Abstract
The importance of love is reflected in literature, movies and music, therefore it seems necessary to understand what role technology plays in relation to love and the roles it could to play in the future. We review studies related to Love in HCI and we identify a lack of consideration of philosophy as a background for love understanding. Based on literature review, we offer a proposal of guidelines for designing technology that aims to improve loving relationships. Besides, we explore principles of engagement with technology that may be important when designing love-promoting technology. Finally we propose a practical design example.

Keywords
Productive Love, affective technology, care, respect, responsibility, knowledge, lovers, family.

ACM Classification Keywords
D.2.2 Design Tools and Techniques: User interfaces; H.5.3. Group and Organization Interfaces: Theory and models And H.5.3. Group and Organization Interfaces: Evaluation/methodology;
Introduction

There is little research on devices or applications that aim to improve loving relationships. In the era of ubiquitous technology, almost all the people feel more excited for using the latest technology than reading the latest books; it seems possible to make use of technology as a medium to improve love. The objective of this study is to provide an understanding of the nature of love in a manner that may be usable for designing the most appropriate love-promoting technology.

In relationship to love and in the field of HCI there have widely been realized studies about transmission of personal information, intimacy, connectedness, awareness, and social presence. However, love has not been approached specifically. Besides, what has been done is mainly based on people experiences and opinions. On the other hand, a philosophical approach may represent a further understanding of the experience of love, consequently, in this paper, our goal is to explore how technology can contribute to improve love relationships through basing our principles on philosophy.

Our contribution is the description of the existing and potential design space for HCI in relation to the field of love. In order to do that, we will introduce a new approach on conceiving loving relationships and explore its usability in HCI. We want to highlight the possibility of a new line of research that has for the most part been unobserved within HCI to date. That is the possibility of using philosophy and technology to improve love relationships.

The structure of this paper is as follows: We will introduce Productive Love philosophical approach and we will explain its possible applicability to HCI by suggesting a set of guidelines for Productive Love promoting technologies. Under the basis of Productive Love, we will examine previous works related to love on HCI reflecting on the type of interaction that they may address, and we will suggest which fields seem to have room for improvement. Furthermore, we will explore principles of engagement with technology, such as technology as a mirror, fun, pleasure and flow, which may be important when designing love-promoting technology. Finally, we propose a practical design example of a Productive Love promoting application that embraces several of the proposed guidelines and that may instigate criticism and challenge future designs of love promoting technologies.

Love approach from theoretical review

Erich Fromm in his book “The art of loving” proposed four basic elements common in all forms of for love: care, responsibility, respect and knowledge [9]. These appeal to us as basis for designing technology to improve love. Nevertheless, in addition to Erich Fromm’s approach, we base the present survey and proposed guidelines on our extensive review of the works of other theorists and researchers. Still, the theories and researches taken into account understand of love not as an involuntary passion but as a voluntary action, which can be improved. The reason that brought us to choose this approach is that the understanding of love as an action brings up the possibility to make use of the existent or future technologies to help to improve love.

It seems that most people and some theorists share the tendency to regard love as innate, passive, and
basically the same as falling in love. For instance, Burston explains that Plato, Schopenhauer, Nietzsche, Freud, and Lacan represents the common understanding that erotic love is an involuntary passion, where love is "blind" and therefore, the adversary of reason. On the other hand, Burston points that Soren Kierkegaard, Max Scheler, Martin Buber and Erich Fromm represents the belief that genuine love always includes an element of volition [4]. Specifically, Fromm differentiated two kinds of love. Immature love or symbiotic union, which corresponds to the person whose character, has not developed further than the receptive orientation, which we call Receptive Love. Mature love, attributable to the person who has developed productive character or orientation, is the representative of active love, and we define as Productive Love [9]. The idea of Productive Love has been approached by several philosophers under different designations such as "being love" by Abraham Maslow or benevolent love, altruistic love and agape love by Bernard Murstein [17]. As a validation of Productive love-related theories that regard it as a higher form of love, in a study among couple relationships, agape love was positively correlated with relationship satisfaction [19].

We enumerate five key aspects in understanding of Productive Love. First, we summarize what has been described to be in relationship to it. Second, we contrast with what has been described in relation to Receptive Love, its antagonist. Third, we include elements of theories and empirical studies about love in general terms that seem to be in accordance with Productive Love. Finally, as a representative of the differences between people’s beliefs about love nowadays and our Productive love approach, we include a comparison between Fromm’s understanding of care, respect, responsibility and knowledge and the results of a brainstorming regarding to them carried out with five participants [9].

