Persuasive Computers: Perspectives and Research Directions

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ABSTRACT

The study of computers as persuasive technologies (called "captology") was introduced at CHI 97 as a new area of inquiry. This paper proposes definitions, perspectives, and research directions for further investigation of this field. A persuasive computer is an interactive technology that attempts to change attitudes or behaviors in some way. Perspective 1 describes how computers can inherit three types of intentionality: endogenous, exogenous, and autogenous. Perspective 2 presents the "Functional Triad," which illustrates that computers can function as persuasive tools, media, and social actors. Perspective 3 presents a "levels of analysis" approach for captology, which include varying levels from individual to societal. Perspective 4 suggests a simple method for exploring the design space for persuasive computers. Perspective 5 highlights some ethical issues inherent in persuasive computing. The paper concludes by proposing seven directions for further research and design.

Keywords

persuasion, captology, media, computers as social actors, ethics, design methods, computers as persuasive technologies

INTRODUCTION

At CHI 97, a special interest group meeting gathered a number of participants who were interested in exploring the domain of computers and persuasion [6]. We agreed to call this area "captology" (built from an acronym for Computers As Persuasive Technologies), with the graphic in Figure 1 serving as a reference point for this domain.

The discussion on captology at the CHI 97 SIG proved fruitful and enlightening, with participants concurring that captology was an intriguing area for further research and design. The group also agreed that this domain had not yet been adequately defined or addressed by researchers and practitioners of human-computer interaction. We found that our discussion suffered at times because we lacked key definitions and frameworks for understanding captology. The purpose of this paper, therefore, is to contribute to the CHI community's understanding of persuasive computing by proposing definitions, perspectives, and research directions for the field of captology.

CHI 98 Los Angeles CA USA

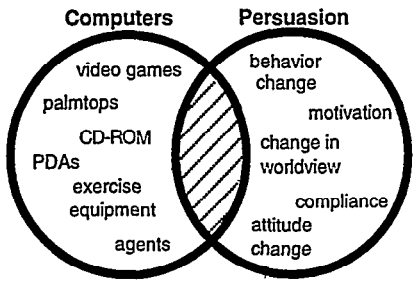

Figure 1: Captology describes the shaded area where computing technology and persuasion overlap.

This paper first presents five perspectives on computers and persuasion. They include the following:

- Perspective 1: Definition of persuasive computers
- Perspective 2: A functional view of persuasive computers
- Perspective 3: Levels of analysis for captology
- Perspective 4: The design space for persuasive technologies
- Perspective 5: Ethics of computers that persuade

Each of these five perspectives provides a different way to view persuasive computers, while also describing examples of relevant technologies. After setting forth the five perspectives on persuasive technologies, this paper concludes by outlining seven profitable directions for further research in the area of persuasive computers.

To be clear, this paper makes a contribution by articulating a range of approaches to captology. It is the role of later work to expand and revise the ideas proposed in this paper.

PERSPECTIVE 1: DEFINITION OF PERSUASIVE COMPUTERS

What is a persuasive computer?

Simply put, a persuasive computer is an interactive technology that changes a person's attitudes or behaviors. This definition works well in many cases, but a more thorough definition gives a better understanding of persuasive computing.

The psychology literature suggests many definitions for the word "persuasion" [e.g., 24, 36]. After reviewing the work of persuasion scholars, I've synthesized the various definitions to define "persuasion" as "an attempt to shape, reinforce, or change behaviors, feelings, or thoughts about an issue, object, or action."

Persuasion and intentionality

One key point in this definition is that true persuasion implies an **intent** to change attitudes or behaviors; in other words, persuasion requires intentionality. Therefore, not all behavior or attitude change is the result of persuasion. For example, a rain storm may cause people to buy umbrellas, but the storm is not a persuasive event because it has no intentionality associated with it. (However, if an umbrella manufacturer could somehow cause rain, then the rain storm might qualify as a persuasive tactic.)

