a persuasive outcome as the overall goal of the product. However, they will incorporate smaller elements of influence to achieve other goals. Microsuasion can be incorporated into dialogue boxes, visual elements, interactions sequences, and more. In productivity software, microsuasion can lead to increased productivity or stronger brand loyalty. The following examples will help clarify the distinction between macrosuasion and microsuasion.

Examples of Macrosuasion

One notable example of macrosuasion is a product named Baby Think It Over. A U.S. company (www.btio.com) designed this computerized doll to simulate the time and energy required to care for a baby, with the overall purpose of persuading teens to avoid becoming parents prematurely. Used as part of many school programs in the United States, the Baby Think It Over infant simulator looks, weighs, and cries something like a real baby. The computer embedded inside the doll triggers a crying sound at random intervals; in order to stop the crying sound, the teen caregiver must pay immediate attention to the doll. If the caregiver fails to respond appropriately, the computed embedded inside the doll records the neglect. After a few days of caring for the simulated infant, teenagers generally report less interest in becoming a parent in the near future (see www.btio.com), which—along with reduced teen pregnancy rates—is the intended outcome of the device.

Next, consider Scorecard.org as another example of macrosuasion. Created by the Environmental Defense Foundation, this Web site helps people find information about pollution threats in their neighborhoods. When users enter their zip code, the site lists names of the polluting institutions in their area, gives data on chemicals being released, and outlines the possible health consequences. But that's not all. Scorecard.org then encourages users to take action against the polluting organizations and makes it easy to contact policymakers to express concerns. This Web site aims to increase community activism in order to pressure officials and offending institutions into cleaning up the environment. The entire point of this Web site is to get people to take action against polluting institutions in their neighborhoods. This is macrosuasion.

Examples of Microsuasion

Most computing products were not created with persuasion as the main focus. Larger software categories include applications for productivity, entertainment, and creativity. Yet these same products often use influence elements, microsuasion, as part of the overall experience. Examples of interactive products using microsuasion are plentiful—and sometimes subtle. A word-processing program may encourage users to spell check text, or a Web site devoted to high-chool reunions may reward alumni for posting a current photograph online. This is persuasion on a microlevel.

For a deeper look at microsuasion, consider the personal finance application Quicken, created by Intuit (www.intuit.com). Quicken is a productivity software product. Its overall goal is to simplify the process of managing personal finances. Quicken uses microsuasion to accomplish this overall goal. For example, the application reminds users to take financial responsibility, such as paying bills on time. In addition, the software tracks personal spending habits and shows results in graphs, allowing projections into future financial scenarios. In addition, the software praises users for doing necessary but menial tasks, like balancing their online check registry. These microsuasion elements—reminders, visualizations, and praise—are influence elements embedded in the Quicken experience in order to change what users think and how they act. Ideally, when these microsuasion elements succeed, users benefit from Quicken's approach to managing personal finances.

Like Quicken, educational software often uses microsuasion. The overall point of most educational applications and interactive experiences is to teach facts and skills, not to persuade. However, in order to get users to stick with the program or to believe what is presented, many products will incorporate motivational elements as well as building credibility perceptions of the content. The product may seek to persuade the learner that the content is important, that the learner is able to successfully master it, and that following the guidelines of the program will lead to the greatest success. Note how these smaller elements of the program—the microsuasions—contribute to the overall goal: learning. Furthermore, interactive educational products will often incorporate elements of games, which leads to a large area related to microsuasion: computer-based gaming.

Video games are typically rich in microsuasion elements. The overall goal of most games is to provide entertainment, not to persuade. However, during the entertainment experience players can be bombarded with microsuasion elements, sometimes continuously. Video games can leverage the seven basic intrinsic motivators: challenge, curiosity, fantasy, control, competition, cooperation, and recognition (Maline & Lepper, 1987). Video [AQ4] games can also incorporate other categories of microsuasion, such as social-influence dynamics.

Captology is relevant to computing products designed with macrosuasion in mind—like Baby Think It Over—and to those that simply use microsuasion in order to make the product more successful—like Quicken. In both cases, designers must understand how to create interactive experiences that change the way people think and behave, whether it is for a single overall outcome or for near-term outcomes that are the building blocks of a larger experience.

NO UNIVERSAL THEORY OF PERSUASION

Creating interactive technology experiences that motivate and influence users would be easy if persuasion were fully understood. It's not. Our understanding is limited, despite the fact that the study of persuasion extends back at least 2,000 years. The fields of psychology, marketing, advertising, public-information campaigns, and others have developed theories and perspectives on how to influence and motivate people, but all approaches have limitations. The reality is this: we have no universal theory or framework for persuasion. In other words, no single set of principles fully explains what motivates people, what causes them to adopt certain attitudes, and what leads them to perform certain behaviors (Ford, 1992). In some ways, this is not a surprise. Human psychology is complex, and persuasion is a large domain, often with fuzzy boundaries. Without a universal theory of persuasion, we must draw from a set of theories and models that describe influence, motivation, or behavior change in specific situations and for specific types of people. This limitation creates an additional challenge for designers of persuasive technology products.

