Lost in Translation: Understanding the Possession of Digital Things in the Cloud

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ABSTRACT

People are amassing larger and more diverse collections of digital things. The emergence of Cloud computing has enabled people to move their personal files to online places, and create new digital things through online services. However, little is known about how this shift might shape people's orientations toward their digital things. To investigate, we conducted in depth interviews with 13 people comparing and contrasting how they think about their possessions, moving from physical ones, to locally kept digital materials, to the online world. Findings are interpreted to detail design and research opportunities in this emerging space.

Author Keywords

Possession; Materiality; Interactive Systems Design; Human-Centered Architectures; Cloud Computing.

ACM Classification Keywords

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

INTRODUCTION

"*...the more I talk about it, the idea of owning something digital seems lost in translation.*" (P4)

People are continuing to amass larger, more diverse and deeply valued collections of digital things. In the past few years, the factors shaping people's relationships with their digital materials has become a focus for HCI research [e.g., 6, 16, 21]. This body of work has produced many worthwhile contributions aimed at better supporting people's values, practices and desires surrounding their digital content kept locally on domestic computers and devices. However, the convergence of social and Cloud computing, along with the growing presence of networked devices, are creating new opportunities for people to move personal files to online places, as well as create new digital content through online services. Despite these real and growing changes, relatively little is known about how they might shape people's orientations toward their digital possessions.

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The standard view – certainly the one outlined in advertising [e.g., 2] – is that, with 'the Cloud', people will be able to keep their digital assets more securely and, potentially, more cheaply. By moving away from local storage, users can be sure that when their devices crash or get stolen, or when they suffer from the myriad other mishaps of daily life, their data will be safe. There is no doubt that such concerns do motivate people to move the data they care about online. Recently, for example, Odom et al. [15], reported on the fear that drives many teenagers to seek remote back-up: the likelihood that they might lose their devices or get them stolen, combined with their own poor data management practices, make Cloud-like services especially appealing.

But, perhaps this view is overly simplistic. As we shall discuss in this paper, there are many reasons people engage with the Cloud when producing, accessing, sharing and keeping their digital materials. Such activities have many benefits, yet at the same time, as we shall see, the result of these new kinds of interactions can also alter users' orientations to their digital "belongings" in complex and nuanced ways. Indeed, it can lead to complexities, concerns and conundrums in the way people reason about and act upon their online resources. We will argue that part of the complexity here is bound to the design of the devices and services that people use. As we move forward into an ever more networked, multiple device and data-centric world, it seems important to investigate and design around human centered preferences and orientations to data, where storage, and 'safety', is simply one manifestation of that orientation.

It is the purpose of this paper to present research findings based on this premise. We begin the paper with a review of the sociological and anthropological literature on the topic of materiality. We shall see that modern anthropology has become increasingly concerned with possession and materiality, examining in much detail the ways people relate to 'things' as a way of constituting identity and social location. Sociology, meanwhile, has focused on how the orientation that people have to their material possessions needs to be examined as a set of 'reflexive practices' manifest in their daily interactions both with these materials and with others around them.

We will then explore data gathered from qualitative interviews with a diverse sample of 13 people in which we ex-

amined how they orient both to their physical and virtual possessions. Specifically, we investigate similarities and differences in how they consider their physical things, their locally kept digital materials, and their things in the online world. Here we shall see that possession is at once a noun for a type of object (physical or virtual) and a verb that labels ways of treating things, again both physical and virtual. This data also illustrates how people are concerned not only with their own possessions, but with others' possessions too. But, beyond this, we shall see that their key concern is that possession be a declarative property of objects, one that can be 'seen' somehow in the type of object—in its location and in the way it is handled by those who have rights to it and concomitantly how it is not handled by those who do not.

With this as a background, the last section of the paper considers how the design of services that allow for the production, gathering, sharing, and storing of digital stuff may proceed in such a fashion that these declarative properties may be embedded in sensible ways. Specifically, we contribute several design considerations to sensitize the design space encompassing Cloud-based interactive systems to better support the possession of personal digital stuff, and the many properties associated with it. To do this, we shall suggest, will not require simple tweaking of current technology, but careful reconfiguration of many aspects of interaction design around digital stuff in all its varieties.

LITERATURE REVIEW

In what immediately follows, we review literature on the topic of materiality in anthropology and sociology. We then describe related works in HCI.

Any investigation of the current literature in anthropology will likely cite Daniel Miller's work. In numerous books he has sought to show how material objects and the study of materiality are fundamental to anthropological research [e.g., 14]. Instead of seeing identity as merely a product of social structure, he shows that identity is partly made in the assemblies of artifacts constitutive of homes in which people live, as well as in their material practices elsewhere (e.g., at work). His study of material displays within homes in South London is a case in point [13]. Here, he argues that 'who you are' is writ large in the things that one possesses and one chooses not to possess; materiality speaks volumes in what it is made up of and what it is does not contain. Miller builds his view through claiming that prior interest in materiality had tended to be at such a high level that it did not account for the richness and diversity of material possessions, a richness that Miller himself tries to convey in the various vignettes presented in his books.

