Design for Forgetting: Disposing of Digital Possessions After a Breakup

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ABSTRACT

People are increasingly acquiring huge collections of digital possessions. Despite some pleas for 'forgetting', most theorists argue for retaining all these possessions to enhance 'total recall' of our everyday lives. However, there has been little exploration of the *negative* role of digital possessions when people want to forget aspects of their lives. We report on interviews with 24 people about their possessions after a romantic breakup. We found that digital possessions were often evocative and upsetting in this context, leading to distinct disposal strategies with different outcomes. We advance theory by finding strong evidence for the value of intentional forgetting and provide new data about complex practices associated with the disposal of digital possessions. Our findings led to a number of design implications that would help people better manage this process, including automatic harvesting of digital possessions, tools for self-control, artifact crafting as sense-making, and digital spaces for shared possessions.

Author Keywords

Autobiographical memories; sense of self; disposal; digital possessions; relationship dissolution; intentional forgetting.

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

General Terms

Design.

INTRODUCTION

We are now living more of our lives online, acquiring vast collections of *digital possessions* which we define as personal digital artifacts acquired through daily activities, including photos, messages, music and videos, that are stored across multiple devices such as computers, phones, cameras etc. Previous work has shown that such digital possessions can be imbued with symbolic meaning, or *ensouled* through appropriation and personalization [27]. They become extensions of the self, triggering attachment just like meaningful physical possessions [13,21,28].
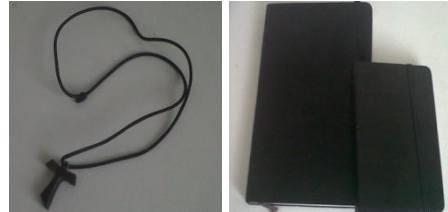
"I deleted emails, photos and text messages from her - but these gifts, I couldn't get rid of. A lot of her is in these objects" (P13)

Figure 1: Symbolic Objects from a Breakup

They can also serve as critical symbols of self and relationships, with the result that collections of digital possessions need to be *actively managed.* One context that demands active engagement with digital possessions is *bereavement.* Here people cherish the departed's inherited digital possessions, feeling the need to organize them to honour the memories of their loved ones [26]. In contrast, in the context of familial spaces, digital possessions seem to be less significant than physical possessions.

Digital possessions are less *salient* [13,19,21,29], less well integrated into family life, and do not seem to be cached for immersive reminiscing [29]. For these reasons, such digital possessions have been described as less *evocative* [29] serving more like commodities rather than *things* imbued with symbolic meanings [27,28]. As a result, in family settings people have a *laissez faire* approach to dealing with digital possessions, letting them passively accumulate on personal hard drives or in social media applications. Although they are preserved, they are not actively curated.

Both these approaches for handling digital possessions, laissez faire and active management, emphasize *retention.* Most work on memory in HCI has also emphasized *exhaustive capture* of digital information, with the life-logging approach arguing for the benefits of exhaustive recordings in supporting 'total recall' [3]. However the topic of *forgetting* and *deletion* of digital possessions has received much less attention. A few exceptions include pleas for 'forgetting' to preserve privacy in ubiquitous computing [1]. However while many users see putative benefits to forgetting, they are also extremely resistant to actual deletion. They want to avoid loss [12] and find it hard to 'clean up' digital possessions, even though these are often poorly organized and valuable information difficult to find [25,33].

This paper examines digital disposal and forgetting. We looked at a situation in which people may be highly

motivated to forget, namely a *romantic relationship breakup*. Being in a relationship could be central to one's sense of identity, and separation may be experienced as a loss of one's sense of self. Other work has begun to explore digital networking after a breakup where feelings are ambivalent or negative [17]. We wanted to examine people's attitudes to their digital possessions in a context where these possessions may serve as upsetting reminders of past events. We interviewed people about their romantic breakup asking them to characterize possessions related to it. We addressed the following questions:

- What *types* of possessions are relevant to romantic relationship dissolution? Are they predominantly photos and videos as suggested in familial spaces, or are there other types that are specific to relationships?

- What *functions* do such possessions serve in the breakup? If they support reminiscing, does this interfere with the process of moving on?

- What *strategies* do people use for managing possessions? Do they tend to avoid deletion although the memories they trigger can be painful, or do they actually delete them?

- *How* do people enact disposal practices? Do they dispose impulsively or more deliberately? Do they delete everything or preserve treasured possessions?

RELATED WORK

HCI has recently begun to tackle relationship dissolution. Also relevant is literature on autobiographical memories addressing the role of emotions and self-relevancy in intentional forgetting. We place this body of work in the context of research on life transitions and sense of self, examining disrupted relationships with significant others as a specific type of life transition. We also review work on material culture and consumer research on the role of possessions' disposal for one's sense of self.

Life Transitions

Theories of life transitions focus on the roles of significant events on identity reconstruction [6]. Such reconstruction is challenged by the tendency to recall things supporting current identity, and to inhibit memories undermining it. A particular type of life transition relates to disrupted relationships with significant others, through *death, divorce* or *premarital relationship dissolution*. In these situations, adjustment to the loss of the loved one is stressful and emotionally charged and is usually captured by theories of attachment, stress, and grief [5,14].

