PRODUCTIVE LOVE PROMOTION VIA AFFECTIVE TECHNOLOGY: AN APPROACH BASED ON SOCIAL PSYCHOLOGY AND PHILOSOPHY

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Abstract: *This paper proposes the use of social psychological and philosophical foundations for designing affective technology that promotes the experience of love. The adopted theoretical basis is the concept of productive love, which is heavily based on Enrich Fromm but also includes theories and scientific findings of numerous psychoanalysts, social psychologists, and philosophers. We conducted a review of the theory about the nature of love and found that social psychological and philosophical approaches differ regarding people's understandings. The findings were used to elaborate eight principles of productive love. Based on these principles, we derived criteria for designing affective technology when the objective is to promote productive love. We reviewed the existent studies on affective technologies and implemented the criteria into a system design, the Pictures' Call. A prototype of the system was pretested to illustrate how productive love technology could be based on established criteria.*

Keywords: *affective technology, productive and receptive love, care, responsibility, respect, knowledge.*

INTRODUCTION

An emerging trend in information technologies aims to support personal relationships. Studies usually approach the topic under titles such as intimacy, connectedness, awareness, or social presence. Most of these studies are predominately based on people's habits and opinions about their relationships. For instance, Kaye and Goulding (2004) based their designs on couples in stable, long-distance relationships. Van der Hoog, Keller, and Stappers (2004) used participatory designs to find out what people miss in distant relationships. Hindus, Mainwaring, Leduc, Hagström, & Bayley (2001), as well as Vetere et al. (2005), assessed users'

self-reports about their activities related to their relationships. Furthermore, Vetere et al. listed several research methods that have been commonly used: online questionnaires, data logs, longitudinal focus groups, interviews, and written reflections.

Conversely, some psychologists, psychoanalysts, sociologists and philosophers claim that the average person's natural behavior may not be perfect, and suggest that scholars have a broader understanding of love than the average person, which offers the possibility to improve loving relationships. Still, consideration of sociopsychological and philosophical studies about love appears to be lacking when implementing technology in order to promote the experience of love.

The purpose of this paper, therefore, is to introduce a new research field that has been mostly unobserved to date: to use the existent theories and scientific findings on love as a basis for designing *affective technologies*. Umemuro (2009) defined affective technologies as ―products to make owners pleased and proud of their owning, products that are comfortable and enjoyable in use, and/or products that provide remarkable affective experience such as excitement and deep satisfaction" (p. 3).

THE NATURE OF LOVE

Levin and Kaplan (2010) point out that a body of theoretical writing has emerged concerning love, along with efforts to validate measurement instruments. However, Levin and Kaplan note that, among scientific disciplines, only social psychology had directed systematic attention to love. Moreover, they remark, a consensus or global definition of love is not forthcoming. The following paragraphs provide an idea regarding the diverse categorizations of love within the literature.

Sorokin (1954) differentiated seven forms of love. Religious love is the love of a god or the absolute, while ethical love represents the identification of love with values such as goodness, truth, and beauty. Ontological love reflects the instrumentality of love or loving to unify, harmonize, elevate, enrich, and empower. Physical love is affirmation of the unifying, integrating, and orderings energies of the universe and biological love is love expressed sexually, romantically, and through passion. Finally, psychological love is love experienced emotionally through giving, or through receiving empathy, sympathy, kindness, and benevolence; and social love manifests in meaningful interactions or relationship with others, as driven by sharing, helping and altruism.

Later, Newcomb (1960, cited in Rubin, 1970) placed love alongside the varieties of personal attraction, such as liking, admiration, and respect. Further, Rubin (1970) compiled speculations about the nature of love, finding that love was seen as related to physical attraction, idealization, predisposition to help, the desire to share emotions and experiences, feelings of exclusiveness and absorption, felt affiliative and dependent needs, and the relative unimportance of universalistic norms in the relationship. Similarly, Averill (1985, cited in Dion & Dion, 1996) proposed four features of romantic love: idealization of the romantic partner, suddenness of onset, physiological arousal, and commitment to the well-being of the loved person. Finally, Weinstein (2007) suggested that love seems to underline terms such as empathy, compassion, acceptance, joining, reflecting, positive feedback, holding and containing environments, meeting mutual needs, and corrective emotional experience.

The most noteworthy measurements of love include several versions of the Love Attitudes Scale by Hendrick and Hendrick (1986, 1990, 1998), based on Lee's (1973, 1988) multidimensional theory of love styles, termed *eros, ludus, storge, mania, agape,* and *pragma.* And Sternberg's (1997) triangular love scale measured the intensity levels of three components: intimacy, passion, and commitment.

In a review of the categorizations of love, Weiss (2006) concluded, "Comparison shows that love styles and systems overlap to a considerable degree" (p. 214). As for commonalities among the diverse categorizations, Murstein (1988, cited in Levin & Kaplan, 2010) pointed out that, depending on upon the researcher, love had been conceptualized as an affect, attitude, behavior, or form of cognition. Further, one line of thought tends to simplify the distinction of love into two categories—rational and irrational. This perspective is well summarized by Burston (2007):

> Throughout the ages, there have been two schools of thought on the nature of love. One holds that erotic love is an involuntary passion that springs from an inner sense of lack, and thrives on illusions. Plato, Schopenhauer, Nietzsche, Freud and Lacan all subscribe to this point of view. By this account, love is "blind", and therefore, the adversary of reason, or the sober realism that characterizes the "lover of wisdom." The other school of thought, represented by Soren Kierkegaard, Max Scheler, Martin Buber and Erich Fromm claims that genuine love always includes an element of volition, is a creature of abundance, and bestows insight into the beloved that is impossible to achieve in any other way. (p. 199)

Fromm (1956) explained that the assumption that there is nothing to be learned about love is led, in part, by the generally shared confusion between the initial experience of falling in love and the permanent state of being in love. Fromm made a comprehensive bipolar categorization of love. Fromm named the first category in three ways: immature love, symbiotic union and pseudo love, indicating passive and irrational love and corresponding to the person whose character has not developed further than the receptive orientation. Fromm named the second category in two ways: mature love and genuine love, which refers to active and rational love, and explained it to be attributable to the person who has developed a productive character or orientation.