Within sociology, interest in materiality and possession is represented most recently in the work of Shove et al [18]. Shove's work is predicated on a similar presumption to Miller; namely, that the relationship between material objects and identity is to be uncovered through examining the myriad forms that possession can take. She notes that possession is not only something that can apply to a thing but to spaces, practices, and of course, power. From this view, materiality and possession cannot be examined through the limited lens of the persons being studied, through their own subjectivity, but only through theoretical elaboration: key to this is an analysis of the reflexive ways power is manifest in material practices. A somewhat different view within sociology suggests that focus should be placed on people's own orientations and practices which are not to be dismissed as subjective, but as being based on 'lay theorizing'. It is the relationship between this theorizing and material practices that produces the world of everyday life. This perspective has been especially influential in HCI in the work of Suchman [19] and many others.

Turning to work within HCI, there has been a growing interest in how people value or keep digital things, and how this contrasts with physical objects. Much of this research focuses on the concerns of the users, and in this resonates with the ethnomethodological approach. Several researchers explore the practices surrounding valued material archives, for example, and then use these to inform the design of interactive systems. The goal of these systems is to better support personal archiving in 'everyday life' [e.g., 5] and the safekeeping of 'the cherished', digital and otherwise [e.g., 6]. Other researchers have investigated how people's personal archives could be leveraged to better support reflection on the past and meaningful experiences with others [e.g., 16, 21].

Collectively, these works and many others have produced significant contributions to understanding how to better support people's practices and desires surrounding their digital things, most often kept locally on domestic computers and devices.

The convergence of social and Cloud computing, meanwhile, has created new opportunities for people to move increasing amounts of their personal data to online places. Along with these shifts there is now a substantial amount of literature (as well as an active community) within HCI focused on understanding the range of experiences and practices that unfold in online places, such as social networking and media sites. This body of work is too large to cover here, but it suffices to say that researchers have explored issues such as how these sites are used to maintain social relationships [1] and how unwanted self disclosure might be better avoided [17].

However, one topic that has received conspicuously little attention is the question of how the placement of an individual's personal digital stuff in online places might alter their perceptions of these things. Very recently, Odom et al. [15] reported on teenagers' drive to put their "virtual possessions" in Cloud computing services to make them more available and present in their lives. This work also described how teens curated their digital things to exercise a higher level of authorship over their online places compared to their bedrooms. Additionally, Marshall and others [10]

have begun to explore implications surrounding the archiving of Internet-based personal information, which revealed people perceived information online to generally be enduring, while also perplexingly susceptible to unanticipated loss. Marshall et al. [9] also investigated peoples' attitudes toward 'owning' social media content on Twitter.com. This study reported that users desired to retain control over the content they produced and to personally archive it, although currently there are no clear ways for this to be achieved. More broadly, there is a history of work in Digital Rights and Digital Identity Management. The former explores how to create technologies used to limit the use of digital content, often to fight copyright infringement [8], while the later aims to verify the identity credentials of a person to decide whether they should be granted access to sensitive content [see 11].

Despite these emerging strands of research, little is collectively known about how the emergence of one's digital stuff in the Cloud might alter people's perceptions of it. In our work, we attempt to address this gap and contribute a more concrete understanding of how people experience the possession of their things in the Cloud, and how this knowledge could better support users' relationships with the digital materials they value.

FIELD STUDY METHOD

The approach we adopted was to recruit a diverse sample of people to elicit a wide range of rich descriptions about how possession of personal digital content is perceived and experienced online. This approach clearly has limitations; for example, it makes the results hard to generalize to any subpopulation of users. However, considering the paucity of work in this area and following Edmondson & McManus [3], we wanted to begin with a diverse group to gain a rich, descriptive understanding of the space as a whole to inform what might be salient issues for future research.

With that in mind, a total of 13 participants (7 female and 6 male) were recruited through word of mouth and advertisements; all came from the South Eastern region of the United Kingdom. Participants were screened over the phone to ensure we recruited a range of ages and occupations. Participants' computing practices and expertise varied; however, all owned personal computers, used them relatively frequently (the majority on a daily basis), and had maintained at least one online account at some point (e.g., email, dating website, Facebook). Importantly, in this paper, when we say "online places", we mean any internet-enabled service. This includes but is not limited to Cloud-based storage services (e.g., Dropbox.com), social media/networking sites (e.g. Facebook,), email accounts, and other sites (e.g. location or photo sharing services).

Our resulting sample represented people at many different life stages and in many different occupations. The ages of the participants were as follows: Teenagers [**P1** (aged 16), **P2** (aged 17), **P3** (aged 16)]; Mid-20s [**P4**, **P5**]; Mid-30s [**P6**, **P7**]; Mid-40s [**P8**, **P9**, **P10**]; Mid-50s [**P11**, **P12**]; Mid-60s [**P13**]. Occupations included student, architect, bank teller, homemaker, tour guide, and retired dancer.