Bereavement is conceptualized through the stage theory of grief [14] and recent work in grief therapy has shifted from an emphasis on breaking bonds with the deceased to continuing them. Here, possessions become invested with symbolic value representing the deceased whose proximity is strongly sought, particularly in the initial stages of grief. Field et al [7] found that using the departed spouse's possessions to gain comfort prolongs grief symptoms,

whereas merely thinking about fond memories could alleviate grief.

Divorce bears similarities to bereavement. Both involve loss and the need to negotiate a new life, as well as complex decisions about how to deal with shared possessions that symbolize the relationship. Sometimes divorce can be more difficult than bereavement, because of the ambivalent emotions that need to be processed. McAlexander [22] explored the disposal of marital possessions following divorce and identified three strategies: break free, hold on, and dissolve ties. In breaking free, the initiator intentionally discards valuable possessions to ritually end the relationship. In holding on, the person resisting the divorce keeps possessions to ensure the maintenance of marital roles, while dissolving ties involves the equitable division of possessions.

Romantic relationship dissolution. Dissolving premarital relationships bears strong similarities to the grief process involved in divorce. Like divorce, it is a challenging life transition requiring reappraisal and sense-making. Some of its negative outcomes include distress, depression and lack of self-concept clarity, while positive ones relate to opportunities for personal growth [18]. Shared possessions in romantic relationships are often significant gifts that may mark important moments in the relationship and are difficult to dispose of.

Intentional Forgetting, Possessions and the Sense of Self

Forgetting is an adaptive mechanism for limiting the impact of outdated past experiences on current ones [4], especially when such memories are emotionally rich [11] and self-relevant but discordant with the current self [16]. Reconstruing self-relevant autobiographical memories is particularly important during life transitions. Self-relevant memories are woven into one's life narrative. If central to self-identity such memories strongly resist forgetting. Most research on material culture has focused on the *acquisition* of possessions to support the extended self, while the *disposal* of significant possessions has received less attention. Disposal is often triggered by changes in self perception when possessions are associated with an undesired self [16] or no longer fit the ideal self [2]. The adaptive disposal of possessions in relationship dissolution, especially bereavement, often follows a creative process of craft or writing as sense-making. Jacoby [10] developed a taxonomy of disposal behavior including retention, temporary relinquishment and permanent relinquishment.

Divorce, Bereavement and Relationship Dissolution in HCI

Most HCI work on interpersonal relationships has focused on positive aspects such as relationship forming and maintenance of intimacy [23]. There is a vast literature into online social networks' value in maintaining close ties, and for exchanging informal information [15]. Intense negative aspects such as relationship dissolution are indirectly addressed through life transitions such as divorce and bereavement [20]. Divorce in HCI has been explored from the perspective of parent-child

communications across post-divorce household and children's access to joint family cultures [28].

Designing for bereavement raises many issues from supporting bereaved parents [19], to continuing bonds with the deceased [25, 26] or across generations [13]. Odom et al. [25] explored the handling of large collections of inherited digital artifacts suggesting the importance of filtering and annotating significant possessions by owners and later by surviving loved ones. They also emphasized the value of 'letting go' of significant possessions for honoring the deceased and moving on. This is however a reverential act, performed after careful reflection. Odom [25] also suggested the need for rituals of putting digital possessions to rest, and that crude deletion of digital artifacts should be replaced with more graceful degradation usually employed with physical artifacts.

Odom and colleagues [26] described how bonds with the departed are maintained through digital communication, and how people invoke artifacts to reflect about the departed, or conceal them to avoid the negative emotions they elicit. Such bereavement work has addressed negative aspects of possessions but with a different set of emotions and issues than this paper explores. Massimi and Baecker's bereavement work suggests the value of narrative and sense-making for communicating feelings and expressing grief through meaningful artifacts [19]. Massimi et al focused on survivors' repurposing of digital artifacts into online memorials, and on how recovering from painful past experiences allow evolving aspects of self to emerge [21]. Other work has examined the problematic role of digital identity in abusive relationships where the abused wants to create a new identity that allows access to friends and family without surveillance and contact by an abusive partner [20].

The effects of social media on romantic breakup have recently begun to be explored. Facebook can threaten romantic relationships, because a tantalizing lack of context in casual interpersonal interactions causes doubts about fidelity [9]. Breakup practices on Facebook are complex with reported difficulties in signaling changes in relationship status, removal of ex-partners from the friends list, and repeated surveillance ('stalking') visits to the ex-partner's profile [18]. Unfriending is difficult as its online conventions have yet to be agreed, and digital traces of the relationship are persistent on Facebook, demanding exhaustive removal that this is not always under one's control [18].

METHOD
We recruited 24 students, 8 male and 16 female, (mean age 23, range 19-34). Participants reported on breakups related to relationships lasting 3-72 months, (mean = 42 months). Overall quality of the relationships was average (mean = 2.5 out of 5) and the breakup was generally negatively evaluated (mean = 1.2 out of 5, where '5' is very good). Eight participants were less than 6 months, 10 between 6-12 months, and the remaining 6 more than one year from the relationship dissolution. We selected this age group for three reasons: they are deeply interested in love and intimacy within friendships and romantic relationships; they belong to generation Y (born between 1980-2005) which effortlessly exploits multiple technologies for work, leisure and everyday practices; finally both 6 months and one year are significant milestones in the grief process following conjugal bereavement and relationship dissolution. Participants were happy to volunteer and highly involved in the interviews. Participants were not married or cohabitating during the relationship. None had children.