Because computing technology creates new possibilities for influencing people, work in captology can lead to new frameworks, which, although not perfect, enhance the knowledge and practice in HCI. One such framework is the "Functional Triad."

THE FUNCTIONAL TRIAD: A FRAMEWORK FOR PERSUASIVE TECHNOLOGY

Computers play many roles, some of which go unseen and unnoticed. From a user's perspective, computers function in three basic ways: as (a) tools, as (b) media, and as (c) social actors. In the last two decades, researchers and designers have discussed variants of these functions, usually as metaphors for computer use (i.e., Kay, 1984; Verplank, Fulton, Black, & Moggridge, 1993). However, these three categories are more than metaphors; they are basic ways that people view or respond to computing technologies. These categories also represent three basic types of experiences that motivate and influence people.

[AQ5] Described in more detail elsewhere (Fogg, 1999, 2000), the Functional Triad is a framework that makes explicit these three computer functions—tools, media, and social actors. First, as this framework suggests, computer applications or systems function as tools, providing users with new abilities or powers. Using computers as tools, people can do things they could not do before, or they can do things more easily.

The Functional Triad also suggests that computers function as media, a role that has grown dramatically during the 1990s as computers became increasingly powerful in displaying graphics and in exchanging information over a network such as the Internet. As a medium, a computer can convey either symbolic content (i.e., text, data graphs, icons) or sensory content (i.e., real-time video, virtual worlds, simulation).

Finally, computers also function as social actors. Empirical research demonstrates that people form social relationships with technologies (Reeves & Nass, 1996). The precise causal factors for these social responses have yet to be outlined in detail, but I propose that users respond socially when computers do at least one of the following: (1) adopt animate characteristics (i.e., physical features, emotions, voice communication), (2) play animate roles (i.e., coach, pet, assistant, opponent), or (3) follow social rules or dynamics (i.e., greetings, apologies, taking turns).

The Functional Triad is not a theory; it is a framework for analysis and design. In all but the most extreme cases, a single interactive technology is a mix of these three functions, combining them to create an overall user experience.

In captology the Functional Triad is useful because it helps show how computer technologies can employ different techniques for changing attitudes and behaviors. For example, computers as tools persuade differently than computers as social actors. The strategies and theories that apply to each function differ. The paragraphs that follow use the Functional Triad to highlight aspects of persuasive technology, including general design strategies and approaches for creating computing products that persuade and motivate.

Computers as Persuasive Tools

In general, computers as persuasive tools affect attitude and behavior changes by increasing a person's abilities or making something easier to do (Tombari, Fitzpatrick, & Childress, 1985). Although one could propose numerous possibilities for persuasion in this manner, below are four general ways in which computers persuade as tools: by (a) increasing self-efficacy, (b) providing tailored information, (c) triggering decision making, and (d) simplifying or guiding people through a process.

Computers That Increase Self-Efficacy

Computers can increase self-efficacy (Lieberman, 1992), an important contributor to attitude and behavior change processes. Self-efficacy describes individuals' beliefs in their ability to take successful action in specific domains (Bandura, 1997; Bandura, Georgas, & Manthouli, 1996). When people perceive high self-efficacy in a given domain, they are more likely to take action. In addition, because self-efficacy is a perceived quality, even if individuals merely believe that their actions are more effective and productive (perhaps because they are using a specific computing technology), they are more likely to perform a particular behavior (Bandura, 1997; Bandura, Georgas, & Manthousli., 1996). As a result, functioning as tools, computing technologies can make individuals feel more efficient, productive, in control, and generally more effective (DeCharms, 1968; Kernal, 1999; Pancer, George, & Gebotys, 1992). For example, a heart-rate monitor may help people feel more effective in meeting their exercise goals when it provides ongoing information on heart rate and calories burned. Without the heart-rate monitor, people could still take their pulse and calculate calories, but the computer device—whether it be worn or part of the exercise machinery—makes these tasks easier. The ease of tracking heart rate and calories burned likely increases self-efficacy in fitness behavior, making it more likely the individual will continue to exercise (Brehm, 1997; Strecher, DeVellis, Becker, & Rosenstock, 1986; Thompson, 1992).

Computers That Provide Tailored Information

Next, computers act as tools when they tailor information, offering people content that is pertinent to their needs and contexts. Compared to general information, tailored information increases the potential for attitude and behavior change (Beniger, 1987; Dijkstra, Librand, & Timminga., 1998; Jimison, Street, & Gold, 1997; Nowak, Shamp, Hollander, Cameron, Schumann, & Thorson, 1999; Strecher, 1999; Strecher, Kreuter, Den Boer, Kobrin, Hospers, & Skinner., 1994).

One notable example of a tailoring technology is the Web site discussed earlier, Chemical Scorecard (www.scorecard.org), which generates information according to an individual's geographical location in order to achieve a persuasive outcome. After people enter their zip code into this Web site, the Web technology reports on chemical hazards in their neighborhood, identifies companies that create those hazards, and describes the potential health risks. Although no published studies document the persuasive effects of this particular technology, outside research and analysis suggests that making information relevant to individuals increases their attention and arousal, which can ultimately lead to increased attitude and behavior change (Beniger, 1987; MacInnis & Jaworski, 1989; MacInnis, Moorman, & Jaworski, 1991; Strecher, 1999).