Several philosophies have paralleled the idea of irrational and rational love under different designations. For instance, Maslow (1968, 1970, cited in Le, 2005) named the idea of irrational love as Deficiency love (D-love) and rational love as Being love (B-love), while Murstein (1990, cited in Le, 2005) described benevolent love as a form of rational love. Moreover, Giddens (1992, p. 38) pointed out that "passionate love is a more or less universal phenomenon and should be differentiated… from romantic love, which is more culturally specific." LaFollette (1996, p. 194) suspected that "marginal relationships fail because they are founded on rigid love," which "is tied to a particular organism, not to a particular person with specific, embodied characteristics," and where "the lover is likely less sensitive to the beloved's interests, needs, and desires." Lastly, Bauman, (2003, p. 9) described love as "the wish to care and to preserve the object of care, a centrifugal impulse, unlike centripetal desire."

Nevertheless, measurement instruments support the bipolar understanding of love. Rubin (1970) was the first to provide an empirical measure of love, distinguishing romantic from friendship. Le (2005) developed a measurement of love in its immature form, while Sprecher and Fehr (2005) developed a compassionate love scale that can be experienced for family,

friends, peripheral ties, and all of humanity. Finally, Levin and Kaplan (2010), in the development and validation of a love scale based on Sorokin's (1954) conceptual model of love, found strong correlations between six of the seven forms of love: Only biological love, which is the love expressed sexually and romantically and through passion, was distinct among Sorokin's typology.

In accord with the theories, rational love has been empirically validated as a higher form of love. Lin and Huddleston-Casas (2005) positively correlated agape love with relationship satisfaction. Sprecher and Fehr (2005) found compassionate love to be more encompassing and experienced among family, friends, social acquaintances, and humanity. It positively associates with prosocial behavior directed toward both close others and all of humanity, while compassionate love for a specific close other was associated with the provision of social support for that person. Finally, Sprecher and Fehr (2006) found that people perceived that their self-esteem, positive mood, self-awareness, spirituality, and closeness to the other(s) increased as a result of feeling compassionate love toward other(s).

Because love means different things to different investigators, depending upon their worldviews and theoretical perspectives, Levin and Kaplan (2010) advise prospective researchers to settle on a precise operational definition that is appropriate for their specific study. Based on the aforementioned attributes of rational love, and the fact that it offers the best possibility to be learned and improved, our approach toward the design of affective technology that promotes love will be based on rational love.

In the following section we deepen our operational definition of rational love by drawing on Fromm's (1956) understanding of love, as well what other theorists have defined as the attributes of rational love. Weiss (2006, p. 324) noted that a universally accepted vocabulary on the subject of love has not yet been found. For those reasons we currently name the forms of love inspired by the receptive and productive orientations as explained by Fromm: The passive and irrational love is defined as *receptive love,* and the active and rational love is defined as *productive love.*

PRODUCTIVE LOVE: OPPORTUNITY FOR IMPROVEMENT

Based on the idea that productive love is not an irrational passion but a voluntary action that can be learned and maintained, the aim of this study is to improve productive love relationships in couples, the family, or among friends. In order to establish a consistent basis for using productive love in technology design, productive love attributes need to be identified, as well as a means to differentiate it from what has been described as its antithesis, receptive love. Moreover, it is valuable to assess whether the productive love principles are understandable and applicable for contemporary individuals. A literature review on receptive love and productive love has been carried out and the results of a brainstorming discussion are presented and analyzed.

Elements of Receptive Love

Fromm (1956) described immature love as a symbiotic union resulting from the biological pattern in the relationship between the pregnant mother and the fetus, and is represented in adult

relationships in the form of masochism and submission. Fromm explained that, consequently, the receptive character focuses on acquiring and possessing the other person or the other's love.

Likewise, Maslow (1968, 1970, as cited in Le, 2005) conceived D-love to reflect a lower love in the service of needs. Furthermore, for Rubin (1970), the concept of love as just involuntary passion belongs to a restricted view, which is the understanding of love as an emotion, a need, or a set of behaviors. The linkage to a particular target implies a narrower perspective than that held by those who regard love as an aspect of the individual's personality or experience, which transcends particular persons and situations. Gelbond (1979) explained that D-love is needful or selfish love, as with all forms of self-centered love in which two people love one another only in the sense that each meets the deficiencies or needs of the other in some way.

Similarly, Loy (2002, as cited in Le, 2005) explained that love becomes a means to ground oneself and fulfill one's sense of something otherwise lacking, which is rooted in the ego's need to ground itself through objectification of self and others. Unless one is able to transcend the self–object duality, any love or attempt of love will never be completely satisfying or adequate. Accordingly, Pickering (2009) recalled the perspectives of Spinoza, Freud, and Grostein. Spinoza pointed out, ―Erotic passion may give rise to frustration, anger, and hate as inevitable corollaries of egocentric desire" (in Pickering, 2009, p. 27). Freud saw the ―overvaluation of the beloved and denigration of oneself as a form of displaced primary narcissism," which is but self-love (in Pickering, 2009, p. 213). And Grostein explained that ―the real person and the real relationship are only disappointing because we have failed to keep our appointment with the other's reality" (in Pickering, 2009, p. 12).