Semi-structured interviews were conducted in participants' homes, lasting between 70-120 minutes. Interviews aimed to develop an understanding of each participant's orientations toward their (i) material things, (ii) locally stored digital content, and (iii) digital stuff appearing in online places. We began by asking participants to describe the material things they possessed that they considered important. We also asked participants to describe material things that were once valued, but possession had since been relinquished (if any came to mind). Participants then gave us a tour of where these artifacts were kept in the home (in the case of teens, this occurred mostly in their bedroom). This was followed by a tour of participants' digital stuff kept on local devices. We similarly asked participants to describe what they perceived to be valued digital things, with emphasis on probing motivations and strategies for holding onto these things. We then asked participants to give us a tour of their digital stuff kept in online environments. Across these themes, we asked participants to reflect on similarities and differences among their material and digital things; we paid close attention to the language participants used to categorize and describe similarities and differences. We were careful to not offer participants any definitions of 'possession' throughout the interviews; when necessary we prompted them to clarify their orientations toward their various material and digital things.

All interviews were audio-taped, which produced nearly 18 hours of recordings. The first author conducted all of the interviews. All authors met weekly for 1-3 hours to review and analyze the data. Documents for each interview were created and contained transcribed segments relevant to our research questions (as opposed to idle chit chat). Documents were coded by researchers before weekly meetings; overlaps and differences in interpretations of the data were discussed. Data were then organized into themes. Meetings were also held with researchers outside of the project to challenge our assumptions and to corroborate the themes. In what follows, we present several examples taken from field observations with participants, which we feel capture the core themes emerging across our interviews.

FINDINGS

In what immediately follows, we briefly describe the main findings related to participants' material possessions and their perceptions with regard to digital stuff kept locally on devices in the home. We then unpack apparent differences that emerged as participants compared these orientations to their digital things kept in online places or when attempts were made to move them from one to the other.

The Possessing of Things: Material and Virtual

Interviews and observations in participants' homes confirmed the insights that Miller offers in his *The Comfort of Things* [15]. The way our subjects spoke about and presented their possessions revealed a range of deeply held

values, values to do with who they were and how they wanted to convey that to those they shared their lives with – at home, at work and even to strangers, like us, the researchers. Material possessions are essential to the repertoire of identity, we learnt. A sample of the materials used in identity production included photographs of family and friends, mementos from trips, and objects symbolic of personal relationships. All the homes we studied contained family heirlooms, for example, tying identity in the here and now with what it was (except P5 and the bedrooms of P1-P3). In some cases these things were on display in the home, and, following Miller, we took this as indicating that the subjects wanted to 'make them present and accessible'. Examples of these included handmade ceramics on a living room mantle. Other artifacts were stored away (in closets or cupboards) but the participants brought them to bear by reporting on how they 'knew' where these things were, and though they might be hidden away in the service of their preservation, their presence remained real, nonetheless. One example of this was a family bible in a bedroom chest. Discussions also revealed material possessions participants had intentionally discarded. The impetus for some of these behaviors simply owed to a loss of utility (e.g., broken mobile phone). But participants also described why some things were discarded because they evoked painful memories or no longer represented their values or desires. What was gone from the material record thus became another resource to account for identity.

Material things were not the only things that our participants had. All owned or had access to a personal computer they were the primary user of. Interviews revealed digital collections of varying sizes kept locally on these machines and other devices (e.g., digital camera, mobile media player). Across all participants, the personal computer functioned as the primary place where their digital content was locally kept. These collections contained such things as: music files, photo collections, personal documents, personal diaries, financial documents, computer game information, and so on. Older participants emphasized the importance of their digital photo collections documenting family members; some of which were expansive. This may be related to the fact that, aside from P10, all of our participants aged 30 and above had children. It was clear that parents perceived these archives to be deeply valued; in fact, several desired to pass them down to their children. In this view, being a parent seemed to imply acting as custodian in this regard, a role that would be 'handed down'.

Some participants raised concerns over their growing size, their importance notwithstanding. For example, P9 compares his archive of nearly 4000 photos (kept on his PC) with physical photo albums, "….*The digital ones, they are my possession, but I don't know exactly what's in there anymore and that sense of not knowing, or not easily knowing, makes possessing them feel somewhat different.*" This quote captures how a lack of awareness of the specificity of a personal archive (the contents in other words) shaped the perception of possessing it. As we will describe, lack of knowledge in this respect emerged as a core factor shaping participants' orientations toward their digital things online, and did so in several ways: the role of curator can become complicated if one does not know what one is curating.

Younger participants (P1-P5) reported keeping less expansive digital archives locally. We observed older participants organized their personal content relatively carefully, often copying it to external hard drives or physical media. By contrast, younger participants generally had less developed practices for organizing files locally, and reported rarely backing their content up. This may be due to the trend among younger participants to put content such as digital photos online [7]. However, as we shall discuss, this transition appeared to cause complications when these participants were asked to discuss their orientations toward these digital things, particularly in terms of issues of control over and awareness of these things once they were online.