Computers That Trigger Decision-Making

Technology can also influence people by triggering or cueing a decision-making process. For example, today's Web browsers launch a new window to alert people before they send information over insecure network connections. The message window serves as a signal to consumers to rethink their planned actions. A similar example exists in a very different context. Cities concerned with automobile speeding in neighborhoods can use a stand-alone radar trailer that senses the velocity of an oncoming automobile and displays that speed on a large screen. This technology is designed to trigger a decision-making process regarding driving speed.

Computers That Simplify or Guide People Through a Process

By facilitating or simplifying a process for users, technology can minimize barriers that may impede a target behavior. For example, in the context of Web commerce, technology can simplify a multistep process down to a few mouse clicks. Typically, in order to purchase something online, a consumer needs to select an item, place it in a virtual shopping cart, proceed to checkout, enter personal and billing information, and verify an order confirmation. Amazon.com and other e-commerce companies have simplified this process by storing customer information so that consumers need not reenter information every transaction. By lowering the time commitment and reducing the steps to accomplish a goal, these companies have reduced the barriers for purchasing products from their sites. The principle used by Web and other computer technology (Todd & Benbasat, 1994) is similar to the dynamic Ross and Nisbett (1991) discussed on facilitating behaviors through modifying the situation.

In addition to reducing barriers for a target behavior, computers can also lead people through processes to help them change attitudes and behaviors (Muehlenhard, Baldwin, Bourg, & Piper, 1988; Tombari, Fitzpatrick, & Childress, 1985). For example, a computer nutritionist can guide individuals through a month of healthy eating by providing recipes for each day and grocery lists for each week. In general, by following a computer-led process, users (a) are exposed to information they may not have seen otherwise, and (b) are engaged in activities they may not have done otherwise (Fogg, 2000). [AQ6]

Computers as Persuasive Media

The next area of the Functional Triad deals with computers as persuasive media. Although "media" can mean many things, here the focus is on the power of computer simulations. In this role computer technology provides people with experiences, either first-hand or vicarious. By providing simulated experiences, computers can change people's attitudes and behaviors. Outside the world of computing, experiences have a powerful impact on people's attitudes, behaviors, and thoughts (Reed, 1996). Experiences offered via interactive technology have similar effects (Bullinger, Roessler, Mueller-Spahn, Riva, & Wiederhold, 1998; Fogg, 2000). [AQ7]

Three types of computer simulations are relevant to persuasive technologies:

- simulated cause-and-effect scenarios
- simulated environments
- simulated objects

The paragraphs that follow discuss each simulation type in turn. (Note that other taxonomies for simulations exist. For example, see Gredler (1986), de Jong (1991), and Alessi (1991)).

Computers That Simulate Cause and Effect

One type of computer simulation allows users to vary the inputs and observe the effects (Hennessy & O'Shea, 1993)—what one could call "cause-and-effect simulators." The key to effective cause-and-effect simulators is their ability to demonstrate the consequence of actions immediately and credibly (Alessi, 1991; Balci, 1998; Balci, Henrikson, & Roberts, 1986; Crosbie & Hay, 1978; de Jong, 1991; Hennessy & O'Shea, 1993; Zietsman & Hewson, 1986). These computer simulations give people first-hand insight into how inputs (such as putting money in a savings account) affect an output (such as accrued retirement savings). By allowing people to explore causes and effects of situations, these computer simulations can shape attitudes and behaviors.

Computers That Simulate Environments

A second type of computer simulation is the environment simulator. These simulators are designed to provide users with new surroundings, usually through images and sound. In these simulated environments, users have experiences that can lead to attitude and behavior change (Bullinger et al., 1998), including experiences that are designed as games or explorations (Lieberman, 1992; Schlosser & Kanifer, 1999; Schneider, 1985; Woodward, Carnine, & Davis, 1986).

The efficacy of this approach is demonstrated by research on the Tectrix Virtual Reality Bike (an exercise bike that includes a computer and monitor that shows a simulated world). Porcari and colleagues (1998) found that people using an exercise device with computer simulation of a passing landscape exercised harder than those who used an exercise device without simulation. Both groups, however, felt that they had exerted themselves a similar amount. This outcome caused by simulating an outdoor experience mirrors findings from other research: people exercise harder when outside than inside a gym (Ceci & Hassmen, 1991).

Environmental simulators can also change attitudes. Using a virtual reality environment in which the people saw and felt a simulated spider, Carlin and colleagues (1997) were able to decrease the fear of spiders in his participants. In this research, participants wore a head-mounted display that immersed them into a virtual room, and they were able to control both the number of spiders and their proximity. In this case study, Carlin found that the virtual reality treatment reduced the fear of spiders in the real world. Other similar therapies have been used for fear of flying (Klein, 1999; Wiederhold, Davis, Wiederhold, & Riva, 1998), agoraphobia (Ghosh & Marks, 1987), claustrophobia (Bullinger et al., 1998), and fear of heights (Bullinger), among others (Kirby, 1996).