Finally, Le (2005, p.75) explained immature love ―remains ego centered and is dependent on self–other distinctions and relationships." Le's measurement of love in its immature form contained these items: (a) love under the condition of being loved, (b) love under the condition of being pleased, (c) the value of receiving love over giving love, (d) expectations of some return for one's love, (e) giving value to commitment and security, (f) belief that to love someone needs practice, (g) belief that it is easier to love someone with good qualities, (h) belief that nonreciprocity of love is less satisfying, (i) the feeling of love without reason, and (j) loving a spouse and children because they are part of oneself.

In conclusion, our study found the support of several philosophers and social psychology scientists for the proposed receptive love concept as the antithesis of productive love.

Elements of Productive Love

Sorokin (1954, p.13) regarded the social aspect of love as ―the meaningful interaction–or relationship–between two or more persons where the aspirations and aims of one person are shared and helped in their realization by other persons." Fromm (1956) explained that mature love is a voluntary action, rather than a pleasant sensational experience as a matter of chance. Love, in its productive character, is the union under the condition of preserving one's integrity and individuality, and the active striving for the growth and happiness of the loved person. For Fromm, giving is the foremost basic element of all forms of love. Moreover, Fromm (1956, p. 20) also cited Marx's (1844) comment, ―…you can exchange love only for love,…" as indicating that there is no need to care about the fairness of a relationship. Fromm pointed out that mature love depends on the character development of the person; that is, the overcoming of one's narcissism is the condition for mature love. The opposite pole of narcissism is objectivity, which is the capacity to

see things as they are. Similarly Pickering (2009, p. 83) saw that ―erroneous views of each other form the greatest impediment to love." Lastly, Fromm‗s mature love goes beyond the element of giving: The active character of love always implies certain and mutually interdependent basic elements, common to all forms of love. These elements are care, responsibility, respect, and knowledge—a syndrome of attitudes that are found as well in the mature persons.

In the same vein, Maslow‗s B-love (1968, 1970, as cited in Le, 2005) is the appreciation of others and the appreciation of the experience of love per se. Maslow stated that self-actualized persons are freer from dependency and thus they are able to engage in B-love. Maslow pointed out as well that B-love is a richer, higher-level, and more valuable subjective experience than D-love, which all B-lovers have also experienced. B-love was further explained by Gelbond (1979, p. 75) as ―the love for the very being or presence of another person, for the qualities, gifts, acts, and aspirations of that person. In B-love one gives of oneself without necessarily expecting any return." Additionally, Gelbond explained B-love as the tendency toward more and more complete spontaneity, the dropping of defenses and roles, and growth in intimacy, honesty, and self-expression. Maslow stressed as well the following aspects: the absence of jealousy, eagerness for the growth of the other, essential affirmation and respect for the other‗s individuality, and enjoyment that includes fun, exuberance, gaiety, and the absence of anxiety. In the same way, Gelbond explained that May (1969) defined love as ―a delight in the presence of the other person, and affirming of his value and development as much as one‗s own" (in Gelbond, 1979, p. 75). Murstein (1990, as cited in Le, 2005) defined benevolent love as the intention to help and to give to another person, without shades of self-interest. This form of love includes spontaneity, motivation by selflessness, impartiality, and creativity. Similarly, Shinebourne (2006) drew on the definitions of Kierkegaard and Levinas. Kierkegaard (1995, cited in Shinebourne, 2006) argued that the person who loves does not seek his/her own, because he gives in precisely such a way that it looks as if the gift were the recipient‗s property. And Levinas (2001, cited in Shinebourne, 2006) suggested that the relation is always nonreciprocal: Love exists without worrying about being loved. Pickering reviewed Levinas and Steiner as well. Levinas saw ―the principle of seeking to serve another without thought of reciprocation as the most fundamental starting point for ethical relations" (in Pickering, 2009, p. 26), while Steiner saw ―in the luminosity of authentic love there is a sense of flourishing and emerging into the fullness of our enlightened being" (in Pickering, 2009, p. 8). Finally, Pickering added, ―When we move to mature love based on appreciation of others then love grows exponentially" (p. 212).

The presented reviews of productive love, as well as its antithesis, receptive love, serve as the foundation for the elaboration of the components of productive love. Further, Fromm‗s basic elements of love—care, responsibility, respect, and knowledge—are studied in detail in the following section.

Socio-Psychological Approach Versus People's Actual Understanding

As previously discussed, Fromm (1956) proposed four basic elements common to all forms of love: care, responsibility, respect, and knowledge. In order to find out what these concepts mean in today‗s world and so that we could compare it with the theory, a brainstorming discussion on each of these elements was conducted. The participants were asked to freely talk about what they think it means to care, to be responsible, to respect, and to share knowledge within a relationship. The given time was 20 minutes to talk about each element. The

participants were recruited within the university; they were a university professor and four graduate students from various cultures: Two participants were Japanese, one was Chinese-American, one Ecuadorian, and one was Spanish. One was female and four were males; they were aged between 22 and 44 years old. ($M = 32$, $SD = 7.28$). The results demonstrated that the participants' views about the meaning of the elements were similar to each other, suggesting that their views could represent people's actual understanding. Furthermore, in order to better understand the discrepancies between the theories and the brainstorming, the results are accompanied by some other theories and findings of other theorists and researchers.

Fromm's Elements of Love: Care

In defining the notion of care, the participants included the care for the elderly or the control of a parent over an adolescent. However, most of the ideas were oriented toward caring within a relationship, such as a couple within an environment of equality. This duality of understanding is in line with Graham (1983) and Ungerson (1983), both cited in Ungerson (2005), who made a basic distinction for the use of the word *care*. They differentiated between caring about, defined within feelings terms, and caring for, defined as task-oriented activity and, hence, most closely defined by *work*. The latter seems close to Fromm's (1956) proposal that the essence of love is to labor for something: ―the active concern for the life and growth of that which we love" (p. 22). Similarly, Mayeroff (1972, p. 1) suggested, ―To care for another person, in the most significant sense, is to help him grow and actualize himself." In addition, Mayeroff described eight major components for caring: knowing, alternating rhythms, patience, honesty, trust, humility, hope, and courage.