Because machines do not have intentions [8], a computer qualifies as a persuasive technology only when those who create, distribute, or adopt the technology do so with an intent to affect human attitudes or behaviors. To be clear, the persuasive nature of a computer does not reside with the object itself; instead, a computer being classified as "persuasive" depends on the context of creation, distribution, and adoption. I propose that if an intent to change attitudes or behaviors is a factor in the creation, distribution, or adoption of a technology, then that technology inherits a type of intent from human actors.

Three types of intent: endogenous, exogenous, and autogenous

For the purposes of captology, I propose three kinds of inherited persuasive intent: endogenous, exogenous, and autogenous. According to my definitions, a computer technology inherits **endogenous** intent when a designer or producer creates a technology with intent to persuade users in some way. A computer technology inherits **exogenous** intent when one person provides another person with a computer technology in an attempt to change that person's attitudes or behaviors. A computer technology inherits **autogenous** intent when a person chooses to use or adopt a technology in order to change his or her own attitudes or behaviors. Table 1 makes this idea clearer.

Type of intent	Where intent comes from	Example
endogenous "from within"	Those who create or produce the interactive technology	Health-Hero video games are designed to persuade children to develop good health habits [17].
exogenous "caused by external factors"	Those who give access to or distribute the interactive technology to others	A mother may give her son a Palm Pilot PDA in hopes that he will become more organized.
autogenous "self-produced"	The person adopting or using the interactive technology	A person may buy and use a calorie-counting computer device to help change his or her own eating behavior.

Table 1: Three types of intent with examples

Although the above categories aim to distinguish among types of persuasive technologies, I recognize that these categories are not always precise, and they are not always mutually exclusive. Indeed, making inferences about intentions is tricky business—we may infer intent where there is none, or we may fail to perceive intent when intent does indeed exist. Furthermore, it is quite possible that a given interactive technology may fall into more than one category. Despite the potential ambiguities, I find these three categories helpful in better understanding the range and roles of persuasive computing technologies.

PERSPECTIVE 2: A FUNCTIONAL VIEW OF PERSUASIVE COMPUTERS

While Perspective 1 provides an "intentional" framework for persuasive computers, Perspective 2 presents what I call a "functional" view. To explain Perspective 2 clearly, I first describe the basics of the "Functional Triad." I then show how this framework can provide key insights into the study of persuasive computers.

The Functional Triad

I propose that today's computers function in three basic ways: as **tools**, as **media**, and as **social actors**. Researchers and designers have often discussed variants of these functions [e.g., 18, 22, 33], usually as metaphors for computer use. However, I suggest that these three categories are more than metaphors; they are basic ways that people view or respond to computing technologies. I refer to these three areas as "functions."

As a **tool**, the computer (or the computer application or system) provides humans with new ability or power, allowing people to do things they could not do before, or to do things more easily [28, 29].

Computers also function as **media** [13, 30, 32], a role that has become more apparent and important in recent years [30, 34]. As a medium, a computer can convey either symbolic content (e.g., text, data graphs, icons) or sensory content (e.g., real-time video, simulations, virtual worlds).

Computers can also function as **social actors** [12, 16, 25, 32]. Users seem to respond to computers as social actors [25] when computer technologies adopt animate characteristics (physical features, emotions, voice communication), play animate roles (coach, pet, assistant, opponent), or follow social rules or dynamics (greetings, apologies, turn taking).

Mapping the functions

One way to view these three functions simultaneously is to map the three categories into two dimensions. Of course, in all but the most extreme cases, these functions mix and blur in any one given interactive technology. However, consciously mapping interactive technologies into a triangular space I call the "Functional Triad" generates insight into the roles and relationships of different computer technologies. Figure 2 represents the Functional Triad with some prototypical examples.

Persuasion and the functional view of computers

Although the functional triad is a useful framework for understanding computer technologies in general, adopting this functional view of computers yields specific insights for analyzing persuasive interactive technologies.