We conducted semi-structured interviews to capture participants' experiences of relationship dissolution, and to examine the role of technology in the process of moving on. We asked about moving on: "How was your journey from the breakup until now? What helped and what hindered this process?" We next focused on practices of treasuring or disposing of digital possessions signaling the relationship (i.e. photos, videos, SMS, emails, blogs, music and digital traces on social networking sites (SNS)). Participants were asked to show the possessions that were most relevant to the relationship and we explored how they served as mementos and the memories that they triggered: "do you still have photos from the relationship?" followed by similar prompts about videos, gifts, emails, texts, social networking posts and updates, music, and blogs. In each case, we talked about digital and physical possessions: what participants had retained, disposed and why, feelings about the process and decisions they made. The interviews took place face to face at participants' residences or via Skype, to ensure they were surrounded by the technologies that were ordinarily part of their lives.

The interviews were recorded and the over 14 hours of audio data was fully transcribed. The analysis involved standard inductive techniques of coding and thematic analysis. A conceptual framework developed from prior literature provided initial categories, namely types and roles of possessions, strategies of dealing with them, i.e. maintaining bonds or cutting ties. This was refined from interview data and new codes emerged, i.e. disposal practices and their enactment. The identified themes were discussed extensively between researchers to reach consensus.

RESULTS
We now describe the various *types* of possessions relevant to relationship dissolution together with their *roles* and *critical functions*. We also describe *strategies* of disposal and the *enactment* of disposal practices.

Types of Possessions
An important outcome is not the *diversity* of digital possessions but the relevance that various types have *during* the relationship and *after* its dissolution, i.e. photos, emails, status posts, IMs, contact information, music and less frequently video and audio recordings. Interestingly, descriptive statistics show that the mentioned digital possessions far surpassed physical ones, both in number (mean counts within the sample: 5.4 digital versus 1.4 physical) and diversity (19 digital versus 3 physical), (i.e.

almost four times more instances and over six times more types of digital possessions). This contrasts with previous findings on mementos in the home [13,29], where people place far stronger emphasis on physical objects. However, it confirms other findings on teenagers' more strategic use of digital possessions [28], highlighting the importance of digital possessions in the life of the young technology-savvy generation. The digital possessions that were important in relationship dissolution also vary in *format*, (i.e. text, sound, visual, and audio-visual), and *location*. They are also *pervasive* distributed among a variety of devices, platforms and applications, hosted on PCs, mobile phones, web blogs, instant messenger services, emails and SNS.

We also computed percentages of items among all digital possessions finding that collections of photos predominate across all devices (40%), followed by SNS contacts (20%), music collections (7%), relationship status on SNS (6%), email collections (5%), text messages (5%), mobile phone contact (4%), and videos (3%). Less frequent were messages and posts on SNS, blog and micro-blog entries, archived IM and computer files (cumulating together 10%). Physical possessions feature mostly as romantic gifts (76%), such as clothes, handmade jewelry; birthday and Valentine cards (15%); as well as some *perfect gifts* (9%) (Fig 1).

Roles and Critical Functions of Possessions
Digital possessions not only vary in the *content* they capture about the relationship but also in the *roles* they support:

- *Communications* that express intimacy and connection, include: (i) *records of conversations*, i.e., email, IM, phone, SMS, and microblog messages; (ii) *contact information*, i.e., ex-partner's phone number, email, and SNS profile; (iii) *relationship indicators* usually on SNS. Significant parts of the relationship were carried out online, so *records* of conversations, *contact* details and *relationship status signals* were all critical. These could involve mundane interactions that acquired significance after the breakup.
- *Evocative symbols* such as photos and videos; and *emotional context* for the relationship usually evoked by music. Certain photos were evocative because they captured significant moments, and music tended to evoke intense emotions about the ex-partner ('our tune').
- *Meta-aspects* such as reflection *about* the relationship and breakup (rather than communications between partners), i.e. sense-making, through blogs, diaries, journals; and meta-data, i.e. reminders to self and others through photo tags and folder names.

While possessions such as photos, videos, emails, text messages, computer files and SNS profiles confirm those identified in home spaces [13,28], we also found digital possessions specific to *romantic relationships*. These can be *public* relationship indicators, i.e. relationship status on SNS, or more *private* access keys such as an ex-partner's phone number. In the context of a breakup, the number and evocativeness of such possessions demand an active stance regarding disposal.