Fromm's Elements of Love: Responsibility

The participants interpreted the concept of responsibility as sharing the blame, keeping promises, and standing on someone's side. Likewise, Fromm (1956) pointed out that responsibility is often meant to denote duty, something imposed from the outside. However to Fromm, responsibility is implied by care and concern, a voluntary act as being able and ready to respond: ―is my response to the needs, expressed or unexpressed, of another human being" (p. 22). In the case of a mother and infant, it refers mainly to the care for physical needs. In the love between adults, it refers mainly to the psychic needs of the other person, which can be expressed or unexpressed. Consequently, it is necessary to stress that responsibility is a response as well as an ability to respond. As a result, this element demonstrates that great differences could be obtained between an empirical assessment and a philosophical perspective. As for the importance of responsibility in relationship with love, Buber (1958, cited in Shinebourne, 2006) conceived love as responsibility for the other: ―Love is the responsibility of the I for thou" (p. 29).

Fromm's Elements of Love: Respect

Most of the ideas provided in the brainstorming discussion focused on respect in terms of not interfering in the other's ways. This is close to Fromm (1956), who defined the concept, ―in accordance with the root of the word (respicere, to look at), the ability to see a person as he is, to be aware of his unique individuality" (p. 22).

On the other hand, some participants pointed out the possibility that too much respect can imply too much credit, and thus less commitment. This does not seem to be in accord with Fromm's understanding, which explained the importance of respect as preventing responsibility from deteriorating into domination and possessiveness. "Respect is not fear and awe… respect is possible only if I have achieved independence; If I can stand and walk without needing crutches, without having to dominate and exploit anyone else" (Fromm, 1956 p. 22). Accordingly, Pickering (2009) pointed that "a good relationship is predicated on the capacity to be alone'… as well as capacity to be together" (p. 212).

As for researchers' understanding today, Hendrick and Hendrick (2006) suggested that respect should be viewed in both structure and content. Structurally, respect can be seen as an attitude. Respect as an attitude consists of affect, cognition, and behavioral tendencies. Respect as content can be viewed as having two primary components: equality/mutuality and caring/supportiveness; the latter seems to be in line with Fromm's idea. Additionally, Hendrick and Hendrick proposed respect to be positively correlated with eros, storge, agape, satisfaction, commitment, and, except for older couples, self-disclosure. Moreover, respect as well correlated negatively with ludus, permissiveness, and instrumentality.

Fromm's Elements of Love: Knowledge

The participants tended to talk about knowledge that seemed more significant or valuable, which is in accord with Fromm (1956). Among the layers of knowledge, he posits, the one that is an aspect for love is the one that does not stay at the periphery, but penetrates the core. To Fromm, knowledge, "is possible only when I can transcend the concern for myself and see the other person in his own terms" (p. 22–23). However, objective knowledge is something that was not commented on by the participants. Besides, Fromm pointed that "knowledge would be empty if it were not motivated by concern" (p. 23).

In a study of the organization of partners' beliefs, Showers and Limke (2006) suggested that there are different ways to organize the beliefs of a partner that are activated in a particular situation. These can be organized in two types that fall on a continuum from compartmentalized knowledge (i.e., positive and negative beliefs are segregated into separate categories of partner knowledge) to integrated knowledge (i.e., positive and negative beliefs frequently appear within the same categories of knowledge). Compartmentalized knowledge is more efficient and thus easier to maintain. It may be used for a partner with many possible attributes, may be more optimistic, and may result in liking the partner more and being more satisfied with the relationship. Integrated knowledge requires more effort and may be used in stressful situations. Integrated knowledge seems closer to Fromm's idea.

Fromm's Elements of Love: Conclusion

The brainstorming discussion we conducted demonstrated that people's understanding of concepts related to love today differ considerably to Fromm's (1956) theories, illustrating how social psychology and philosophical methods lead to different and better understandings of love. Further, the brainstorming results were perceived as a warning regarding making assumptions and avoiding misinterpretation of the productive love principles in a contemporary environment.

Summary and Final Productive Love Principles

We brought together all the reviewed theories for a summation of the principles of productive love, taking into account the differences between today's understanding and Fromm's (1956) elucidation of the four basic elements of love. The literature and the empirical data allow us, then, to define eight principles of productive love.

The first principle, *giving, not exchange or egoism,* embraces doing things for the other without expecting a return. The second principle, *care, not involuntary love,* is the most important thing that can be done for the other, since it implies assisting the life and growth of the other. In order to be able to care one has to undertake the third principle, *responsibility, not irrationality,* which is to listen and respond to the other's needs. The fourth principle, *respect, not exploitation*, is needed in order to prevent responsibility from deteriorating into domination and possessiveness. The fifth principle, *realistic knowledge, not delusion,* is essential to guide care and responsibility, while the sixth principle, e*njoyment, not evaluation,* is included in order to motivate concern for learning about the other. The seventh principle, *freedom, not a feeling of duty*, is a condition to experience without restraint the previous principles. The eighth principle, *self-growth, not dependency,* is the base condition which makes possible the rest of the principles in a larger or smaller degree.

PRODUCTIVE LOVE CRITERIA FOR TECHNOLOGY DESIGN

Although many modern technologies may distract us from active caring, responsibility or loving, our objective is to create new technologies that move the attention away from the technology itself and refocus it on the person's ability to love. That could be done through two different settings: computer mediated communication (CMC) or face-to-face (FtF) communication.