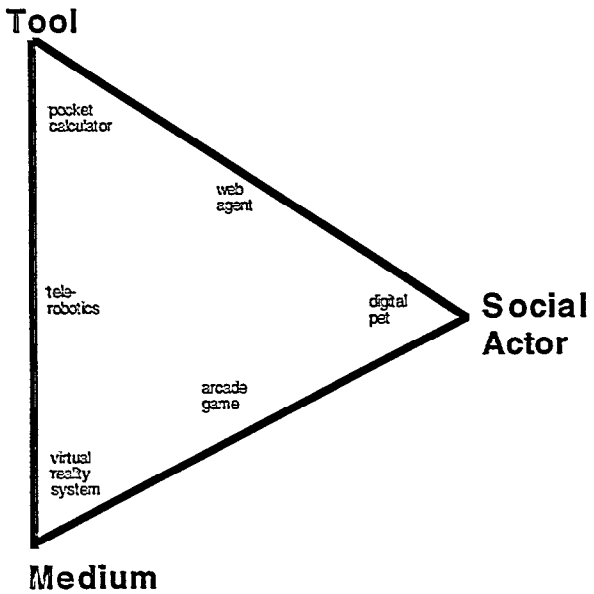

Figure 2: The Functional Triad with examples

By viewing a computer technology as a tool, one can then ask how tools can be persuasive devices. In other words, "How do tools change attitudes or behaviors?" While this question deserves more detailed exploration, one preliminary answer is that tools can be persuasive by (1) reducing barriers and thereby increase the likelihood of a certain behavior [2, 11], (2) increasing self-efficacy by making a certain behavior seem achievable [2, 17], (3) providing information that allows informed decisions [19], and (4) shaping a person's mental model by channeling behavior in a certain pattern.

One could also pose similar questions about the other two functional areas for computers: "What makes computers as media persuasive?" and "What makes computers as social actors persuasive?" [4, 5, 20]. While this paper will not fully answer these questions, Table 2 highlights some persuasive affordances in each of the three functional areas:

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/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

Table 2: Three computer functions and their persuasive affordances

Examples in each functional area

As the Table 2 shows, computers functioning as tools, media, or social actors can change attitudes and behaviors through different means. Examples of persuasive computers in each category follow:

Example of computer as persuasive tool

Polar Heart Rate Monitor [www.polar.fi]: This exercise device sounds an alarm when a person's heart rate falls outside a pre-set zone. The device not only can motivate a person to change behavior during exercise, but it may also increase self-efficacy about one's ability to exercise effectively (thus increasing likelihood of adherence to an exercise program).

Example of computer as persuasive medium

HIV Roulette [www.exploratorium.edu]: A computerized exhibit at the San Francisco Exploratorium allows visitors to make hypothetical choices about sexual behavior and then vicariously experience how those choices would affect their chances of contracting HIV. This exhibit attempts to motivate people to avoid unsafe sexual behaviors.

Example of computer as persuasive social actor

"5-A-Day Adventures" [www.dole5aday.com]: This CD-ROM, designed for children, features a character named HB who guides users through the application. HB encourages users to eat more fruits and vegetables, and he praises them for compliance.

Functional view illuminates affordances

The functional view of persuasive computers offers key insights into the different affordances of persuasive computers. Not only does this framework help differentiate among persuasive computers (as well as among different aspects of a single persuasive technology), but this perspective can also provide researchers with guidance for primary and secondary research efforts.

PERSPECTIVE 3: LEVELS OF ANALYSIS FOR CAPTOLOGY

The third perspective I propose for understanding computers as persuasive technologies is one that directs specific attention to various levels of analysis for both computer use and behavior/attitude change.

Levels of analysis: Not just individuals

Most people think of computer use as it applies to an individual—an individual interacts with or through a computer. The same holds true for notions of persuasion: An individual changes his or her attitudes or behaviors. In both cases, this level of analysis focuses on the individual. Even though both computer use and persuasion are often thought to be most germane to individuals, other levels of analysis besides the individual level can generate important insights in researching and designing computing technologies.

In recent years, HCI researchers have done admirable work in conceptualizing computer use on a level of analysis other than individual [see reference 10 for resources; see also www.acm.org/sigchi/cscw98]. Usually referred to as

"computer-supported cooperative work," this area examines computing as it pertains to groups or organizations (group and organizational levels of analysis). It is important for the HCI community to continue defining and exploring the various levels of analysis related to computer use.