Transitioning to Online Places

Several factors shaped participants' motivations to put their personal digital stuff on the internet. These relate to matters which have to do with identity through the management and display of possessions and because of matters that can best be described as practical. All told these can be broadly characterized as the following: (i) to share digital content with others (and potentially acquire new value through the accrual of social metadata), (ii) to make digital things more ubiquitously accessible, opening up the possibility of drawing on these things across different physical places, and (iii) to put in an alternative place of storage for back-up purposes (in case hardware should break down, for example).

While the second and third reasons above treat the online world much like a networked "storage box", the first reason—to share information with others—is perhaps the most compelling. This is because posting information to online sites for sharing fundamentally alters and potentially adds value to these possessions. At the same time, it is clear that the attribution of social metadata, such as comments and tags, seemed to change participants' perceptions of the digital thing itself. In a sense, these digital "things" are transformed into actions and, through this process, transformed into something else.

For example, P8 describes the distinction between digital photos on her hard drive and the 'same' copies uploaded online: "…*they get comments from my friends and family, and those acknowledgments and stories become part of them. …When I think about the photos as my possessions, I think about the ones on my computer and the ones on my Facebook as different. My* [local] *photos are me saving them for my family, for the future. …On Facebook, the photos are me and my family and the connections we have with other people through the comments. I want both of them.*"

Discussions with younger and older participants also illustrated how metadata was used as a resource to create a sense of sharing things among friends. For example, con-

sider P2 (our youngest participant): "*I upload photos of when I'm out with friends. ...Like one time is at the midsummer fair. I posted photos* [on Facebook] *and tagged* [my friends]. *...We write things if something catches our attention or* [we] *remember something happened in that photo. ...I posted them, but I put them up there to share and it's like when we all write on them and tag them, it's those things that make it feel like we all have them together.*"

These reflections help illustrate how the act of sharing online shapes orientations toward this content, possessed in some sense collectively, but still content which participants wanted to keep for themselves. This also shaped participants' orientations toward their own material possessions and digital collections kept locally in the home. Further, while research has described this general phenomenon in the context of teenagers [15], our discussions suggest it was widely applicable to participants from various generations.

Complicating and complicated notions of possession

The case of social metadata as a motivation for posting online highlights how the notion of "possession", in the ways it has traditionally been described, begins to break down in online places. When we talked to participants more closely about whether they possessed this content, and how it compares to digital content they keep locally, or indeed physical possessions, we see that it begins to make people question what this means, and struggle to articulate it.

This is nicely summed up by P8 who describes how placing photos into his Flickr account both created deeply valued digital things she desired to possess, whilst simultaneously prevented him from doing so, "*...When I think of my most important possessions, this is at the top of the list. But at the same time, I have no idea how to get them, not just the photos, but everything together. ...that's where 'possessing' them breaks down. ... I want them, I'm entitled to them, and they're there* [motioning to screen] *but do I have them? ...it feels like there's this illusion that they're mine. ...it's a very strange thing that I do not know how to resolve.*"

So what does it mean to "have", to "own" or to "possess" something? It is clear that the online world brings into question notions that we almost take for granted in the material world. In fact, it may help to appeal to participants' orientations toward what it means to possess something in the physical world to see how those basic concepts are altered, undermined or made more complex once our digital stuff begins to live on the network or in the Cloud.

In what follows, we examine how these basic, implicit assumptions are challenged. In doing so, we will show that two emergent themes run throughout: that posting something online, in today's world, can mean *relinquishing control* over the things that you care about, but also *losing awareness* of what exists, where it is, who has access to it, who is accountable for it, and what is being done with it.

Knowing what you have

In the physical world, one of the characteristics of the things we possess is that we generally have some sense of what we own and where these things are, at least in some approximate way. We organize our possessions in containers, put them in special places, or at least have some loose idea of where something we value resides. At the highest level, our homes, offices and even cars act as a kind of physical boundary around the collection of material things we possess, and within those we may have special places to further contain them, as against other members of the household, for example.

When it comes to online data, there is no equivalent sense of a place where something resides, let alone a clear boundary to understand the limits of what is ours and what is not ours. Participants expressed concerns about not knowing "where" their data lives, what it means for something to reside online, and not really knowing where the entirety of their valued things might actually exist. In this way, notions of *where you have* things are entwined with knowing *what you have*. In other words, it is difficult to take inventory on what you own without knowing where to look.

An excellent illustration of this was given by P12, who had recently experienced a hard drive crash, losing her digital photo collection in the process. As it turns out, many of these photos were also on Facebook, and she had recently taken to copying the online photos onto the local hard drive on her new laptop: "*...I feel like I need to copy them somewhere, have them covered. ...I do that and I've done that and I don't even think about why I do it. I am scared of losing them, but I didn't realize it until I started talking, right here, consciously you know. ...I use the sentence 'I've got some photos', so I've said it, but I don't know really if I possess them, not until they're here* [pointing at laptop], *at least then I know where they are.*"

Despite her recent loss of data on her local hard drive, P12 was driven to move her things from an online place to her local hard drive to have a better understanding of where they are, which appeared in part tied to the experience of possessing them. Being aware of where something resides, and being able to point to that physical place, reinforced her perception of owning those things, despite the fact it might be risky in the long term, as she had learned.