Digital Possessions Are a Problem Demanding Radical Action

While much prior work has emphasized the *positive* roles possessions play in people's lives, in the context of a breakup they present serious *problems* that people have to deal with. These problems relate to the *functions* that digital possessions served in the relationship. Before the breakup possessions were valued because they: (a) facilitated awareness, intimacy and contact, (b) served as evocative triggers for reminiscing about shared experiences, communications and feelings, and (c) were tangible symbols of the relationship. In contrast, after the breakup these functions all become problematic as we saw participants seeking to *limit contact and awareness, suppress and control reminiscing,* and *achieve symbolic detachment.*

Limiting contact and transforming self-presentation. Limiting contact and awareness of the ex-partner was highly problematic. Digital possessions were pervasive in participants' lives, almost compelling them to stay in touch. To sever connections therefore demands radical action. Communication technologies and social networking sites are designed to promote rapid, continual contact and connectedness. Consequently they feature crude, unsophisticated methods for discontinuing contact, while the emphasis on continuous connection makes breakup particularly challenging. Many participants reported severe problems in using common technologies such as Facebook during the breakup, such as P9's difficulties with an ex-partner who maintains ties with her family, hindering her efforts to move on: "*Facebook doesn't help because he can still contact my family even if I don't speak to him. He could get in contact with my little sister or auntie on Facebook. That hindered [moving on] because every time I thought I had got to the point of moving on, something would happen that would take me back to square one".* P2 also experiences difficulties with an ex-partner who is visible online but uncontactable: "*I miss him. His uploads on Facebook make me feel hurt. What hurts are pictures with his new friends and new experiences, because I can see him but cannot talk to him. I have thousands of questions in my mind but I cannot ask him".*

Other problems related to stored messages, P13: "*I deleted all emails; whether they were exchanged for studies or personal*"; text messages, P1: "[What helped moving on?] *Deleting all of the SMS texts from the phone*"; because these led participants to repeatedly encounter traces of their ex-partner's communications. Seeing messages presented a grave temptation to regress and reinitiate contact via a short communication or more passively check an ex-partner's recent activities. Participants were aware of these problems, although for some, these problems could only be resolved by irreversible measures, P13: "*I deleted her number from my phone. That took the longest and I'm better off not having it because at least now I can get drunk and not worry about having called to shout at her.*" In addition, SNS presented problems because they featured not only *self-presentation* [28,30], but also *relationship presentation* conducted within joint networks of friends. Once the

relationship breaks, evocative issues of dividing friends and friends' loyalties surface, similar to the division of physical property and friends in divorce [22], P3: "*Seeing on Facebook my family and some friends asking if he was okay following the breakup hindered me moving on considering the nature of the relationship.*"; P17: "*none of my friends spoke to him*". Most participants struggle not just with the loss of the partner, but also with the changes in their offline and online social networks, P16: "*One major change was that my ex blocked my access to his friends on Facebook*". And as we have seen, online social networks currently offer few methods for gracefully handling this. Participants were challenged in their ability to dispose of possessions with strong personal symbolic characteristics that were outside their direct control.

Reducing evocative reminiscence. Participants also experienced serious problems with their digital possessions' power to *evocatively remind*. Using common applications led them to encounter old photos, P9: "*Pictures always let me remember some good memory and I tried to not look at them at all because good memories also link to a bad memory.*"; or music, P23: "*There are some songs that recall the feeling in that period. I do listen to them, and this hinders* [moving on]". Photos and songs provoke painful memories of events and intimacy. Unlike the traditional predominantly positive view of possessions engendering positive reminiscing [8], in this situation our participants expressed strongly ambivalent feelings, P22: "*I kept everything including pictures, videos and messages about her. I do not look at them very often; sometime I feel sorrow but sometimes I feel happy when I see that beautiful time.*"

Symbolic detachment: regaining one's sense of self. Symbolic detachment is a response to the role of possessions (including significant others) as extensions of self, and highlights the importance of disposal. Disposal is critical when possessions evoke an undesired self [16] or no longer fit the ideal self [2]. Romantic breakup is a life transition requiring reevaluation of possessions of the old self, which influences the development of the new one. Disposal plays a symbolic role in indicating it is over, P1: "*Deleting everything was a kind of symbolic gesture of starting fresh as well as not having to look at it again*".

Few truly shared digital possessions, artwork and gifts
Interestingly, unlike physical ones [29], we saw few examples of *shared possessions* and none of *digital artwork*. Shared physical possessions are highly relevant in the case of romantic relationships, as emphasized in the divorce literature [22]. However with a few exceptions of shared blogs or music, we found no examples of complex negotiations around shared digital possessions. A simple explanation is that digital possessions can be easily replicated, but since we found no accounts of such practices, more plausible is that partners do not have many shared digital possessions. This contrasts with digital possessions in familial spaces where emotional disagreements between family members about how to curate digital collections indicate that these are genuinely shared [29].

Unlike previous work, there were also less creative practices around digital possessions. Our participants placed less emphasis on videos, and showed no evidence of artwork. This is particularly interesting given previous work documenting the value of craft in the grief process [34,32]. Among *physical* possessions, our findings also emphasized gifts (76%) as relationship signals, to a larger extent than in studies of familial spaces. However such gifts were rare in the digital context. These outcomes open up new design opportunities for the creation of shared digital possessions and digital artwork capturing relationship symbolism.

Strategies for Disposing of Possessions
The critical problems described above give rise to three different disposal strategies enacted by: 12 *deleters* who engage in total disposal, 8 *keepers* who retain all their possessions, and 4 *selective disposers* who employ a hybrid strategy disposing of all but a few treasured possessions.