Computers That Simulate Objects

The third type of computer simulations are "object simulators." These computerized devices simulate an object (as opposed to an environment). The Baby Think It Over infant simulator described earlier in this chapter is one such device. Another example is a specially equipped car created by Chrysler Corporation, designed to help teens experience the effect of alcohol on their driving. Used as part of high-school programs, teen drivers first navigate the special car under normal conditions. Then the operator activates an onboard computer system, which simulates how an inebriated person would drive—breaking sluggishly, steering inaccurately, and so on. This computer-enhanced care provides teens with an experience designed to change their attitudes and behaviors about drinking and driving. Although the sponsors of this car do not measure the impact of this intervention, the anecdotal evidence is compelling (i.e., see Machrone, 1998).

Table 7.2 lists the three types of simulations just discussed above and outlines what advantage each type of simulation offers as far as persuasion and motivation are concerned. [AQ8]

Computers as Persuasive Social Actors

The final corner of the Functional Triad focuses on computers as "persuasive social actors," a view of computers that has only recently become widely recognized. Past empirical research has shown that individuals form social relationships with technology, even when the stimulus is rather impoverished (Fogg, 1997; Marshall & Maguire, 1971; Moon & Nass, 1996; Muller, 1974; Nass, Fogg, & Youngme, 1996; Nass, Moon, Fogg, Reeves, & Dryer, 1995; Nass & Steuer, 1993; Nass, Youngme, Morkes, Eun-Young, & Fogg, 1997; Parise, Kiesler, Sproull, & Waters, 1999; Quintanar Crowell, & Pryor 1982; Reeves & Nass, 1996). For example, individuals share reciprocal relationships with computers (Fogg & Nass, 1997a; Parise, Keisler, Sproull, & Waters, 1999), can be flattered by computers (Fogg & Nass, 1997b), and are polite to computers (Nass, Moon, & Carney, 1999).

In general I propose that, computers as social actors can persuade people to change their attitudes and behaviors by (a) providing social support, (b) modeling attitudes or behaviors, and (c) leveraging social rules and dynamics.

Computers That Provide Social Support

Computers can provide a form of social support in order to persuade, a dynamic that has long been observed in human-human interactions (Jones, 1990). While the potential for ef-

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Simulation Type	Key Advantages
Cause-and-effect simulators	• Allow users to explore and experiment • Show cause-and-effect relationships clearly and quickly • Persuade without being overly didactic
Environment simulators	• Can create situations that reward and motivate people for a target behavior • Allow rehearsal: practicing a target behavior • Can control exposure to new or frightening situations • Facilitate role playing: adopting another person's perspective
Object simulators	• Fit into the context of a person's normal life • Are less dependent on imagination or suspension of disbelief • Make clear the impact on normal life

fective social support from computer technology has yet to be fully explored, a small set of empirical studies provide evidence for this phenomenon (Fogg, 1997; Fogg & Nass, 1997b; Nass et al., 1996; Reeves & Nass, 1996). For example, computing technology can influence individuals by providing praise or criticism, thus manipulating levels of social support (Fogg & Nass, 1997b; Muehlenhard et al., 1988).

Outside the research context, various technology products use the power of praise to influence users. For example, the Dole *5 A Day* CD-ROM, discussed earlier, uses a cast of over 30 onscreen characters to provide social support to users who perform various activities. Characters such as "Bobby Banana" and "Pamela Pineapple" praise individuals for checking labels on virtual frozen foods, for following guidelines from the food pyramid, and for creating a nutritious virtual salad.

Computers That Model Attitudes and Behaviors

In addition to providing social support, computer systems can persuade by modeling target attitudes and behaviors. In the natural world, people learn directly through first-hand experience and indirectly through observation (Bandura, 1997). When a behavior is modeled by an attractive individual or is shown to result in positive consequences, people are more likely to enact that behavior (Bandura). Lieberman's research (1997) on a computer game designed to model health-maintenance behaviors shows the positive effects that an onscreen cartoon model had on those who played the game. In a similar way, the product "Alcohol 101" (www.centurycouncil.org/underage/education/a101.cfm) uses navigable onscreen video clips of human actors dealing with problematic situations that arise during college drinking parties. The initial studies on the Alcohol 101 intervention show positive outcomes (Reis, 1998). Computer-based characters, whether artistically rendered or video images, are increasingly likely to serve as models for attitudes and behaviors.

Computers That Leverage Social Rules and Dynamics

Computers have also been shown to be effective persuasive social actors when they leverage social rules and dynamics (Fogg, 1997; Friedman & Grudin, 1998; Marshall & Maguire, 1971; Parise et al., 1999). These rules include turn taking, politeness norms, and sources of praise (Reeves & Nass, 1996). The rule of reciprocity— that we must return favors to others— is among the most powerful social rule (Gouldner, 1960) and is one that has also been shown to have force when people interact with computers. Fogg and Nass (1997a) showed that people performed more work and better work for a computer that assisted them on a previous task. In essence, users reciprocated help to a computer. On the retaliation side, the inverse of reciprocity, the research showed that people performed lower quality work for a computer that had served them poorly in a previous task. In a related vein, Moon (1998) found that individuals followed rules of impression management when interacting with a computer. Specifically, when individuals believed that the computer interviewing them was in the same room, they provided more honest answers, compared to interacting with a computer believed to be a few miles away. In addition, subjects were more persuaded by the proximate computer.