Having access when you want

In the physical world, another benefit of knowing where your things live is that you can have quick access to them. A major concern voiced by participants centered on their perceptions that since they had no discernable control over the services that host the place(s) where their digital stuff "lives", they might temporarily or even permanently lose access to them.

In all, 10 of our 13 participants noted similar concerns. For example, consider P4's discussion of her Facebook content: "*I have this fear that all of a sudden it's going to get shutdown and they're going to wipe* [it] *and I won't be able to*

get it back. So it doesn't feel like I'm fully possessing it, I mean I feel like it's my information …but it's like I'm not in charge of it fully. Like it's at the mercy of someone else."

P6 similarly described a deep attachment to her travel blog, which she now thinks of as a travel memento: "*I put a lot of work into it, but it doesn't feel exactly like mine because, let's face it, that site isn't going to be around forever. I'm thinking to back it up, but how do I do that? If I put it on a CD it's probably going to get lost.*"

The teenagers we interviewed all used social networking sites, uploading digital photos, among other things, frequently. All three teens, along with P6, reported maintaining minimal digital photo collections locally, generally opting to delete photos from their computer, camera, or phone after they had been uploaded. Discussions revealed these participants generally considered their online content would last indefinitely into the future. However, they did raise other concerns, when reflecting on differences between their access to and control over their material possessions compared to their digital things online: "*What if Facebook would block me from coming in or didn't recognize me 'as me.' I might never get those things back. I'd be distraught. …With Facebook, there are so many things on there that are important to me but they're different than my* [physical] *things because there's this chance I'd never be able to get to them. That fine line can change a lot about how I think of them. It's like possessing them, but not quite.*" (P2).

Alongside fears that services or organizations might block access to one's treasured digital things, the following poignant example shows that this can also happen because others may have rights over content that undermine your access. P5 described how the deletion of his departed friend's Facebook account (by the bereaved parents) also erased the social metadata his friend had created previously: "*Those comments were a big part of what I had left from him. …his personality really came out in them. …Now they're gone, just gone and they can't be replaced. Even if I could get them back, it wouldn't be the same. It's not just the text …it's the time he wrote it, the day he wrote it. It's like this marker of him and it all came together into something special. …made me realize how fragile things online can be.*"

What we want to highlight across these instances is that while it came naturally to participants to describe their material things, they often struggled to articulate how these orientations mapped to their digital stuff in online places. Specifically, they help illustrate how participants simultaneously had deep convictions that their online content belongs to them, while feeling ambivalent over whether access to them would continue to persist. This in part appeared to be due to a loss of control—participants could control what was stored in and presented through their online places, however higher level concerns over how these places would endure appeared to unsettlingly place their contents, as P4 put it, "at the mercy of someone else."

Being accountable for care and protection

A related issue is that knowing where something is kept is often bound up with a responsibility to care for and protect those objects. In other words, it is not solely a matter of knowing where things are, and being able to access them when you want, but there is accountability implicated in many things that one possesses. This can be, for example, a duty to keep those objects safe for someone else's sake, or to pass on to future generations [6]. What our interviews revealed was that keeping things online in some sense hands that accountability over to some unknown, unseen entity—and further that people may have very little faith in its persistence or reliability.

These issues were highlighted by three participants in possession of digital content that they had acquired from departed friends or family members. In one instance, P9 described how her lack of trust in online services complicated transitioning digital photos and documents from her father's computer to the Cloud: "*I felt like I needed to protect it* …[put] *it in a special place. …I did think about putting it online, but it didn't feel right. …It probably wouldn't* [disappear], *but who knows? …What if it was accidentally erased? …Those are chances I can't take."* When probed further on the very real possibility that the hard drive in her personal computer could crash, she pointed to a higher level moral concern: *"I know my computer could die, but at least it would be* ***on me****. …it's my responsibility to take care of it. Leaving it up to a website, there's no guarantee it's going to stay around. I can't live with that.*" As another example, P8 described complications after uploading digital photos that had belonged to a departed friend to his DropBox.com account: "*My first thought was to put them on DropBox, like if my computer dies, they'll be somewhere else. Then this whole thing came out* [about] *nothing on DropBox being safe and heaps of people's accounts weren't as private as they thought. …I had this wretched feeling, like I was being lazy about him. …I took them down immediately. …They're backed up on my* [computer] *hard drive and on a CD. I'm more in command of their destiny.*"

What is interesting in both of these examples, (and in P12's earlier reflection on backing up photos onto a new hard disk after the old one died), is that having data in some physical form in one's own possession appears to reinstate a sense of responsibility and control over it. This is despite the fact that such storage devices can and do become corrupted.

As a final example, P5 was in possession of 5 digital photos downloaded from Facebook that a friend had tagged him in on the same day of his accidental death. His reflection further highlights how a lack of awareness and control diminished his sense of guardianship over this content: "*…there's all these contradictions with putting something of that weight online because there's a need to watch over it. …*[but] *there's this sense that it's more out of my hands. Maybe someone copies it, or it gets deleted, or gets harder to find. …maybe nothing happens, but it's about the fact*

that when it goes online it is in a situation where all those things become possible."