The fields of public information campaigns and health promotion interventions have also done notable work in conceptualizing different levels of analysis [e.g., see 1]. The levels of analysis from these fields include—

- intraindividual level
- interindividual level (dyads, couples, friends)
- family level
- group level
- organizational level
- community level
- societal level

To be sure, previous HCI work has examined computing at all of the above levels, but our field can benefit from more clearly differentiating these different levels and from deliberately using these levels more often as a driving force in researching or designing computing technologies. HCI and captology have much to gain from viewing computing from these various levels of analysis.

Different levels of analysis cause different variables to be salient, which generates new insights in research or design. The different levels also draw on different theoretical frameworks, methodologies, and measures. For example, persuasion on the individual level is conceptualized and measured differently than persuasion on the community level. Although examining each level as it applies to persuasive computers is beyond the scope of this paper, Table 3 gives some examples to help illustrate this point.

Level of analysis	Computer artifact, application, or system	Behavior change of interest
individual	Baby Think It Over (A computerized doll that requires care. Designed to teach teens about the difficulties of parenting [www.btio.com])	To motivate an individual to be more sexually responsible so he or she doesn't become a teenage parent.
family	Home video game system (A parent may want her family to interact more with each other rather than passively watching TV.)	To increase family interactions (possibly measured by number of conversations, frequency of eye contact, etc.)
organizational	Remote work system (A computer system that allows people to work effectively from home.)	To reduce absenteeism. To increase employee retention.
community	Ride-sharing system (A community paging network that allows people to coordinate ride sharing with minimal prior planning.)	To reduce the community's use of private cars. To reduce traffic congestion and pollution.

Table 3: Levels of analysis, technologies, and behavioral outcomes

The table shows that, at least in principle, certain technologies are best suited for different levels of analysis—some are individual-level technologies and some are community-level technologies. (Admittedly, today's default view is biased toward computers as individual-level devices; however, advances in online technology are making community and societal interactive technologies more common. To be sure, the rise of the Internet has helped shift our focus to larger levels of analysis.) Furthermore, the table implies that behavior change is not just an individual-level variable: families change, organizations change, and communities change.

Although this section of the paper only begins to explore the benefits of conceptualizing persuasive computers at different levels of analysis, the potential benefit to HCI and captology is substantial. Public information campaign researchers have accomplished much by conceptualizing interventions at different levels of analysis [1, 26]. The same should be true for those of us working in HCI-related fields, especially those interested in researching or designing interactive technologies that promote beneficial social changes [27].

PERSPECTIVE 4: THE DESIGN SPACE FOR PERSUASIVE TECHNOLOGIES

The previous three perspectives propose frameworks for better understanding persuasive computing technologies. Although the ideas from the previous sections serve as analytical tools to study existing persuasive computing technologies, these frameworks can also serve a useful **generative** purpose. In other words, the previous frameworks can help create ideas for new types of persuasive computing technologies. When used for their generative powers, the three previous perspectives contribute to my fourth perspective: the design space for persuasive technologies.

The captology design space is large and relatively unexplored. Because captology presents a new perspective on the role of computers, it is relatively easy to conceptualize new technologies, or to add persuasive enhancements to existing technologies.

To approach this design space methodologically, I propose a two-step process: (1) identify domains and issues of interest, and (2) use the above frameworks to gain new perspectives.

Identifying domains and issues

My searches in the academic literature indicate that most existing computer systems which attempt to change attitudes or behaviors fall into just a few categories: health, mental health, and education [e.g., see 31]. My efforts to identify persuasive interactive technologies in today's marketplace also showed health as a central domain. Of course, health and education are still excellent areas for research and design of persuasive technologies, but many other domains remain relatively unexplored.

When my students and I set out to identify appropriate domains for captology, we first made an extensive list of pervasive social or personal problems. We then clustered the problems and nested them under broader headings. In this exercise we developed a long (though not exhaustive) list of domains in which persuasive computer technologies may serve

a useful role. Table 4 contains a brief excerpt from our list (see www.captology.org for more domains).