The previous paragraphs outline some of the early demonstrations of computers as social actors that motivate and influence people in predetermined ways, often paralleling research from long-standing human-human research.

Functional Triad Summary

Table 7.3 summarizes the Functional Triad and the persuasive affordances that each element offers. [AQ9]

In summary, the Functional Triad can be a useful framework in captology, the study of computers as persuasive technologies. It makes explicit how a technology can change attitudes and behaviors—either by increasing a person's capability, by providing users with an experience, or by leveraging the power of social relationships. Each of these paths suggests related persuasion strategies, dynamics, and theories. One element that is common to all three functions is the role of credibility. Credible tools, credible media, and credible social actors will all lead to increased power to persuade. This is the focus of the next section.

COMPUTERS AND CREDIBILITY

One key issue in captology is computer credibility, a topic that suggests questions such as, "Do people find computers to be credible sources?," "What aspects of computers boost credibility?," and "How do computers gain and lose credibility?" Under-

TABLE 7.3. Missing Title

Au: Pls. provide title

Function	Essence	Persuasive Affordances
Computer as **tool** or **instrument**	Increases capabilities	• Reduces barriers (time, effort, cost) • Increases self-efficacy • Provides information for better decision making • Changes mental models
Computer as **medium**	Provides experiences	• Provides first-hand learning, insight, visualization, resolve • Promotes understanding of cause-and-effect relationships • Motivates through experience, sensation
Computer as **social actor**	Creates relationship	• Establishes social norms • Invokes social rules and dynamics • Provides social support or sanction

standing the elements of computer credibility promotes a deeper understanding of how computers can change attitudes and behaviors, as credibility is a key element in many persuasion processes (Gahm, 1986; Lerch & Prietula, 1989; Lerch, Prietula, & Kulik, 1997).

Credibility has been a topic of social science research since the 1930s (for reviews, see Petty & Cacioppo, 1981; Self, 1996). Virtually all credibility researchers have described credibility as a perceived quality made up of multiple dimensions (i.e., Buller & Burgoon, 1996; Gatignon & Robertson, 1991; Petty & Cacioppo, 1981; Self, 1996; Stiff, 1994). This description has two key components germane to computer credibility. First, credibility is a perceived quality; it does not reside in an object, a person, or a piece of information. Therefore, in discussing the credibility of a computer product, one is always discussing the *perception* of credibility for the computer product.

Next, researchers generally agree that credibility perceptions result from evaluating multiple dimensions simultaneously. Although the literature varies on exactly how many dimensions contribute to the credibility construct, the majority of researchers identify trustworthiness and expertise as the two key components of credibility (Self, 1996). Trustworthiness, a key element in the credibility calculus, is described by the terms *well intentioned*, *truthful*, *unbiased*, and so on. The trustworthiness dimension of credibility captures the perceived goodness or morality of the source. Expertise, the other dimension of credibility, is described by terms such as *knowledgeable*, *experienced*, *competent*, and so on. The expertise dimension of credibility captures the perceived knowledge and skill of the source.

Extending research on credibility to the domain of computers, I have proposed that *highly credible computer products will be perceived to have high levels of both trustworthiness and expertise* (Fogg & Tseng, 1999). In evaluating credibility, a computer user will assess the computer product's trustworthiness and expertise to arrive at an overall credibility assessment.

When Does Credibility Matter?

Credibility is a key component in bringing about attitude change. Just as credible people can influence other people, credible computing products also have the power to persuade. Computer credibility is not an issue when there is no awareness of the computer itself or when the dimensions of computer credibility—trustworthiness and expertise—are not at stake. In these cases computer credibility does not matter to the user. However, in many cases credibility is key. The following seven categories outline when credibility matters in HCI (Tseng & Fogg, 1999).

1. When computers act as a knowledge repository. Credibility matters when computers provide data or knowledge to users. The information can be static information, such as simple Web pages or an encyclopedia on CD-ROM. But computer information can also be dynamic. Computers can tailor information in real time for users, such as providing information that matches interests, personality, or goals. In such cases, users may question the credibility of the information provided.

2. When computers instruct or tutor users. Computer credibility also matters when computers give advice or provide instructions to users. Sometimes it's obvious why computers give advice. For example, auto-navigation systems give advice about which route to take, and online help systems advise users on how to solve a problem. These are clear instances of computers giving advice. However, at times the advice from a computing system is subtle. For example, interface layout and menu options can be a form of advice. Consider a default button on a dialogue box. The fact that one option is automatically selected as the default option suggests that certain paths are more likely or profitable for most users. One can imagine that if the default options are poorly chosen, the computer program could lose some credibility.