Elements of productive love
A synthesis of the elements related to the concept of Productive Love is the following: self preservation, striving for the other, giving, concern for the other, appreciation of love, enjoy the other, selflessness, non exchange, realism, maturity, and insight [9, 10, 17, 23].

Elements of receptive love
A synthesis of the elements related to the concept of receptive love is the following: objectification, complementarily, fairness, exchange, ego, receiving, involuntary love, evaluation, materialism, and irrationality [9, 17].

Elements from theoretical studies related to productive love
A synthesis of the elements related to the concept of receptive love is the following: concern, communication, action, and independence [6, 8, 13, 22, 29].

Elements from empirical studies related to productive love
A synthesis of the elements related to the concept of receptive love is the following: concern, communication, striving for the other, and giving [17, 22, 25].
Discrepancies between Fromm’s (1956) theory about love and nowadays people’s thoughts from an exploratory brainstorming

First, Fromm defined care as active concern for life and the growth of that which we love [9]. However, participants mainly concerned about care between equals, and not much about care as labor for the other. Second, Fromm explained responsibility as a voluntary act, to be able and ready to respond [9]. Conversely, participants understood it mostly as a duty. Third, Fromm explained respect to be the ability to be aware of the other’s person unique individuality [9]. In spite of this, participants concerned about too much respect, as negative. Finally, Fromm explained that knowledge is a core factor for love [9]. However, participants did not reflect on objectiveness as fundamental factor for the knowing about the partner.

New directions: improvement of actual interactions

In order to obtain a summary representative of Productive Love, the above-introduced elements from literature were analyzed and classified. In addition, insights from the brainstorming were taken into account, resulting in the following list of elements of Productive Love.

- Preservation of personal individuality and freedom, not feeling of duty.
- Respect, not objectification or exploitation.
- Self-growth, not dependency on others.
- Care, responsibility and active concern, not involuntary love.
- Giving, not exchange and fairness.
- Selflessness, not egoism.
- Enjoy the other, as he is, not evaluation of the other.
- Enjoyment of the love experience, not materialism.
- Realism, not delusion.
- Knowledge, not lack of understanding.

Guidelines For Designing Technology That Promotes Productive Love

This section introduces an initial proposal of theory and some examples of how the final elements of Productive Love could be taken into account when designing love-promoting technology.

Preservation of Personal Individuality and Freedom, not Feeling of Duty

When using a love-promoting technology, there should be freedom of actions; there should not be rules of “good” or “bad”. There should neither be obligation for stereotyped acts such as using emoticons, which may not represent the user. On the other hand, love-promoting technology should facilitate every person to feel easy to express freely, such as accepting an open-ended range of actions instead of offering a pre-defined and limited one.
Respect, not Objectification or Exploitation
Love-promoting technology should respect everyone’s desired degree of privacy such as not encouraging the use of devices (i.e., cameras) if this invades one’s privacy or lead control over a person. Moreover, love-promoting technology should not help in acquiring a person, or obtaining something from the other, as it could be obtaining personal favors or getting chores done.

Self-growth, not Dependency on Others
Love-promoting technology should not lead to creating dependency. For instance, a device that facilitates a person to wake the other person in the morning would be better if it also facilitates the receiver in learning to do it by himself. A love-promoting device that intends to improve self-growth could facilitate to show the person’s improvements, which may help to improve self-awareness.

Care and Responsibility not Involuntary Love
A love-promoting technology which intends to improve active concern for the other person and responsiveness for the other’s actions could inform about the person illusions, dislikes, or moods which could motivate responsiveness to the other’s needs. For example, thinking how to do something for the other person when seeing that he or she needs it.

Giving, not Exchange and Fairness
The actions done on love-promoting technology should facilitate to understand the other’s pace instead of focus on a return, which may be derived from an operating logic that requires correspondence of actions. The user should be able to find pleasure not only on receiving an action from the other, but doing an action for the other. For instance, providing information of the other person’s feelings when receiving an action could motivate this.

Selflessness, not Egoism
In a love promoting technology the source of pleasure should not remain in the human-device interaction but grow to be in the human-human interaction, which may lead to learn to enjoy doing actions for the other. In order to accomplish that, the actions carried out in the love-promoting technology should be far from fiction, as the ones carried out by fictional characters in fictional contexts in most of the videogames, but closer to real actions and real persons as accurately as possible.

Enjoy the Other, as he is, not Evaluation of the Other
Love-promoting technology should not make differences of rank, status, personal scoring, comparisons, or competition. For instance, high amount of actions should not be evaluated as better. Likewise, actions such as “buying a present” or “asking how are you” should not be established as having different value. Both of them should be shown as valuable in order to let the receiver understand its context and enjoy them.