Domain	Issues
safety	• safe driving • wearing bike helmets • substance abuse
environment	• recycling • conservation • bicycle commuting
personal management	• time management • study habits • personal finance

Figure 4: A sample of domains for persuasive computers

Using captology frameworks

Once a person selects a domain or issue, the next step in exploring the design space for persuasive computers is to use the captology frameworks described in this paper to generate a variety of perspectives and ideas about the selected domain or issue. For example, one might ask the following questions:

Levels of analysis: What do different levels of analysis offer to this issue or problem? Which level of intervention is likely to be most productive?

Functional Triad: What functional areas will the persuasive technology leverage? Should it focus on computer as tool, medium, social actor, or combinations of the three?

Intentionality: For this issue or domain, what are the possibilities for endogenously, exogenously, or autogenously persuasive interactive technologies?

An example of using these frameworks in design exploration follows.

Example: Recycling paper products

For this example, I have chosen **recycling** as the issue to address using persuasive technology. Specifically, this example focuses on recycling paper products.

Levels of analysis perspective: One can profitably conceptualize recycling paper at various levels: individual, family, organization, or community. Of these levels, I have chosen the organizational level for this example. The goal, then, is to explore the possibilities for creating a persuasive technology for increasing paper recycling behavior at the organizational level. (At this point one might then study various issues for more insight: organizational culture, barriers to recycling, etc.)

Functional Triad perspective: One would also explore how the three different functions of computers (tools, media, social actors) might profitably motivate paper recycling behavior. Even on the organizational level, many ideas are possible. For this example, one might propose the following:

A computer acting as a **tool** could weigh the recycled paper in the organization and calculate the number of trees saved from recycling efforts. Other types of calculations are also possible (trees saved per week, oxygen produced by the saved trees, etc.). Knowing this information might motivate people in the organization to recycle their paper products more.

The computer acting as a **medium** could then render an image of a tree growing as paper is added to the recycling container. (The image might be on the recycling container itself.) Seeing the tree grow in size might provide motivation to recycle because the image helps people visualize a cause/effect relationship in recycling.

The computer as **social actor** could audibly thank people each time they added paper to the recycling container. A more extreme idea is to have an anthropomorphic tree that smiles or tells humorous stories in response to recycling efforts.

Intentionality perspective: The recycling technology described above would inherit both **endogenous** persuasive intent (from the designers of the device) and **exogenous** persuasive intent (from the management team that provides the technology for rest of the organization).

To further explore the design space, one might profitably ask, "How might an **autogenously** persuasive technology function in this organizational setting?" Because this design example focuses on the organizational level, autogenous intent would imply that the organization as a whole (not just the management) would choose to adopt a technology to change their collective recycling behavior.

Design explorations generate insight

Exploring the design space for persuasive computers is often an enlightening process. Especially if one has no intentions of turning ideas into marketable products, one can push the envelope of the design space to illuminate new theoretical areas of persuasive computing. As the above example shows, the two-step method of (1) identifying domains/issues and then (2) applying the captology frameworks is a simple process that yields rich—and often surprising—results.

PERSPECTIVE 5: ETHICS OF COMPUTERS THAT PERSUADE

Ethics is yet another perspective from which to view computers as persuasive technologies. Adopting an ethical perspective on this domain is vital because the topic of computers and the topic of persuasion both raise important issues about ethics and values [7, 15, 36]. Therefore, when the domains of computers and persuasion merge (as they do in captology), the ethical issues are sure to play a crucial role. This section presents examples of some ethically questionable technologies, proposes ethical responsibilities for designers of persuasive computers and captology researchers, and discusses the importance of educating about persuasion.

Persuasive technologies that raise ethical questions

Most examples of persuasive computers in this paper are technologies that promote widely held conceptions of the "good" [23]: a computerized doll motivates responsible sexual behavior, a CD-ROM encourages eating fruits and vegetables, a ride-sharing technology cuts down on pollution in a city.

However, persuasive technologies can also serve ignoble purposes. Table 5 contains examples of persuasive computing that may be ethically questionable, along with a brief gain/loss analysis for stakeholders (which is, admittedly, highly subjective).