The transmission of direct information about inner feelings may be the fundamental reason for getting together and talking intimately. However sometimes FtF communication is not possible, such as in the case of long-distance relationships. Furthermore, for some people or some cultures, it is possible that FtF communication is difficult, for instance, some people may find it easier to express their feelings in a letter than in person. On that direction, Briggle (2008) explained that filtration cues in computer-mediated communication have been viewed positively. McKenna et al. (2002, cited in Briggle, 2008, p. 225) pointed out that ―many may feel less vulnerable in mediated situations—outside the gaze of the other—and thus find it easier to express their real ‗selves,‘ including their intimate feelings of love and care."

However, productive love technology, that is, affective technology with the objective to promote productive love, should not simulate the other's presence, or replace a genuine encounter if it leads to FtF communication being substituted by CMC. On the other hand productive love technology should assist the existent communication, for instance, by *reconfiguration.* Briggle (2008, p. 226) explains reconfiguration as the case where ―the technology mediates the experience by making visible what was previously hidden." This mediated vision seems not limited to CMC outcomes, but could be applied for enhancing FtF relationships as well.

In order to make available the final productive love principles for designing productive love technology, this section presents an initial proposal of design criteria for the use of the eight principles of productive love listed above. Additionally, we provide examples of how these principles could be taken into account in order to explicitly design tools that target the promotion of love.

Giving, Not Exchange or Egoism

A productive love technology can support actions such as buying a present, sending a greeting, writing a poem, and so on. Moreover, the technology can automatically remind us of tasks that we may want to do for the other, such as giving a birthday present or visiting grandparents once in a while. On the other hand, the productive love technology should avoid putting a premium on the user actions by obtaining points or evaluation, since that may divert focus to the return rather than the sentiments expressed by the action

Care, Not Involuntary Love

In FtF encounters, productive love technology can motivate care by promoting communication and thus can contribute to making the people know what the other may need. This could be done, for example, by suggesting topics to talk about, activities to do together, or games to play together.

Through CMC, productive love technology could provide mutual information, such as surfacing ideas or realizations about the other's dreams, dislikes, or moods, or even sharing virtual common spaces. Being in contact with each other's reality may let us see the other's needs and motivate care as a voluntary act. Suggesting actions to take or providing information without the people's voluntary action may seem at first contrary to the spirit of active caring that is essential to productive love. However, the automatic action of the device should not be the activity or action of the caring, but just a reminder. As an example, one has to remember to water flowers to care for them. Thus, setting an alarm or putting the flowers in a visible place is a way that may reinforce the active caring.

Responsibility, Not Irrationality

In FtF encounters, productive love technology could support responsibility by providing environments where people are able to relax and bring more attention into the other, and thus feel concern about the other's possible problems. This could be accomplished through using relaxing music or nature sounds, or projecting peaceful scenes within the shared environment. Moreover investigating recipes to cook together, games to play, or prompting yoga and meditation-like exercises could support relaxation.

In CMC, technology can support responsibility by facilitating an answer when one receives some information about the other and cares about it. For instance, it can support writing, voice, and videoconference. Also actions such as buying something that one sees that the other needs, or planning to meet up are responsibility acts that could be supported. In that sense, a real-time technology could be more supportive for the response, just as a phone call

can facilitate the response ability versus sending a letter. Furthermore, being informed about the person allows a user to better respond to technology-enhanced opportunities.

Respect, Not Exploitation

If the technology could provide information that supports the person—in both FtF encounters and CMC—seeing the other realistically, as he or she is, it then supports the meaning of respect that is adopted here. Such support could be generated through new or enhanced knowledge about the other, or by facilitating the attention toward the other, as seen in the first three principles.

In addition, productive love technology should avoid situations in which the other person is ―acquired,‖ or where the user is getting something from the other, such as obtaining personal favors or completing tasks through the other. Such processes could create a situation where the user feels obliged to the other. Furthermore, productive love technology should not facilitate differences in rank between the people, which may lead to situations of domination.

Realistic Knowledge, Not Delusion

In both FtF encounters and CMC, knowing about the other person could be facilitated by providing personal information through conversation, answering questions, writing, or by sharing personal images or objects. Moreover, information could be collected automatically, for instance, by using sensory technology that may collect images, sound, movement, presence, and so on. Importantly, however, such automatic information gathering should not invade the person's privacy. It is possible as well to estimate the person's activity or feelings from data collected in unobtrusive ways (Eguez Guevara & Umemuro, 2010).

On the other hand, and in particular in CMC, productive love technology should avoid showing an unrealistic or partial image of the partner, such as highlighting only good points or showing too many signs of affection through, for instance, exaggerated emoticons. Biased or incomplete perspectives could create an idealization of the partner, which may lead to ―hyperpersonal communication,‘ or the state in which CMC becomes more desirable than FtF interactions‖ (Walther, 1992; Walther et al., 1994, in Briggle, 2008, p. 225)

Enjoyment, Not Evaluation

Although applications similar to a game might provide initial mutual interest among users, engagement with the system ultimately should contribute to engagement with the other person. In order to move the pleasure of interaction with the device into the personal relationship, the actions carried out within the productive love technology should be as close to reality as possible, and as distant as possible from fantasy, such as activities carried out by fictional characters in fictional contexts in most videogames. Information regarding what the other does, what he/she is interested in, and so on, may prove a stimulus for thinking about the object of affection.

Importance is also attached to having productive love technology diminish the differences between people regarding rank, status, comparisons or competition, and personal scoring, all of which may promote evaluation and criticism of the other person. Therefore, if actions are assessed in any way, a high number of actions or measures should not be

evaluated as better or worse. Likewise, the nature of the actions, such as buying a present or asking ―How are you?" should not be established as having different value. All possible actions should be shown as valuable to the receiver and his/her understanding of the specific contexts and appreciation for them.