Enjoyment of the Love Experience, not Materialism
Love-promoting technology should not put a premium on the user actions by obtaining points or evaluation, which may drive focus on the return. However, initially, something similar to a game might provide initial interest, which could help to appreciate the love experience.

Realism, not Delusion
Love-promoting technology should avoid showing an unreal or partial image of the partner, which may lead to create a wrong image of him or her. Love-promoting
technology should avoid promoting idealization of the partner by showing too many signs of affection such as exaggerating emoticons, for example. What is more, in order to help for an objective understanding of the partner; love-promoting technology should transmit realistic information about good and bad things.

Knowledge, not Lack of Understanding

In order to make possible other aspects of Productive Love, knowledge should be promoted by the love-promoting technology. To know about the other person could be helped by facilitating the user to provide personal information such as answering questions, being motivated to talk, write about oneself, or to share personal images or objects. However, knowledge could be collected as well automatically, using for instance, sensory technology that may collect images, sound, movement, presence, etc. It is possible as well to use the collected data to estimate the person’s activity, emotions or feelings.

Previous related works

In this section we explain previous researches whose approach could be related to Productive Love and its elements. First, we describe systems that provide some aspects related to Productive Love. Second, we describe the methods that have been used for designing some of the described systems.

Systems

Simple and lightweight distant means of communication where proposed in the Casablanca project. For instance, The Lampshade, glowed when both users manually indicate their presence. Similarly, the Presence light showed activity from a remote location by turning on and becoming brighter. As well as the Intentional Presence Lamp transmitted presence only if the user explicitly activated it [14].

Awareness systems with higher intimacy were explored through metaphoric representations. For instance, the Feather let a plume float on a transparent tube, and the Scent let an fragrance vaporize in the room when a distant partner touched a frame of a picture of the couple. The Shaker transmitted a vibration maintaining timing and amplitude of movements, [26]. The LumiTouch picture frame lighted when the remote user touched a picture [5]. The Sensing beds transmitted the remote user position by heat [12]. The Secret touch allowed sharing tactile impulses from the pockets, the Hug over a distance composed by jackets allowed to exchange a virtual hug [11]. Pulling the Curtain IPL the user was shown as a flower. In touch transmitted touch into glow, warmth or vibration [14]. Finally, the Digital family portrait examined abstract visualizations of information about well being of an elderly relative [20]. These devices provided awareness through several kinds of actions and representations. However, the metaphoric representations provided by these devices may be excessively ambiguous on its interpretation under the point of view of Productive Love; therefore, they may fail to provide objective knowledge about the partner, which is needed as a basis for growing Productive Love.

Some proposals transmitted the information in a more objective way. Social presence was achieved by displaying a remote friend watching the same television program [15]. The Coffee aroma generator was used as a clear and natural representation of a distant action [24]. The Gustbowl was a bowl placed at the home entrance, which sent pictures when things like keys
were dropped into it [27]. The Whereabouts clock demonstrated to serve as reassurance by representing an animated representation of family location where members of the household are represented by icons linked to the location of their cell phones [3]. The synchronized CommuteBoard was a whiteboard that visually showed general noise level at the remote location and the Romlink connected two remote locations with high quality audio [14]. Finally, the Syncromate allowed to exchange a message while it was being composed, [11]. Those devices provided more realistic information about the other person actions, however in our opinion, those devices are restricted concerning the transmission of information about the person’s inner situation, which would be highly valuable in promoting Productive Love.

Some proposals transmitted even more personal information. The Hand Holding transmitted heartbeat and warmth and the Love egg acted as a voice mail [16]. The Scanboard, enabled two houses to share a writing surface. [14]. The I-fuzz allowed to leave messages around to be found serendipitously [11]. Finally, in the ToTell list, pictures or messages acted as a post card, that functioned as a reminder of interesting moments and experiences to talk about [21]. Those devices provided more objective and intimate information about the partner however they required a voluntary action of the user. We believe that there is the possibility to provide intimate information automatically, without voluntary action, which may not fail to be continuously provided and may serve to initiate concern about the other and instigate Productive Love growth. This belief as well as previous remarks will be materialized in the practical design example of the last section.

Methods
In order to approach the above-mentioned designs related to love, several research methods have been used. First, designs were based on interviewing couples in long distance stable relationships [16]. Participatory designs were used to find out that people miss [27]. Cultural probes were used as well [14, 28]. Furthermore, Vetere listed several research methods: online questionnaires, data logs, longitudinal focus groups, Interviews, and written reflections [28]. The pointed methods rely on people’s opinions and habits about their relationships. However, we believe that generally, people’s ways are not perfect and could be improved through the Productive Love principles. Moreover, we believe that the theory of productive love is not commonly known and shared by people, therefore, the above mentioned methods seem to not be applicable for assessment. A reason of using philosophy consent as a basis for designing for love is that common people usually may not understand love in such a deep way as philosophers do.