Summary of persuasive technology in question	Stakeholder analysis
A computerized slot machine uses animation and narration to make the gambling experience more compelling.	gain: manufacturer and casinos loss: individuals (money, time)
A computer system records employees' activities on the Web.	gain: company loss: employees (privacy, trust)
A computer system monitors restaurant employees' hand washing behavior after using the restroom.	gain: restaurant patrons loss: employees (privacy, trust)
A software installation seems to require registration with the company in order to complete the installation. The software automatically dials company to download personal information.	gain: company loss: individual users (personal information)

Table 5: A simple stakeholder analysis of some persuasive technologies

I believe that the simple gain/loss analysis in Table 5 helps show why the above technologies could be ethically questionable. In most cases above, companies stand to gain profit or information, while individuals stand to lose money, privacy, or freedom. In contrast, a simple gain/loss analysis for the other persuasive computers in this paper would likely show gains for all stakeholders, including individuals.

Ethics of distributing or creating computers to change attitudes or behaviors

The ethical implications for those who design persuasive technologies are similar to the ethical implications for other persuaders in society (e.g., sales people, coaches, counselors, religious leaders, etc.) [15]. Because values vary widely, no single ethical system or set of guidelines will serve in all cases, so the key for those designing persuasive interactive technologies is gaining a sensitivity to the ethical implications of their efforts. High-tech persuaders would do well to base their designs on a defensible ethical standard. At the very least, a few core values should apply to all persuasive computing designs, such as avoiding deception, respecting individual privacy, and enhancing personal freedom.

Ethics of studying persuasive computers

The ethical implications for those who study persuasive computers are somewhat different from those for designers. I propose that those who study persuasive technologies have a responsibility to play a watchdog role for the HCI community, in particular, and for technology users, in general. Ethical actions for those who study persuasive computers fall into four categories:

1. Identify artifacts and techniques. By using the various frameworks suggested in this paper, a researcher can better identify persuasive technologies, as well as the persuasive strategies a technology uses.

2. Examine effectiveness and effects. Researchers should also assess the effectiveness (the intended impact) and the effects (the unintended side-effects) of persuasive technologies or strategies.

3. Disclose findings. Those who study persuasive computers then have an obligation to disclose their findings.

4. If needed, take or advocate social action. Finally, if a computing artifact is deemed harmful or questionable in some regard, a researcher should then either take social action or advocate that others do so.

Education is the key

I propose that the best approach regarding the ethics of computers and persuasion is to educate widely about this new area of research and design. Education about captology helps people in two important ways: First, increased knowledge about persuasive computers allows people more opportunity to adopt such technologies to enhance their own lives, if they choose. Second, knowledge about persuasive computers helps people recognize when technologies are using tactics to persuade them. In the end, the best path for captology is the same as the path taken by various persuasion researchers [15, 24, 36]: Educate widely about persuasion. This paper represents one effort to bring such issues to light.

RESEARCH DIRECTIONS FOR CAPTOLOGY

Because captology is a relatively new field of inquiry, many questions about computers and persuasion remain unanswered. To help move the field forward, I propose seven directions for research and design that will yield the greatest understanding of persuasive computers in the shortest amount of time.

Seven profitable directions for captology

Direction A: *Captology should focus on interactive technologies that change behaviors.*

As stated earlier, my definition of persuasion is "an attempt to shape, reinforce, or change behaviors, feelings, or thoughts about an issue, object, or action." Although this is a good definition, it is too broad to be useful in focusing research and design in the early stages of captology. Therefore, at this point people involved in captology would do well to pursue **behavior change** as the test and metric for persuasive computers.

Behavior change is a more compelling metric than attitude change for at least three reasons: (1) behavior change is thought to be more difficult to achieve than attitude change [15, 36], (2) behavior change is more useful to people concerned with real-world outcomes [9, 31, 36], and (3) one can measure behavior change without relying on self-reports [9] (attitude change measures hinge on self-reports).