What is interesting about this last example is that it draws attention not just to the issue of personal accountability, but to the issue that the uncertainty about handing over care of one's data to an online entity is potentially exacerbated by the actions of others. It is this issue that we turn to next.

Giving access or rights to others

One aspect of possessing a material thing is that there is some level of implicit control over others' access to it. In other words, if you possess something, you have the right to alter that thing, or to give or loan it to someone else. On the flipside, others have no rights to alter, take, or borrow your possessions without your permission. Again, this is an issue that becomes more complicated in the online world.

Part of this owes to the fact that digital things can be copied. Those copies can easily be controlled by someone other than the original owner. This is illustrated in the following example where P12 describes an undesirable experience she had on an online dating site: "*I used to be on a dating site and I had a photo of myself on it. …after a disagreement, a man I'd been talking to took it from my page. He sent me a message saying, 'If I can't have you, at least I can have your picture on my computer.' ….He put it on his desktop* [background image]*! …that was 'my' page, 'mine', he shouldn't have been able to do that! I couldn't get rid of it* [on his computer] *because it's not 'mine' anymore. …I possess the original copy, but that doesn't feel like mine anymore because of what happened.*"

Similarly, P1, one of our youngest participants, described how lack of awareness of the duplication of photos online could shift perceptions of possessing them: "*…the real way you can keep some possession of a photo online* [is] *knowing who can look at it. …once someone has viewed it they take some possession of it, but if I am the one letting that happen, then it's still mine. …but if someone gets the photo without you knowing, then I don't know if you can ever really get it 'back'. Because who knows what's going to happen with it once they get it.*"

In a more drastic example, P5 describes the experience of having his house burgled in comparison to when possession of his Facebook account was temporarily assumed by an ex-lover and his personal content was altered: "*When* [my account] *got hacked, it's more like they came in and dressed me up in a weird way that's not quite me. …so it is weird, like getting burgled with everyone watching but not realizing that someone else is making me look different.*"

Collectively, these instances highlight how the fact that digital content can be taken, copied, or otherwise appropriated by others profoundly undermined our participants' notions of possession. Clearly part of the complexity bound up in these examples is tied to the 'public' and 'semi-public' online places they unfold in, where digital content is visible to anyone (e.g. travel blog) or select subgroups of people (e.g., social networking sites). Nonetheless, these complications were in part due to the affordances of digital media and its inherent reproducibility. They were also a function of the lack of awareness of the actions of others—not knowing who had access to personal content, who at looked at it, and who had appropriated it—as well as lack of control over all of these aspects of the data. This is summed up nicely by P5's reflection on his photos and social networking content spread across Flickr and Facebook: "*I 'have' them so 'I' should have access to them and be able to decide who else does too. …but once it goes online it, it's like a void. …who knows where it will go, or really where it is. …For me possession is about knowing my things.*"

Being able to relinquish possession

A key property of possessing a thing is the ability to relinquish possession of it. Whether through throwing away love letters or deleting digital photos on their computer, all participants described experiences of relinquishing possession of things they no longer wanted in their lives. In all but two interviews (P1, P3), stark contrasts to these instances emerged as participants described how these processes unfold in online places. For example, P12 describes relinquishing possession of photos on her computer compared to on Facebook and Picasa: "*…online, well I can try to delete something, but who knows? Who deletes the deleted? Where does it go? I don't know, but I don't think it disappears, and that's odd come to think about it. …You can't very well possess something if you can't 'unpossess' it.*"

P5 describes recurrent complications experienced as he compares relinquishing possession of material things symbolic of a past relationship to similar digital things on Facebook: "*all of a sudden a photo of my Ex comes up that she's tagged me in and I want to be done with it and I'm trying to get rid of those things. …In the real world, I removed these stimuli from my life. …*[online] *it can feel impossible.*" P4 similarly described how she fully relinquished material things associated with a past relationship, while similar associations continued to linger on Facebook. She concluded the discussion with this reflection: "*There's this ironic thing about the idea of possessing something online. …you can feel like you can't really 'have it' but then when you don't want it, it's not always so easy to get away from it.*" P4 provides a salient point capturing the complex nature of possessing digital things online: when possession begins and ends, particularly as we understand it in the material world, can remain highly ambiguous in online places that are neither entirely 'public' nor 'private'.

DISCUSSION AND IMPLICATIONS

It is clear that people's notions about what it means to own something digital can be both complicated and difficult to articulate—difficulties exacerbated by the shift of personal data to the Cloud. A key contribution of our study is to present evidence that helps illustrate just what these are. What should be clear is that, even though people may deploy different strategies, the choices people make reflect a common set of concerns and orientations. It seems too that

commonalities in the concerns and strategies we observed can be understood with reference to how people think about and deal with physical things. Either this is because there is something fundamental about the link between materiality and possession, or it is that such notions are so deeply embedded in our dealing with the physical world that people cannot but help use them in their dealings with the digital. Nevertheless, some of the properties of the digital are themselves so new that no analogue for them can be found. This makes the case that people must learn new ways of thinking about digital properties and adjust their notions of ownership accordingly. At the same time, when translating notions of possession from the material to the online world causes difficulties, there may be ways of leveraging concepts of physical ownership to improve the way we deal with digital materials.