Freedom, Not a Feeling of Duty

In order to facilitate every user feeling it easy to act and express freely using the productive love technology, the technology should accept a wide range of actions, as opposed to fixed and predetermined ones. Additionally, there should not be rules determining ―good" or ―bad" actions, which may limit the users' expression. For instance, no topic for discussion should be considered inherently bad. Nor should the user feel obligated toward stereotyped actions, such as using emoticons, or toward imposed duties, such as defined tasks that may not represent either the user or the receiver.

Moreover, respect for privacy is requisite for not limiting freedom. This can be sustained by keeping personal information private and by discouraging the use of devices (e. g., microphones or cameras) if those would invade one's privacy or lead to (perceived or actual) control over a person

Self-growth, Not Dependency

Acquiring maturity is not a simple process. Still, productive love technology could target and enhance it through local elements, such as mirroring the person's own changes and improvements. For instance, simply reviewing their own pictures may make people reflect on the emotions of the moment, what changes have occurred, and how they feel about them now. Moreover, if the user has some particular habits related to the use of the productive love technology, those habits could be tracked and illustrated; for instance, the time spent communicating with others. Furthermore, productive love technology could target self-improvement as a whole by supporting techniques that have been demonstrated to lead to self-actualization, such as mediation. See Sorokin (1954) for possibly the finest available summary of techniques of altruistic transformation.

On the other hand, productive love technology should not lead to dependency that is in opposition to personal growth. For instance, as a very basic example, a device that helps the user to wake up another person in the morning would be better if it also facilitates the receiver learning how to do it on his/her own.

RELATED STUDIES ON AFFECTIVE TECHNOLOGIES

In order to apply the reviewed findings and design criteria within a practical technological device, we briefly review systems that provide interactions related to loving relationships. We discuss the types of interaction, including the identification of the gaps related to the viewpoint of productive love, and suggestions for improvement.

Several systems aim to promote connectedness. For example, Hindus et al. (2001) proposed a simple and lightweight means of distance communication in the *Casablanca*

project. The project included the *Lampshade* and the *Intentional Presence,* which glowed when remote users manually indicate their presence, while the *Pulling the Curtain IPL* depicted the user as a flower in the remote location.

Awareness systems with a higher degree of intimacy have been explored through metaphoric representations. For instance, Strong and Gaver (1996) proposed three systems: the *Feather,* which lets a plume float on a transparent tube, and the *Scent,* which lets a fragrance vaporize into the room, with both systems activated when a distant partner touched a frame of a picture of the couple; and the *Shaker,* which transmitted a vibration while maintaining timing and amplitude of movements. Hindus et al. (2001) created the *In Touch,* which transmitted touch into glowing light, warmth, or vibration. Chang, Resner, Koerner, Wang, and Ishii (2001) proposed the *LumiTouch* picture frame, which lighted when the remote user touched a picture. Lastly, Chung, Lee, and Selker (2006) created the *Lover's Cups,* which transmitted the movement of the cup into illumination of another cup in a remote location. These devices support awareness through several kinds of actions and representations. However, metaphoric representations can be ambiguous in their interpretation; therefore, they may fail to provide objective knowledge about the partner, which is needed as a basis for growing productive love.

Some proposals reproduce a companion's actions in several nonmetaphoric fashions. Gibbs, Vetere, Bunyan, and Howard (2005) created two systems, the *Secret Touch,* which allowed sharing tactile impulses within pockets, and the *Hug Over a Distance,* where jackets allowed exchanging a virtual hug. Similarly, the *iFeel_IM,* by Tsetserukou et al. (2009), provided realistic hugs over distance accompanied by butterflies in the stomach and shivers in the body's spine using an augmented reality vest. Other devices allow sharing personal information. For instance, Hindus et al. (2001) enabled two houses to share a writing surface with the *Scanboard*. Vetere et al. (2005) allowed leaving messages around to be found serendipitously with the *i. fuzz.*. Gibbs et al. (2005) allowed the exchanging of messages while they were being composed though the *Synchromate*. And more recently, Romero et al. (2007) created the *ToTell List,* where pictures or messages acted as a postcard that functioned as a reminder of interesting moments and experiences to talk about. Each of these devices provided more intimate or objective information about the partner through a voluntary action of the user.

Remote location and activity can be informed automatically as well. Brown et al. (2007) demonstrated the *Whereabouts Clock* to serve as positioning representation in which icons of family members are plotted based on the location of their cell phones. A more intimate approach was the *Sensing Beds* by Goodman and Misilim (2003), which transmitted the remote user's position by heating a parallel spot. Hindus et al. (2001) visually showed activity from a remote location by turning on and increasing the brightness of the *Presence Light* and showed general noise levels at a remote location through the synchronized *CommuteBoard*. Siio, Rowan, Mima, and Mynatt (2003) used the *Coffee Aroma Generator* as a clear and natural representation of coffee that is being made in a distant location. Moreover, Yashikida and Umemuro (2008) presented the *Close to you,* which transmitted prepared sounds or smells that suggested several actions of the counterpart. Huijnen, IJsselsteijn, Markopoulos, and de Ruyter (2004) achieved social presence by displaying a processed visual representation or a full video of a remote friend watching the same television program. Furthermore, Takashima and Umemuro (2008) displayed the same program in a submonitor next to the main television in order to activate the communication among family members. Van der Hoog et al. (2004) placed the *Gustbowl* at the

home entrance, which sent to the remote individual pictures of things like keys when dropped into it. Lastly, Sorakubo and Umemuro (2008) created the *Two-nearly,* which allowed the house of the family members who are living in a physically distant location to be seen through an analogy of a window at the present location. Although these devices succeed in automatically transmitting information about location and activities of the companion, under the point of view of productive love, the output of the devices are restricted regarding the transmission of the person's inner feelings, which would be highly valuable in promoting productive love.