Deleters Engage in Total Disposal
Deleting everything eliminates contacting awareness and reduces painful reminiscence. Often performed *immediately* after the breakup, it provides space for dealing with loss and reconstruing identity (singlehood included), P4: "*Having photos on my phone and computer did cause me to feel sad, but I immediately removed them after the breakup, in order to move on*"; P7: "*I got rid of all the things that were common between the two of us.*"

Disposal on SNS is particularly problematic because of limited control over the self-relevant material. Deleters therefore had to *untag* rather than *delete* photos owned by others, P6: "*Some pictures were untagged from Facebook because you can't really delete them.*" Other radical deleters' practices on SNS include *immediate unfriending* or blocking ex-partner's access to one's profile (P1, P4, P5, P6, P17, P23), *immediate changing relationship status to single* (P5, P8, P9, P18, P20, P21), as well as *discontinuing online surveillance*, P8: "*We do not follow each other or have any sort of conversation or contact through any social media*". Deleters engage in *total disposal* practices either actively as described above, or passively through willful neglect, P5: "*There are still some pictures on Facebook but it is not worth the effort to delete [them]. I lost some copies when my hard disk crashed*"; P7: "*I did not make the effort to delete text messages; when they get old, they leave the system automatically*"; P8: "*I lost all my messages when I changed phones.*"

Interestingly, there appears to be a larger range of practices for disposing of *physical* compared to digital possessions. Thus, beside active disappearance through throwing away, and willful neglect, people also engage in *destruction* through burning physical possessions, P6: "*Some of them were burnt in a bonfire*"; and *passing onto others*, P6: "*The gifts that he gave me were donated to the charity shop*".

Although highly beneficial immediately following the breakup, some deleters later regret disposing of everything,

P15: "*some books and music that he recommended would continually remind me of him. I didn't keep these because I just felt it would not be productive for my attempts to move on with my life. Now I wish I had kept them because they form an important part of my life*."

Outcomes also confirm the importance of self-relevance of autobiographical memories in intentional forgetting. This allows new memories related to the emerging self to overwrite previous ones P12: "*I think the best way to forget is to gain new memories*".

When deploying the disposal strategy, deleters engage in two forms of intentional forgetting, tackling: (i) both good and bad memories, P7: "*I wanted to get rid of all of them*", or (ii) good memories only, often employed by the breakup initiator to reduce the guilt associated with it, P4: "*I attempted to push aside any of the good memories of the relationship, and tried to focus on the bad memories in order to feel better about ending it*". Deletion enforces cutting ties and is particularly beneficial on a short-term basis, providing separation from continual contact and painful reminders, as well as allowing for sense-making, P7: "*I have grown emotionally and understood how relationships work*". Its main limitation is that is often impulsive; deleters sometimes later regret failing to save mementos symbolizing a chapter of their life. Future technologies may help address this limitation.

Keepers Retain Everything Either Visibly or Concealed
A contrary approach is employed by *keepers* who treasure all their digital possessions, i.e. emails, IM, videos, music, photos, texts, phone numbers, messages and photos on SNS, P18: *"I didn't delete anything"*; P22: *"I kept everything including pictures, videos and messages about her"*. They often engage in reminiscing, P23: *"I have kept everything to remind me about our happy time"*. Keepers also persist with similar practices on SNS oriented towards proximity and continual contact, including subtle online surveillance, P10: "*I follow his Facebook and I still check it.*"; P11: "*I also try to get his information through social networks in a quiet way*"; P23: *"At the beginning I followed her social network site"*. Treasured physical possessions about relationships are also preserved, P10: "*Pictures are still in my computer and gifts in my room*".

Interestingly, keepers also try to manage painful evocativeness of their possessions through concealment and the ritual of emotional disinvestment. While kept possessions are often visible, sometimes they are concealed. *Concealment* tends to be immediate and reversible. Here keepers store possessions in inaccessible places to reduce their negative impact. Some people developed sophisticated practices of deleting everything from its original location after performing a complete backup to a hidden folder, P22: *"I deleted all the messages though I have backed them up. I put all the digital material into a file and set as "Hidden"*. They exploited meta-data, to signal the importance of the folder, along with the warning to stay away. Concealment

may also involve storing digital possessions on dedicated but less accessible storage devices, P11: "*I kept all the pictures of him and me on a USB stick.*", or on seldom accessed devices like old phones, P23: "*I kept the messages in chat software and in my old cell phone.*" When dealing with physical possessions, some people also engage in *emotional disinvestment rituals*. Here the aim is to strip the object of symbolic meaning leaving it imbued exclusively with its functional meaning, P18: "*Yeah, I still wear* [the gift clothes], *but now they don't have any meaning behind them, they are just things*". Whether they are visible or concealed, such possessions have compelling evocative power, acting as continual reminders that can disturb or hinder moving on, P10: *"Pictures hindered my moving on, when I looked at them would make me remember him, I just try to not look at them now, but at the very beginning of the breakup I looked at them frequently. [] These possessions don't help me"*; P22: *"Keeping gifts, made me feel sad, very sad."*

Keepers are strongly oriented towards maintaining ties, P20: "*Sometimes looking at* [photos] *made me miss him, and want him back, though I knew I shouldn't*". This leads the romantic attachment to persist, which prolongs the grief process [34], P23: "*When I noticed her updated blog about her new life I felt pity and envy*". New designs that allow keepers to better control the reminiscing triggered by digital possessions could be critical for addressing these problems.