Direction B: *Captology should follow the well-established CHI tradition of adopting and adapting theories and frameworks from other fields.*

While captology has the potential to generate new theories and frameworks—as demonstrated to some degree in this paper—those of us who study computers as persuasive technologies would do well to find extant persuasion theories and frameworks and investigate how they apply to captology. For example, Aristotle certainly did not have computers in mind

when he wrote about the art of persuasion, but the ancient field of rhetoric can apply to captology in interesting ways.

The field of psychology—both cognitive and social—has a tradition of examining different types of persuasion and influence. The theories and methods from psychology transfer well to captology, enriching the field. In addition, the field of communication has a history of examining the persuasive effects of media and other types of message sources. Specifically, the applied domain of public information campaigns has a set of theories and practices that give insight into the study of persuasive computers.

Direction C: *Captology should examine and inform the design of interactive technologies that are specialized, distributed, or embedded.*

While the typical computer of today lives on top of a desk and requires a keyboard and a monitor, people involved in captology would do well to focus mainly on technologies that are **specialized, distributed,** or **embedded** [for more on the concept of ubiquitous computing, see references 3 and 34].

From my vantage point, the most interesting interactive technologies today seem to fall in at least one of these three categories. And it seems that most persuasive technologies of the future will not be associated with desktop computers; they will be specialized, distributed, or embedded. If this is true, then it would be a relatively poor use of time to examine existing desktop applications or to design persuasive programs solely for desktop computers. Persuasive situations occur most frequently in the context of normal life activities—not when people are seated at a desktop computer.

Direction D: *Captology should focus on endogenously persuasive technologies.*

I've proposed three types of persuasive technologies: endogenously persuasive (those designed with persuasive goals in mind), exogenously persuasive (those used to persuade another person), and autogenously persuasive (those used to persuade oneself). Understanding **endogenously persuasive technologies** seems more essential to understanding captology than the other two types. According to my definition, endogenously persuasive technologies were created with an intent to change attitudes or behaviors. As a result, the strategies and techniques to persuade are embedded in the technology itself. In contrast, the other two types of persuasive technologies—exogenous and autogenous—rely heavily on external factors for their persuasive power.

Direction E: *Captology can learn from other media but should steer clear of comparing computer persuasion with persuasion from other media.*

Although captology has much to gain from other media research (such as effects of video, print, radio, etc.), comparing computer persuasion with persuasion from other sources seems to be a dead end. Many studies have attempted to do this, and virtually all of them contain serious weaknesses [for a longer discussion of this claim, see 14].

Although a researcher can clearly determine that computer program X is more persuasive than video Y or pamphlet Z, these results hold only for artifacts X, Y, and Z—not for comparing computers, videos, and pamphlets in general. One problem is that too many variables are at play in cross-media studies; as a result, no useful theory comes from this type of research [21].

In order to avoid this well-traveled dead-end road, those involved in captology research should compare the persuasive effects of one aspect of computing technology with other aspects of computing technology.

Direction F: *Captology should focus on both "what is" and "what could be."*

Captology should focus both on existing persuasive technologies and on potential persuasive technologies. A fairly good number of persuasive technologies already exist. Research into the impact, uses, and implications of these technologies can yield valuable insight for the field.

But captology also has a strong generative component. Because this field provides a new lens for viewing computing technology, captology generates insights about novel possibilities for computers, as well as new ways to bring about attitude and behavior changes.

Direction G: *Captology should be pursued with ethical issues and implications in mind.*

The study of computers as persuasive technologies raises important ethical questions. This is understandable and inescapable, given the fact that persuasion has long been an area for ethical debate, and that computer technology has raised recent ethical questions. As with any other means of persuasion, one could compromise values and ethics intentionally or unintentionally. Therefore, those who study persuasive technologies should have a sound understanding of the ethical implications of this field. A subfield on the ethics of persuasive computing is a worthy and important endeavor.

SUMMARY

This paper has defined captology and has articulated five different perspectives for studying computers as persuasive technologies. This paper also proposed seven directions for future research. While these perspectives and research directions may be superseded by better ideas and new perspectives, this paper lays the groundwork for taking significant steps forward in understanding this new field.

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