Finally some devices automatically transmit intimate information about the other person's condition. For example, Hindus et al. (2001) simply connected two remote locations with high quality audio through the *RoomLink*, allowing listening to the other person´s activities. Mynatt, Rowan, Craighill, and Jacobs (2001) provided abstract visualizations of information about the well-being of an elderly relative with the *Digital Family Portrait*. Finally, Kaye and Goulding (2004) transmitted the heartbeat and hand warmth via the *Hand Holding* device.

The technology research above, to varying extents, is useful toward the objectives of productive love technology. However most of these systems were designed based on the self-perceived beliefs of either the designers or the users about love and related relationships, rather than on explicit theoretic and scientific considerations on what is necessary for creating, supporting, or enhancing the experience of love. Thus the principles of productive love that our study follows might provide a significant contribution toward the design of productive love technology.

PICTURES' CALL SYSTEM PROTOTYPE

The objective of productive love technology is to create an environment where the users can experience the principles related to productive love. The described design criteria offer space for many types of technologies, for instance, in aiding FtF communication, for supporting distant relationships, or even for helping personal development. This section describes a prototype of a system, *Pictures' Call*, which intends to embrace the proposed principles for productive love in a case where the users live separately and spend some time without meeting each other, whether it is just some days, or several months. The empirical study presented here is intended to illustrate and model how technology development can fulfill specified research-based criteria.

Pictures' Call System Description

As seen in the productive love principles and productive love design criteria sections, objective knowledge is essential to support care, respect, and responsibility as basic principles of productive love. Consequently, the focus of supporting the exchange of valued and valuable information was established as the key priority of the system intended to develop the qualities of productive love through the Pictures' Call system. What is more, we wanted to automatically initiate activities that can promote productive love. Pictures' Call is a bidirectional, dual-component system that automatically takes, sends, and displays everyday images between two users. Pictures' Call is built in the Java environment, connected via the Internet, and is configured for tablet PCs at the site of each user. Details of the process and how the device meets the rest of the principles are explained as follows.

Pictures' Call automatically takes pictures of each of the users and sends to the other within a certain time frame. The automated system frees the users from a task that could be seen as a duty, and perhaps abandoned. The automatism intends to provide better engagement with the system and the interaction with the other person in a fun and nonjudgmental way, therefore supporting the sixth principle of productive love—enjoyment, not evaluation.

The first device holds the capture system, which is designed for placement at home or other habitual environment. When movement is detected, the system takes several pictures at different times of the day and at random intervals: In this way, the photographed person appears natural, doing daily tasks and not posing. Moreover the user has no control over the picture that may be taken; neither have the option to look at what has been taken before it is transmitted. Such a simple and natural process eliminates the need for the photographed individual from having to choose the best smiling picture to be sent; therefore, the user's condition is represented realistically, which is the objective of the Pictures' Call device. Users who wish to capture specific actions or happenings can use their digital cameras and video conference systems, activities which are distinct from, but may complement, the Pictures' Call device.

The capture system accomplishes the seventh principle—freedom, not a feeling of duty—firstly by displaying a mirror image when in operation mode. The mirror function informs the user of the type of view of him/her that may be taken and thus preventing the users from feeling that they are being secretly observed. Secondly, the users are able to turn the device off or to move it to locations around the home that they like or that do not interfere with their privacy. Moreover, the pictures are sent after a security delay that allows the users to erase the images within 2 hours and to stop the system for 2 hours by pressing the privacy button (see Figure 1). The fact that the privacy button takes over from the real-time picture exchange was a significant issue during the design process. While a real-time transfer and viewing of pictures could be a high motivator for responding to them, and thus support responsibility and enjoyment through engagement, there is a downside to this as well. Because the seventh principle—freedom, not a feeling of duty—is a condition for being able to experience without restraining the other principles, we agreed that it was most important to support this principle through technology that did not confine the user.

The second device holds the receiver system. It takes delivery of the pictures from a distant location and displays them as a slide show as they become available. The newest pictures supplant

Figure 1. Privacy button of the Pictures' Call capture system.

the oldest ones, keeping a slideshow of up to 20 pictures. Displaying realistic pictures aims to let the receiver see the partner as he/she is, which intends to contribute to the fifth principle—realistic knowledge, not delusion—as well as the fourth principle—respect, not exploitation.

Additionally, the receiver system allows commenting on the pictures through an edit function on the touch panel display, and then sends them back to the original person in real-time (see Figure 2 for a screen shot of the edit function). This encourages the person to take an action related to the loved one who appears in the picture, which may motivate the second principle—care, not involuntary love—and the third principle—responsibility, not irrationality. Moreover, taking an action for the other, as a response to the possible clues conveyed by the picture, can be a selfless act, which strives for the first principle—giving, not exchange or egoism. Nevertheless, the nature of the comments is completely up to the user. Therefore it does not limit the seventh principle—freedom, not a feeling of duty.

Furthermore, Pictures' Call does not generate any obligation on the receiver. Because the user has not seen his/her own pictures, she/he should not expect any specific response. Moreover, the number of sent pictures is not clearly defined but can range from zero to seven in a day, depending on the time that the user spends in front of the capture system's camera. The undefined number of pictures a day keeps the user away from knowing that the other user should have received already a determined number of pictures. This intends to decrease the expectations of responses of the user who appears in the pictures, and the feeling of obligation to respond to the pictures from the receiver, contributing as well to the seventh principle—freedom, not a feeling of duty.

Finally, receiving commented pictures of oneself, which the user has not seen yet, serves as a mirror that supports personal awareness. This can support the eighth principle—self-growth, not dependency. The commented pictures are not automatically erased but remain available for further review. However, the receiver of the commented picture can delete the edit, or edit the edit and resend it, which encourages further communication as well as the first principle—giving, not exchange or egoism, second principle—care, not involuntary love—and the third principle—responsibility, not irrationality.