Keepers tend to be biased in what they remember, recalling only good memories, thus idealizing the relationship, P10: "*I ignore the bad memories and just keep the good memories*"; P18: "*I like to keep all good memories, [] I blocked out bad memories and don't really remember them, I tried hard to do that.*" Keeping was more common in those who were not the initiator of the breakup. It also depended on when the relationship dissolved, being more frequent in the first 6 months.

Selective Disposers Discontinue Use and Later Curate
A final adaptive hybrid strategy involves two phases: immediate *discontinued use* creating the emotional space needed for the moving on process. Later it can involve *selective disposal* of unwanted digital possessions with the aim of reminiscing around a small core of preserved valued possessions. *Discontinued use* of possessions retains their accessibility and visibility, while limiting or preventing reminiscence, P19: "*I didn't look at photos, just knew they were there*". Selective disposers also engage in *limited use* of SNS, P13: "*I stopped using Facebook for as much and so did she actually.* [For a while] *it gave me some distance"*; P17: "*It helped a lot not following him on any social networking site. For sure, as those things are kind of intense.*"

Discontinued use is different from concealment. Unlike concealment it leaves possessions in their place while allowing participants to dismiss them from their minds. In contrast, concealment can involve a preoccupation with possessions, triggering reminiscing and maintaining bonds.

Selective disposers later identified a subset of digital possessions to be kept. One participant deleted all but a few special photos to be enjoyed after the grief work had been completed, and avoid anticipated regret, P13: "*I actually had a little clean up there* [3 weeks after the breakup] – *deleted a bunch of emails I had from her, cleared all her stuff off my computer and I deleted her number from my phone. [] But I kept her photos; someday, I may want to revisit some of the times we shared; just not right now*". Being selective avoided regret experienced by others who were too radical in their disposal. P15 asserted: "*unfortunately, I was too impulsive at the time and threw everything out*", while P14 expressed overt regret about disposing of a *perfect gift: "I got lego. There was a letter with it too. But it really disrupted my recovery because it made me think he knew me and it reminded me of him. So I had to get rid of it because it was too painful to see - although some days I do regret throwing it out.*"

Deleting the vast remaining collection can take the form of a *separation ritual* usually performed after careful deliberation, and only when the person feels ready for it. This can be any time from 3 weeks to 8 months, P17: "*I only deleted pictures of us this Christmas. I didn't look at them, just knew they were there and chucked them away 8 months later. I had to do that one day.*" Such behaviour differs from deleters' total disposal because it is performed after deliberation, while leaving the most valued possessions untouched for later reminiscing.

Selective disposers tend to remember both good and bad memories, P15: "*I think I kept the good and the bad, and still do. So when I did miss him, it was usually because I was reflecting on the good things about him and the great memories we made, but it was important to keep the bad memories as well to balance the good ones.*"; P16: "*It also made me realize the value of keeping the memories of that person because while they hurt immediately, you will want to revisit them at a later stage.*"

Selective disposal is arguably a more adaptive strategy; it resists the temptation to act impulsively, and defers dealing with possessions until one feels ready, allowing for the construction of a redemption narrative, P15*: "I'm glad I met him and glad we broke up. He helped me figure out what I don't want or need in a relationship, so for that I am thankful".* This strategy requires new designs to facilitate active selection of highly valued possessions to be retained. It does not seem to depend on the status of breakup initiator, quality of the relationship or time elapsed from dissolution. Instead it may depend on the type of attachment [5], but more work is needed to explore this.

Enacting Disposal Practices
Enacting disposal practices presents serious difficulties particularly on SNS, and depends on various temporal, spatial and emotional factors.

Disposal is Difficult and Seldom Exhaustive
If and when people decide that they want to engage in disposal, they experience major difficulties in enacting systematic disposal. This is because digital possessions are in vast collections spread across multiple devices, applications, web-services, and platforms. When the relationship is good, this promotes a rich digital life. But when it sours and people feel compelled to dispose, they have to systematically cull collections across multiple digital spaces.

Apart from being time consuming, disposal is also *emotionally taxing*, since people often re-engage with possessions while they make clean-up decisions, especially when looking at photos. Because of this, even for deleters who want to disengage completely with the partner, disposal is seldom exhaustive. And one negative consequence of partial disposal is that participants stumble upon digital traces of the partner they thought they had already disposed of. This could be very upsetting, P1: "[What hindered moving on?] *Occasionally finding things that I had missed throwing out or deleting: the odd email stored in Outlook on the computer I didn't often use or messages I missed on a social networking site I didn't use much.*"

Deleting and Renegotiating Ties in Social Networks
Enacting disposal is even more complicated within SNS because of: (i) a lack of control over digital traces of the relationship - photos outside one's profile can only be untagged not deleted; (ii) the tension of maintaining or deleting shared friends. Retaining ties enables unwanted access to the ex-partner's activities or raises problems with friends taking sides. Deleting friends disrupts one's already compromised social network; (iii) direct access to an entire *social world*. By default this provides information about the ex-partner unless one takes steps. Relationship status causes particular problems in explaining one's new status to acquaintances who do not know the breakup details. More perniciously, digital accessibility makes it easier to "check up" on the other person, which can be either maladaptive, or positive if merely done to 'see if they are ok'. Access to status updates also facilitates ex-partners' surveillance possibly promoting attempts to get back in touch, which may slow the process of moving on.