3. When computers report measurements. Computer credibility is also at stake when computing devices act as measuring instruments. These can include engineering measurements (i.e., an oscilloscope), medical measurements (i.e., a glucose monitor), geographical measurements (i.e., devices with GPS technology), and others. In this area I observed an interesting phenomenon in the 1990s when digital test and measurement equipment was created to replace traditional analog devices. Many engineers, usually those with senior status, did not trust the information from the digital devices. As a result, some engineers rejected the convenience and power of the new technology because their old analog equipment gave information they found more credible.

4. When computers report on work performed. Computers also need credibility when they report to users on work the computer has performed. For example, computers report the success of a software installation or the eradication of viruses. In these cases and others, the credibility of the computer is at issue if the work the computer reports do not match what actually happened. For example, suppose a user runs a spell check and the computer reports no misspelled words. If the user later finds a misspelled word, then the credibility of the program will suffer.

5. When computers report about their own state. Computers also report their own state, and these reports have credibility implications. For example, computers may report how much disk space they have left, how long their batteries will last, how long a process will take, and so on. A computer reporting about its own state raises issues about its competence in conveying accurate information about itself, which is likely to affect user perceptions of credibility.

6. When computers run simulations. Credibility is also important when computers run simulations. This includes simulations of aircraft navigation, chemical processes, social dynamics, nuclear disasters, and so on. Simulations can show cause-and-effect relationships, such as the progress of a disease in a population or the effects of global warming. Similarly, simulations can replicate the dynamics of an experience, such as piloting an aircraft or caring for a baby. Based on rules that humans provide, computer simulations can be flawed or biased. Even if the bias is not intentional, when users perceive that the computer simulation lacks veridicality, the computer application will lose credibility.

7. When computers render virtual environments. Related to simulations is the computer's ability to create virtual environments for users. Credibility is important in making these environments believable, useful, and engaging. However, virtual environments don't always need to match the physical world; they simply need to model what they propose to model. For example, like good fiction or art, a virtual world for a fanciful arcade game can be highly credible if the world is internally consistent.

Web Credibility Research and Guidelines for Design

When it comes to credibility, the Web is unusual. The Web can be the most credible source of information, and the Web can be among the least credible sources. Limitations inherent to traditional media—most notably modality, interactivity, and space limitations—are often avoidable on the Web. As a result, online information has the potential to be more complete and enhanced by interactive options for users to more thoughtfully process what they read.

However, this potential is accompanied by several features of the Web that can erode its credibility as a medium (Danielson, 2005). First, the Web lacks the traditional gate keeping and quality-control mechanisms that are commonplace to more traditional publishing, such as editing and fact checking. Second, because digital information can be manipulated, disseminated, and published with relative ease, online information seekers must learn to account for incorrect information being widely and quickly duplicated (Metzger, Flanagin, & Zwarun, 2003), as in the case of ubiquitous "Internet hoaxes." Third, where in most media environments prior to the Web and in face-to-face interactions the speaker or writer of proposed ideas and facts was typically clear to the listener or reader, source *ambiguity* is often the rule rather than the exception in Web information seeking. Finally, as with any new media technology, the Web requires users to develop new skills when evaluating various claims (Greer, 2003), as in the case of checking Uniform Resource Locators (URLs) as an indicator of site credibility.

Many Web sites today offer users low-quality—or outright misleading— information. As a result, credibility has become a major concern for those seeking or posting information on the Web (Burbules, 2001; Caruso, 1999; Johnson & Kaye, 1998; Kilgore, 1998; McDonald, Schumann, & Thorson, 1999; Nielsen, 1997; Sullivan, 1999). Web users are becoming more skeptical of what they find online and may be wary of Web-based experiences in general.

There's a direct connection between Web credibility and persuasion via the Web. When a site gains credibility, it also gains the power to change attitudes, and, at times, behaviors. When a Web site lacks credibility, it will not be effective in persuading or motivating users. In few arenas is this connection more direct than in e-commerce, where various online claims and promises about products and services provide the primary or sole basis for buying decisions.

As part of the Persuasive Technology Lab, we have been investigating factors influencing Web site credibility and user strategies for making such assessments. A general framework for research in this relatively young field is captured in Fogg's Prominence-Interpretation Theory (Fogg, 2002, 2003). Credibility assessment is an iterative process driven by (a) the likelihood that particular Web-site elements (such as its privacy policy, advertisements, attractiveness, etc.) will be noticed by an information seeker (*prominence*), and (b) the value that element will be assigned by the user in making a credibility judgment (i.e., increases or decreases perceived credibility) (*interpretation*). Several factors can influence the likelihood of an element being noticed, including the user's level of involvement, the significance of the information sought, and the user's level of Web experience, domain expertise, and other individual differences. Similarly, interpretation is influenced by such individual and contextual factors. Noticeable Web-site elements are evaluated until either the user is satisfied with an overall credibility assessment, or a constraint (often associated with lack of time or motivation) is reached.