One powerful motivation for putting things online is to share them with others. Material things are of course shared too, but the digital allows new forms of sharing. This sometimes alters the thing itself in ways that are more difficult to achieve with material things. For example, the history of some real artifact can be reflected in the markings that give it a patina. But who made the markings or why they were made is often lost–the markings cannot tell that tale. But social metadata may be much richer in that respect: the residue they leave may allow for much deeper interpretations of doings-with-the-object that can change people's perceptions of the digital things in question.

It is not all positive, however. The placement of a digital thing online can have perplexing effects for people, in particular when it challenges ingrained notions about material things. This includes the fact that material things reside in places—places that one can control access to, and keep safe if need be. Possession becomes a difficult concept when the thing possessed has no geographic locale. It seems reasonable then that there are deep concerns and unresolved tensions when valued things have to go online: for this can mean relinquishing control over that thing, and this itself implies something about the 'owners' competence.

The flipside of knowing where something is, is knowing that something is gone. In the physical world, once something is destroyed, it no longer exists. In the online world, the notion of deleting something is undermined when objects can be replicated many times over. The irony here is that the very thing that may drive people to put things online—to share them—leaves those materials susceptible to the actions of others. All of this has implications not just for a person's sense of control of digital objects, but their awareness of them: location is no longer a resource that can be used to judge the safety of a thing. Likewise absence in a location is no guarantee something no longer exists.

There are many other such complications. Some are paradoxical. For example, putting things online is most often done to make them available to oneself or to others. But it can also raise the possibility that access to those things will temporarily or permanently cease. Part of the fragility of online things is not a mirror of the delicate nature of local hardware, such as the PC. It is because of the apparent arbitrariness of the services and service providers, as well as network fragility. At least with a PC, one can own responsibility for damage to it; with the Cloud, there is often little knowing why access is denied.

The point here is that online digital things (or even online places) break "the rules" of how we understand possession of material things. Further, these are issues that seem not to overly concern people in their day to day lives. Not, that is, until something unsettling happens. Just as with a car, ownership of it does not really preoccupy the owner until the day their car is stolen. Likewise, it is when a hard disk fails, a photo is appropriated by someone with mal intent, or when one suddenly loses access to the things they care about that the issues come home to roost. Apart from such events, people's feelings about digital ownership are better described as either uncertainty or uneasiness, revealing themselves very much in the process of asking our participants to reflect on their own experiences and perceptions.

Design Considerations

So how then, might we think about new ways to design Cloud technology? One might approach this through better digital rights or digital identity management solutions, or through more secure storage systems. However, such incremental enhancements in our view may only further burden users' interactions with the Cloud, not to say further complicate notions of ownership. The sensitive and complex issues outlined above suggest that we might instead reexamine how we interact with the Cloud and with the data we keep there in a more fundamental way. In what follows, we outline several design considerations emerging from this study that suggest areas for future research. Some of these have to do enabling users to have better control over their digital things they care about, and others focus on augmenting users' awareness of interaction with their stuff. Still other ideas suggest we may need to propose new properties for files, ones that extend beyond today's file types.

Knowing what you have—What would it take to give people back a sense of "having" a collection of digital objects, of feeling that they own them? One of the main findings was that a lack of awareness of the totality of one's digital assets was a major factor in undermining a sense of possession. This was in part due to the fact that these materials "lived" in many different places—in fact too many to keep track of. A workaround for many was to create local copies of online things to be able to give these materials a sense of place on a hard disk, or on CDs in a shoebox, even if this could be a risky strategy in the long run. For one thing this potentially complicates the situation for people grappling already with too many copies of too many things.

A different approach is to bring together interaction designers and systems developers to create a circumscribed but virtual place where all of the digital assets one cares about are represented. In other words, the suggestion is that there is a place where "my stuff" can be found, even if, in technical terms, it exists on many different servers, or many applications. Such a collection or visual inventory would allow these materials to be browsed through, giving users a sense of what they have. Critical here is that users could also use this as a way to find where the original objects can be located. In other words, objects in the inventory can be interrogated and used as quick ways to navigate to the place where the data resides, offering up access to its original context, metadata and so on. Such an approach could help reinstate that essential sense of awareness that people wish to have, while offering up the control they need to be able to find the objects they care about. This direction also opens up questions about how different forms and presentations of one's virtual inventory could shape interactions with and perceptions of it, and how they could be embodied through applications, devices or appliances.

Retaining guardianship—Another issue that arose was the need for users to have some way of caring for and protecting certain kinds of digital data, without depending on some other entity for guardianship. The findings showed participants had a strong desire to be accountable for safeguarding significant digital materials for future generations.