Engagement with the technology
Love-promoting technology besides being a vehicle for human-human interaction is still a piece of technology that requires human-technology interaction. This section discusses factors that seem critical to effectively engage with the love-promoting technology.

Bolter and Gromala defended that technology can be a mirror where every application must be an experience [2]. The quality of the experience and the importance of enjoyment related to human computer interactions has been discussed by Blythe and Hassenzahl who explained fun to be trivial, repetitive, spontaneous,
frivol and spectacle-like. While pleasure was explained to be relevant, progressive, not necessarily spontaneous, somehow serious, aesthetics or art-like, requiring commitment to the basic principles and rules of the activity, sources are limited to three: opportunities for personal growth, memory attachment, and anticipation [1]. Accordingly, in order to make the experience pleasurable, the love-promoting technology could strive for the feelings that can be experienced when remembering a loved person, or when anticipating the other person acts. Moreover, the mirroring of own acts could stress the consciousness of the active engagement, which may lead to personal growth. For example, a game where one is able to discover and do things for a partner could be a way to motivate the user to initiate some of the above described keys of pleasure in relation to the other.

Nevertheless, besides being pleasurable, love-promoting technology might need to provide an extra attractiveness in order to compete with nowadays most popular daily leisure activities such as watching TV, browsing the Internet, or playing videogames. Among nowadays popular leisure activities, videogames and web activities have been extensively linked to flow, concept that was initially introduced by Csikszentmihalyi, who explained it as an optimal experience that follows the optimal combination of challenge and skill levels of the person and the situation [7]. In that sense, a game-oriented or web-oriented application could be at first appropriate for the love-promoting technology. For example, if icons that appear on a screen suggest some kind of easy interaction, it might lead to reactive operation and thus, be attractive and fun.

**Practical Design Example**

In this section we describe a hypothetical system that targets to improve the love between persons (i.e., lovers, familiars, friends) that are distant from each other. This intends to provide a practical example of a system design that embraces several of the proposed guidelines for love-promoting technology and factors of engagement with technology.

The system automatically takes pictures of each of the users and sends to another selected user. The automatism frees the users from a task that could represent duty, a burden, and thus, could be abandoned. Essentially, it intends to provide better engagement with the system, and consequently with the other person.

The pictures are taken in random intervals, this way the photographed person appears completely natural, doing whatever he is doing and away from posing and choosing the best smiling picture to be send. This ensures that the information objectively represents the person. Realistic information is a good basis to appreciate the other, as he is, to see what he does, how he looks, or even to infer how he feels.

However, in order to respect intimacy, the user is able to regulate the extent and allocation of time for the taken pictures. The span of time where the pictures are taken can be selected manually by the user, it varies from very short, in punctual situations such as while having lunch, or while using the PC, to more longer spans of time, such as while being in a room, kitchen, etc. This regulation reflects degrees of openness between the users, providing information about them and the relationship. The degree of clarity of the
pictures can be regulated as well. As a result, those who feel very open choose a completely clear picture, while when the user needs to keep some distance he or she selects a blurry effect. The option to blurry the image includes artistic effects, which are playful and motivates engagement. However, in order to avoid shifting the focus of attention from the person into the art effect, which would distract the main objective of improving love for the person, the artistic effects are limited.

The number of pictures sent is small, a set of three plus a short video every day. The receiver is able to find them very accessible in an application of his computer, gaming console, digital picture frame or a “love device”. The user feels desire of taking a look into his lover’s pictures, and then to his mother’s pictures.

In order to promote active concern for the other person, as well as engagement with the system, the system includes a touch panel display. Using the touch panel display, the pictures are directly commented by writing on them, and re-sent to the original person. This encourages the person to take an action related to the person who appears in the picture, which helps to move the concern from the self to the other person. What is more, receiving commented pictures of oneself, which one has even not seen yet, serves as a mirror that supports personal awareness. This also keeps the user interested and engaged with the technology, and therefore with the loved person.

**Conclusion**

A love-promoting technology might not be able to create love itself. However, providing enjoyment of doing activities related to the other person may help to know the other, thus may be able to create the conditions to find ways to improve love. Eventually, those activities might substitute general forms of entertainment such as watching TV, or playing videogames, which are done without relation with the loved persons. The challenge now is to conceive systems that demonstrate ability to improve love relationships on the suggested direction.

**References**