Time, Distance and Emotions Influence Strategy Choice
Disposal strategies are enacted in different ways with different temporal, spatial and emotional characteristics. These are all important considerations for design. Strategies varied in the *length of time elapsed* from the breakup until enacting them. *Duration-wise*, for some they were *swift* and *cathartic*; e.g. when many materials were collocated in a single folder they could be disposed of by a single delete key press; for others disposal was *gradual* like a separation ritual. Gradual disposal is difficult as it can mean protracted painful reminding. While length of time elapsed is under the user's control, the duration of disposal, and its reversibility are critical for design. While deletion is final, a hidden possession can later be permanently removed or re-engaged with.

The *spatial* dimension relates to the location of the disposed possessions. Some people created physical distance from possessions they wanted to disengage with, storing them with trusted others, such as parents or friends, or lodged in inaccessible locations, e.g. infrequently used devices or inaccessible folder. Many others created *social distance* by removing digital traces from SNS.

Feelings can also influence disposal strategy choice. Hurt or a desire for control can lead people to impulsively and permanently dispose of many traces of their ex-partner. However, choice of strategy can also affect feelings directly; people who kept possessions accessible experienced painful reminding as they encountered these on a daily basis. Those who chose radical deletion sometimes experienced later regret about their impulsive purging. Others wanted to defer symbolic cleansing until they felt ready.

DESIGN IMPLICATIONS
We now discuss the design implications of our findings. We address the problems of vast, heterogeneous and distributed collections of digital possessions serving as painful reminders, and promoting involuntary rather than mindful interaction. We also discuss the need to support active selection of valued possessions, and the value of digital craft for sense-making as an opportunity to move on. In addition, the value of genuinely shared possessions is also addressed.

Automatic Harvesting of a Pandora's Box
Having a vast, heterogeneous, and distributed set of digital possessions is considered an advantage in supporting memory and sense of self [13,28]. In contrast, we found that such possessions are problematic when they challenge a newly emerging self, and that their pervasiveness and sheer number hinder people's attempts to dispose of them. One solution is to design new ways to *automatically harvest* digital material about the relationship, using face recognition, machine learning or entity extraction generating a *unified set* of possessions about the relationship. Being automatic allows collation without participants having to confront painful reminders. The resulting collection could be metaphorically captured by the term *Pandora's Box*. Participants could dispose of this as they choose, e.g. safely conceal it from routine activities with a label warning of its intense, unprocessed content.

Don't Touch!: Self Control in Intentional Forgetting
Few participants were able to dispassionately evaluate digital possessions about the relationship to retain only the most valued ones. A lack of disposal tools meant most participants either kept, or disposed of *everything*. For keepers, confirming grief therapy [34], possessions hindered recovery, triggering upsetting reminiscence. Deleters responded very differently: often regretting impulsive decisions to dispose of digital possessions because these were painful, pervasive reminders. However automatically harvesting relationship possessions into a Pandora's box offers new choices for strategically deleting or retaining problematic possessions.

We propose new *technologies for self-control*, explicitly designed to help manage emotions and control rash impulses, preventing deleters from destroying valued possessions and keepers from obsessively revisiting them. We might help *keepers* reduce the temptation to *maladaptively re-engage* by providing self-administered mechanisms to block direct access to the Pandora's box. New tools might allow keepers to choose availability regimes imposing deferred or infrequent access to restrict impulsive requests to re-engage. Or keepers could engage social support by specifying trusted friends as 'gatekeepers' to be consulted before accessing evocative materials. Finally, such tools might steer keepers towards building a new life by engaging them with new SNS posts from friends rather than surveillance.

A different design might help *impulsive deleters*. Instead of permanently destroying materials they later want, deleters could self-impose a regime that would make the Pandora's box totally inaccessible for a long period, e.g. a year. They could then revisit their decision to 'delete everything' following this cooling off period. Together such self-administered systems may block impulsive behaviors creating much needed space for understanding the breakup, and for retrieving inaccessible content if later requested.

Active Selection of a Treasure Chest
We also need new tools for active selection from collections of digital possessions to create a *treasure chest*. Very few participants succeeded in retaining a small set of highly valued digital possessions to facilitate positive reminiscing [13,29]. New tools might allow users to actively select [19,21,26] valued materials during and after the relationship. For instance, automatically-generated meta-data such as photo viewings might implicitly identify valued materials. Of course we would recommend that systematic attempts to identify valued materials be deferred until the separation process is well underway to avoid upsetting reminiscence [19].

Crafting for Moving On
Although a few participants wrote blogs to make sense of their breakup, none created digital artwork symbolizing the relationship, although crafting is an important ritual for sense-making following trauma [32,34]. This suggests new technologies for *crafting creative symbolic digital artifacts* as alternative ways of processing grief. Unlike the current "delete" option, they should emphasize slow transformation of the contents of the Pandora's Box. During a separation ritual, people might generate collages of photos or emails employing visual techniques to transform them into compelling abstract visualizations; or symbolic objects might be embodied in tangible artifacts which when held might issue sounds for mood enhancement. By supporting separation rituals, these tools afford closure, celebrating the good, acknowledging the bad and helping moving on.