One approach to this would be to propose a new kind of file property we might call *permanency*, by which we mean the capacity to make a digital thing incapable of being deleted and thus to ensure its safety. There are, of course, Web services that offer this kind of security, but this is to place the trust in some organization "in the ether", something our participants were clearly concerned about, especially for their most sensitive materials. We propose instead that the stuff itself and the architecture of where it is stored should have demonstrable properties that prohibit or make especially difficult the destruction of them. These immutable file types and how they might be constructed will of course be a technical challenge, but the essential value of them would be to place control over guardianship back in the hands of the owners of the data. Additionally, recent work outside of HCI [12] has described new techniques for interfacing cloud computing with personal networks and devices. Those techniques could be used to create 'private clouds', where Cloud services obtain 'leases' from the user for how long their data can be 'used' and when the Cloud-based caches of this stuff expires. These advances could potentially enable people to backup the files they care about simultaneously on multiple devices, and thus deeply safeguard them, while, in a sense, still keeping them 'in the Cloud'—suggesting a body a work that could be productively drawn on in the service of future research in HCI.

Giving rights or access to others—A core motivating factor for putting things online is to share them with others. These actions occurred through various platforms, such as email services, social networking sites, and personal blogs; they offered opportunities to connect with people and in some cases accrue social metadata. The act of sharing online can also transform the thing in question when this metadata comes to extend the meaning of that originating object or stuff. The thing then becomes something that is collectively possessed. Yet we have seen that this can be problematic, leading to confusions over ownership and uncertainty about the actions of others in relation to an object, such as whether it has been copied and so on.

Here it might be valuable to devise a means by which people can retain some sense of the originating file, and of the life history of an object: allowing shared possession but pointing somehow to the original object. In a sense, what we propose is ways to extend representations of data to people without fully relinquishing it to them.

If one can extend such rights to people for joint ownership, it must also be possible to withdraw those rights. People's ability to give up their rights to access digital things are dramatically underdeveloped in online places. Current architectural design in many systems provides little choice other than letting data persist on the network or removing it completely, which, as we saw, can have significant consequences for the people invested in these things. There is a need to more sensitively handle the nuanced social connections among people. In some cases, this might mean removing connections among some people, while retaining others.

Another approach would be more focused on awareness rather than different mechanisms for control. In this approach, people can query any object they own to view other people's actions in relation to that object. In doing so, they can find out who else has made copies, who has modified an object, who has added metadata and so on. This would be a kind of "object lens" allowing people to interrogate their digital things to see what has happened to them, and who has interacted with them. This obviously raises some challenging issues for privacy. But it might be that the owner or creator of the "original" object has certain rights or priorities to view subsequent actions upon that object, as is the case now with many online services.

Being able to relinquish possession—A final aspect of ownership, confounded by the online world, is the right to get rid of something that we own. We might be able to remove material possessions from our lives that evoke memories we wish to forget, however we may be peculiarly unable to free ourselves of these things in our digital world [11]. Collectively, there is a clear need for people to be able to permanently dispossess things online.

Based on these findings, we propose that just as digital objects might have properties that make them permanent, so should it be possible to delete them forever from the context of an online system. In part, this requires that these kinds of objects keep track of actions done to them, and copies taken

from them, making sure that this network of relationships is bound up with the action of permanently deleting that object. Moreover, such objects should enable users to see that this is possible, so that if they want to keep copies, one must negotiate the right to do so. We can imagine this applied to not only digital objects (e.g., photos), but other data created as a result of interactions, such as social metadata or machine-produced metadata (e.g., timestamps, frequency of views). Emerging work in the Systems community, such as the Vanish project [4], is beginning to develop new techniques that could help address some of these concerns. More generally, this and the other considerations we have outlined suggest that there is a significant opportunity for HCI and Systems researchers to work together in developing new interventions that could influence the design and implementation of cloud-based systems.

CONCLUSION

Of course many more suggestions probably come to the mind of the astute reader; all the more so if that individual is well versed in the often arcane structures of the systems that allow the PC to connect to the Cloud and for sharing and posting to occur over different social networking services. We aimed to present those suggestions that the qualitative data gathered here suggest; other techniques for data gathering might well suggest alternatives to our proposals. Additionally, there are clear opportunities for future comparative cross-cultural research investigating people's orientations toward their digital content,

Importantly, what we want to emphasize is that our research shows that the 'materiality' of digital artifacts is of prime importance for future HCI research. This turns around the subtle and delicate properties associated with the term possession. We have seen that to possess is not merely a noun nor a verb, but a complex set of actions that transform the relationship between a thing (virtual or physical) and a person. Like physical possessions, virtual ones too play an important role in how people assert their identity, realize their aspirations and interconnect with the lives of others. It is no wonder, then, that as users of contemporary technology increasingly engage with their digital stuff, seeking to place it in secure storage, sharing it with others, and sometimes wanting to know 'who has it' or 'where it has gone', that they end up worrying about rather profound issues. As the online world threatens to complicate our lives further, it is a good time to rein in, reflect on and re-design our interactions with our digital possessions.

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