Figure 2. Edit function of the Pictures' Call receiver system.

Pictures' Call System, Tentative Evaluation

This section intends to provide a brief illustration of how productive love technology can be evaluated in principle, as well as provide a preliminary feedback from six users specifically on the Pictures' Call system. The users were two females and four males, aged between 21 and 55 years old. ($M = 36.16$, $SD = 11.99$). Three of them were Japanese: a married couple who through Picture's Call remotely connected with their grandson. The rest involved a Spanish citizen living in Japan who was connected to his sister and a close friend living in Spain.

The testing took two weeks for each group of users; the instructions given to the users were to place the capture system in a place where they would feel comfortable to share images of themselves and to spend some time seeing the other´s pictures at the receiver system and try to send comments. No restrictions were given. The users became familiar with the system from the very beginning; however the system failed to send the pictures several times during the testing, which created some concern in the users about their correct usage of the system.

The users answered three questionnaires about productive love and three questionnaires about system use; the questionnaires were administrated in Japanese and in Spanish, depending of each user mother tongue. Any quotes drawn from these questionnaires for this paper have been translated by the authors.

In terms of productive love, one questionnaire was completed before system usage and assessed how much they valued the principles of productive love. A second questionnaire was completed before and after using the system and assessed if the users experienced changes in their relationships in terms of productive love. The third questionnaire was completed after the system use and assessed if the system had promoted their productive love. All three questionnaires contained 24 items each, representing the eight principles of productive love.

Regarding the system use, the fourth questionnaire assessed the costs of communication, inspired by the Affective Benefits and Costs of Communication (ABC) questionnaire, created by Romero et al. (2007). However, for this research, we created a new questionnaire with nine items about the creation of expectations, creation of obligations, and privacy invasion. The fifth questionnaire assessed three of the Nielsen's (1993) five criteria of usability: learnability, efficiency, and satisfaction. In the final questionnaire, three open-ended questions asked their impressions about the system.

Although the users participated with someone they loved and had no productive love objectives at first, the results from the first questionnaire showed that all users evaluated positively the productive love principles. However, the second questionnaire indicated that the overall difference in productive love relationships between the users before and after using the system was minimal. This seems attributable to having used the system for only 2 weeks, which may be not long enough for the actions carried out for productive love to be reflected on the users' relationships. On the other hand, the results of the third questionnaire showed that the system succeeded to support all the principles of productive love for all the users.

The open-ended questions showed that all of the users highly enjoyed receiving images of their companion and sending comments. Moreover, the participants used the system in an unpredicted playful way: They made drawings like cartoons, expressed their creativity, and challenged the other. Also, they enjoyed that the pen was not perfectly precise, resulting in childish writings that contrasted well with real images. For further enjoyment, some users suggested additional functions for future development. These included taking a photo when

they want; videoconferencing opportunities; an available keyboard to type comments on pictures; image editing tools, like Photoshop or Illustrator, or the ability to easily export and import from them; the availability of some sound or talk; and predefined and easy to tag messages, like ―Congratulations!‖ From this feedback, it seems that playfulness is an important factor for an enjoyable engagement with this type of system (which is essential for the technology to convey productive love). Moreover, users highly valued sending and receiving handwriting in real time, and handwriting itself, in words of a participant, ―led to natural communication of feelings.‖

The system was generally well evaluated in terms of the creation of expectations and obligations, and privacy invasion. This makes the system valuable for relationships where one of the parties has a higher desire of updated information than the other. For example, grandparents may want to see more of the younger generation, who are sometimes too busy to keep informing them.

The system was well evaluated also in terms of learnability and satisfaction, which indicates good qualities of the system in spite of having stopped several times, which caused low evaluation in terms of efficiency. The comments of the users reflected that they were satisfied principally about the ease of communication. In the words of one user, ―The best is to have it all in one at hand: Receive the picture, play with it and send it.‖

Overall, although the productive love qualities of the users seemed to improve just minimally during the testing periods of 2 weeks, the users experienced the system as successful to promote the productive love objectives. Moreover, the system did not bring unwanted burdens due to communication and had acceptable usability. These results support the idea that an automatic picture exchange can be enjoyed by users and has the potential to support productive love.

DISCUSSION AND CONCLUSION

This is an original study that proposes the use of social psychology and philosophy for designing technology that promotes love. Although numerous philosophers, psychologists and spiritual gurus have tried to teach the nature of love, their success reached a few curious people only. We believe that in the era of ubiquitous technology, where many people feel more excited about using the latest technology than reading the latest books, there exists the possibility to make use of the technology to promote love. A possible criticism of productive love technology could be a point of view similar to Illich (1973, p. 76), who advised, ―When overefficient tools are applied to facilitate man‘s relationship with the physical environment, they can destroy the balance between man and nature.‖ However, Sorokin (1954) and Fromm (1956) claimed that among the forms of love similar to the one presented here, productive love, while not very common nowadays, can help better the world. Moreover, Fromm‘s (1956) view is that certain cultures, particularly capitalistic ones, hinder productive love.

The proposed design criteria are a first step of an approach where technology incorporates the proposed philosophy of productive love. Therefore any idea that is in accord with the productive love principles could improve the design criteria presented here. Likewise the undertaken philosophical review about love may have potential to be extended. Further, the Pictures‘ Call device is a first example of how the principles of productive love

can be applied and evaluation methods could be conducted. The device is not intended to be the definitive love-prompting technology but rather aims to raise criticism as well as challenge designers to consider ideas for new productive love-promoting technologies.

Furthermore, the authors foresee the possibility that the design criteria could be incorporated into other existent technologies, which may make them able to support productive love or avoid creating environments that may undermine it. Conveying the productive love principles through technologies can improve not only people's relationships and therefore their happiness, but also make the technologies that surround us more affective and thus contribute on their commercial success.

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