Beyond the Self: Truly Shared Possessions
Participants showed us *individual* rather than shared possessions. One apparent exception was SNS. However on

closer examination, one critical source of user problems was that on SNS people had individual profiles, rather than shared digital spaces. This could open up a design space of new systems for *creating truly shared objects sets from private repositories*. Possessions on SNS are particularly problematic when it comes to disposal [28], arising from their predominantly individual- not relationship-focus.

Designing dedicated spaces for a couple's shared digital possessions, through a *relationship profile*, would allow celebration of successful relationships. In the case of dissolution, it could afford transition to singlehood, without the need for laborious extraction of traces of coupledom from individual profiles. Such relationship spaces might also provide opportunities where partners might 'vent' or tell their side of the story.

THEORETICAL IMPLICATIONS

Since digital possessions are strong, evocative and emotionally ambivalent, their disposal for intentional forgetting is crucial. An additional suggestion concerns the value of genuinely shared digital possessions within the dyadic relationship.

Digital Possessions Are Salient and Significant

Traditionally, digital possessions were thought to have limited materiality [24] serving more like commodities than *things* imbued with symbolic meanings [27,29]. Instead, we found evidence of the *pervasiveness* of digital possessions in SNS and a large range of devices. Digital possessions are directly integrated into young people lives, unlike their limited integration in family life [29]. The widespread impact of SNS on young people's lives, through visible daily reminders of mundane and important events, is also suggested by [28]. Much previous work shows that people archive *physical* possessions for occasional reminiscing [8,29]. However, using *digital* possessions in a similar way has not often been found [29]. In contrast, we found some people actively saved sentimental digital possessions for later reminiscing, and experienced regret when they did not.

Consistent with [13,28] our participants' reactions indicated that in other contexts the same digital possessions can be powerful reminders of negative (or positive nostalgic) memories that must be avoided at all costs. Their evocativeness, visibility, pervasiveness, and above all strong yet no longer self-relevant symbolic meaning, gives digital possessions *gravitas*, making them as real as physical ones.

Ambivalent Emotions with Digital Possessions

Prior work focused predominantly on *treasured* possessions cueing positive memories of happy events, personal achievements, or loved ones. Exploring digital possessions through the lens of significant, negative, self-relevant events revealed that retention was not always positive. Exploring possessions for some was like opening a Pandora's box. While work on bereavement has examined digital possessions within emotionally challenging contexts, such work has emphasized their role in maintaining ties,

with disposal practices that are less destructive than we saw here [21,25,26]. This is less surprising as, although tragic, bereavement tends to celebrate the life of, and relationships with the departed.

Demographics are also critical. Our participants were young, with strong interests in romantic relationships and they spent much time within the digital space. As students, they were in a transitional stage of their lives, not living in their own houses, and without large sets of physical possessions. This may explain why their relationships are strongly reflected in digital rather than physical possessions. Future work could explore the role of digital possessions in life transitions [20] or where people bequeath something ambivalent or confining, such as a job resignation, imprisonment, asylum seekers or even retirement and relocation.

Intentional Forgetting: Some Digital Possessions Have to be Disposed Of

Digital possessions that engender negative reminiscing cannot be simply ignored; instead they demand attention and strategic disposal, arguably even more than physical possessions, e.g. in the case of SNS [28]. However, not all digital possessions are equally disposable, some may be retained and treasured when congruent with the current self; others are disposed of when they clash with the self. This requirement for active disposal supports new findings [21,26] and differs from previous accounts of *laissez faire* curation of largely positive digital mementos [31]. It supports pleas for 'intentional forgetting' of digital possessions [1,31]. However digital disposal is far from straightforward. Some participants kept too much and were subjected to painful reminiscence. Others impulsively deleted possessions they later wanted. Yet others engaged in immediate *discontinued use* and later *selective disposal*. Disposal was *emotionally taxing* because digital possessions are ubiquitous occurring across multiple devices. When disposal occurred it was often associated with strong emotion and contained ritualistic elements.

This also begs the question of *why* digital possessions engender these emotions. *Pervasiveness* of digital possessions creates problems during a breakup, as people 'inhabit' their digital space, where photos and music, constantly remind them about their prior relationship. In SNS they encounter traces of their ex-partner and have to clarify their new status to others. Self-control is required to resist the temptation to engage in surveillance of their ex-partners. Future work needs to examine 'active forgetting' of digital possessions to understand its characteristics and what determines strategy choices.

Sharing and Digital Identity

Whereas previous findings emphasize the roles of digital possessions in self-definition and self-presentation [13,28,30], or in representing *family* relationships [13,29], our findings highlight the role of digital artifacts in *dyadic* relationship symbolism. The meaning of sharing raises

challenging issues for digital possessions, bringing up ownership (who can change or remove), authorship (who generates), and content (who it is about).

CONCLUSION

Our field study explored the challenges of digital possessions following a breakup. We advance theory by finding strong evidence for the value of intentional forgetting and provide new data about complex practices associated with problematic disposal of digital possessions. Our findings led to a number of design implications that would help people better manage this process, including automatic harvesting of digital possessions, tools for self-control, artifact crafting as sense-making, and digital spaces for shared possessions. The proposed design implications should help people convert what is currently a *Pandora's Box* into a *treasure chest* of memories, to more adaptively respond to the difficult life transition of relationship dissolution.

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