Perhaps more than with any other medium, Web-interaction designers face increasing challenges to design Web experiences that first and foremost hold the attention and motivation of information seekers; the second hill to climb is in persuading Web users to adopt specific behaviors, such as the following:

- register personal information
- purchase things online
- fill out a survey
- click on the ads
- set up a virtual community
- download software
- bookmark the site and return often

If Web designers can influence people to perform these actions, they have been successful. These are key behavioral outcomes. But what do users notice when evaluating Web content, and how are those noticed elements interpreted? What makes a Web site credible? We offer the following broad guidelines, arising out of our lab's experimental work:

Guideline #1: Design web sites to convey the "real world" aspect of the organization. Perhaps the most effective way to enhance the credibility of a Web site is to include elements that highlight the brick-and-mortar nature of the organization it represents. Despite rampant source ambiguity on the Web, Web users show a strong reliance on indicators of identity (Rieh, 2002), including credentials, photos, and contact information

(Fogg, Marshall, Laraki, Osipovich, Varma, Fang, et al., 2001). The overall implication seems clear: To create a site with maximum credibility, designers should highlight features that communicate the legitimacy and accessibility of the organization.

Guideline #2: Invest resources in visual design. Web users depend to a surprisingly large degree on the visual design of Web sites when making credibility judgments. In one study, we found "design look" to be the single most mentioned category by a sample of more than 2,800 users when evaluating the credibility of sites across a wide variety of domains (Fogg, Soohoo, Danielson, Marable, Stanford, & Tauber, 2003). Similar to the assessment of human communicators, the attractiveness and professional design of a Web site is often used as a first indicator of credibility.

Guideline #3: Make Web sites easy to use. In the HCI community we have long emphasized ease of use, so a guideline advocating ease of use is not new. However, our work adds another important reason for making Web sites usable: it will enhance the site's credibility. In one study (Fogg et al., 2001), people awarded a Web site credibility points for being usable (i.e., "The site is arranged in a way that makes sense to you"), and they deducted credibility points for ease-of-use problems (i.e., "the site is difficult to navigate"). While this information should not change how we, as HCI professionals, design user experiences for the Web, it does add a compelling new reason for investing time and money in usable design—it makes a site more credible. Going beyond the data, one could reasonably conclude that a simple, usable Web site would be perceived as more credible than a site that has extravagant features but is lacking in usability.

Guideline #4: Include markers of expertise. Expertise is a key component in credibility, and our work supports the idea that Web sites that convey expertise can gain credibility in users' eyes. Important "expertise elements" include listing an author's credentials and including citations and references. It's likely that many other elements also exist. Many Web sites today miss opportunities to convey legitimately expertise to their users.

Guideline #5: Include markers of trustworthiness. Trustworthiness is another key component in credibility. As with expertise, Web site elements that convey trustworthiness will lead to increased perceptions of credibility. Such elements include linking to outside materials and sources, stating a policy on content, and so on. Making information verifiable on a Web site increases credibility despite the fact that users are unlikely to follow through on verification (Metzger et al., 2003). Thus, the mere presence of some design elements will influence user perceptions. We propose that Web site designers who concentrate on conveying the honest, unbiased nature of their Web site will end up with a more credible—and therefore more effective—Web site.

Guideline #6: Tailor the user experience. Although not as vital as the previous suggestions, tailoring does make a difference. Our work shows that tailoring the user experience on a Web site leads to increased perceptions of Web credibility. For example, people think a site is more credible when it acknowledges that the individual has visited it before. To be sure, tailoring and personalization can take place in many ways. Tailoring extends even to the type of ads shown on the page: ads that match what the user is seeking seem to increase the perception of Web site credibility.

Guideline #7. Avoid overly commercial elements on a Web site. Although most Web sites, especially large Web sites, exist for commercial purposes, our work suggests that users penalize sites that have an aggressively commercial flavor. For example, Web pages that mix ads with content to the point of confusing readers will be perceived as not credible. Fogg et al. (2001) found that mixing ads and content received the most negative response of all. However, it is important to note that ads don't always reduce credibility. In this study and elsewhere (Kim, 1999), quantitative research shows that banner ads done well can enhance the perceived credibility of a site. It seems reasonable that, as with other elements of people's lives, we accept commercialization to an extent but become wary when it is overdone.

Guideline #8. Avoid the pitfalls of amateurism. Most Web designers seek a professional outcome in their work. Organizations that care about credibility should be ever vigilant—and perhaps obsessive—to avoid small glitches in their Web sites. These "small" glitches seem to have a large impact on Web credibility perceptions. Even one typographical error or a single broken link is damaging. While designers may face pressures to create dazzling technical features on Web sites, failing to correct small errors undermines that work.

Despite the growing body of research, much remains to be discovered about Web credibility. The study of Web credibility needs to be an ongoing concern because three things continue to evolve: (a) Web technology, (b) the type of people using the Web, and (c) people's experiences with the Web. Fortunately, what researchers learn about designing for Web credibility can translate into credible experiences in other high-tech devices that share information, from mobile phones to gas pumps.

POSITIVE AND NEGATIVE APPLICATIONS OF PERSUASIVE TECHNOLOGY

As the power of persuasive techniques becomes more understood, we are beginning to see more examples of persuasive technologies being created. Many have positive goals in mind, but there are also many technologies designed to negatively influence attitudes and behaviors.

An example of a positive technology is a mobile application called MyFoodPhone. While mobile persuasive devices have not been studied rigorously, they have several unique properties that may improve their abilities to persuade. First, they are personal devices: people carry their mobile phones everywhere, customize them, and store personal information in them. Second, intrinsic to them being mobile, these devices have the potential to intervene at the right moment, a concept called *kairos*.

MyFoodPhone is an application for the camera phone that helps people watch what they eat—whether they want to change their weight or just eat right. Whenever a user is concerned with an item they are about to eat, they simply take a picture of it with their camera, then use MyFoodPhone to send it to a system that evaluates if it is appropriate to eat (given the user's predefined dietary restrictions). MyFoodPhone then tells the user if he or she should eat the food. In this case, the simplicity and appropriate timing of the application make it a powerful persuasive tool.

On the Web, GoDaddy (www.godaddy.com), a popular Web-hosting company, attempts to persuade users to purchase more expensive hosting solutions by "disguising" links to their less-expensive plans with plain text links, while links to more pricey upgrades are in large, brightly colored buttons.

A more negative example can be found in the rise in "Pro Anorexia" Web sites, encouraging self-starvation and sharing tips for losing weight. Though they reached their height in earlier part of the decade, many of these sites are still being operated. By creating social networks around it, people suffering from anorexia are supported and encouraged to continue their unhealthy habits. Many of these Web sites use the Web credibility techniques discussed earlier: the sites are well designed and contain expert advice.

As the power of persuasive technologies becomes more understood, the consideration of the ethical ramifications of these technologies becomes essential.

THE ETHICS OF COMPUTING SYSTEMS DESIGNED TO PERSUADE

In addition to research and design issues, captology addresses the ethical issues that arise from design or distributing persuasive interactive technologies. Persuasion is a value-laden activity. By extension, creating or distributing an interactive technology that attempts to persuade is also value laden. Ethical problems arise when the values, goals, and interests of the creators don't match with those of the people who use the technology. HCI professionals can ask a few key questions to get insight into possible ethical problem areas:

- Does the persuasive technology advocate what's good and fair?
- Is the technology inclusive, allowing access to all, regardless of social standing?
- Does it promote self-determination?
- Does it represent what's thought to be true and accurate?

Answering no to any of these questions suggests the persuasive technology at hand could be ethically questionable and perhaps downright objectionable (for a longer discussion on ethics, see Friedman & Kahn, later in this volume).

While it's clear that deception and coercion are unethical in computing products, some behavior change strategies such as conditioning, surveillance, and punishment, are less cut and dry. For example, Operant conditioning—a system of rewards—can powerfully shape behaviors. By providing rewards, a computer product could get people to perform new behaviors without their clear consent or without them noticing the forces of influence at work.

Surveillance is another common and effective way to change behavior. People who know they are being watched behave differently. Today, computer technologies allow surveillance in ways that were never before possible, giving institutions remarkable new powers. Although advocates of computer-based employee surveillance (i.e., DeTienne, 1993) say that monitoring can "inspire employees to achieve excellence," they and opponents agree that such approaches can hurt morale or create a more stressful workplace. When every keystroke and every restroom break is monitored and recorded, employees may feel they are part of an electronic sweatshop.

Another area of concern is when technologies use punishment—or threats of punishment—to shape behaviors. Although punishment is an effective way to change outward behaviors in the short term, punishment has limited outcomes beyond changing observable behavior, and many behavior change experts frown on using it. The problems with punishment increase when a computer product punishes people. The punishment may be excessive or inappropriate to the situation. Also, the long-term effects of punishment are likely to be negative. In these cases, who bears responsibility for the outcome?

Discussed elsewhere in more detail (Berdichevsky, 1999; Fogg, 1998), those who create or distribute persuasive technologies have a responsibility to examine the moral issues involved.

PERSUASIVE TECHNOLOGY: POTENTIAL AND RESPONSIBILITY

Computer systems are now becoming a common part of everyday life. Whatever the form of the system, from a desktop computer to a smart car interior to a mobile phone, these interactive experiences can be designed to influence our attitudes and affect our behaviors. They can motivate and persuade by merging the power of computing with the psychology of persuasion.

We humans are still the supreme agents of influence—and this won't change any time soon. Computers are not yet as effective as skilled human persuaders are, but at times computing technology can go beyond what humans can do. Computers never forget, they don't need to sleep, and they can be programmed to never stop trying. For better or worse, computers provide us with a new avenue for changing how people think and act.

To a large extent, we as a community of HCI professionals will help create the next generation of technology products, including those products designed change people's attitudes and behaviors. If we take the right steps—raising awareness of persuasive technology in the general public and encouraging technology creators to follow guidelines for ethical interactive technologies—we may well see persuasive technology reach its potential, enhancing the quality of life for individuals, communities, and society.

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AU Comment 1: [AQ12]Please specify whether Washington refers to D.C. or the state in Balci, O. (1998). If referring to the state, please provide city.
AU Comment 2: Please provide issue number, pages numbers, publisher and publisher city for Balci, O., Henrikson, J. O., & Roberts, S. D. (1986).
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